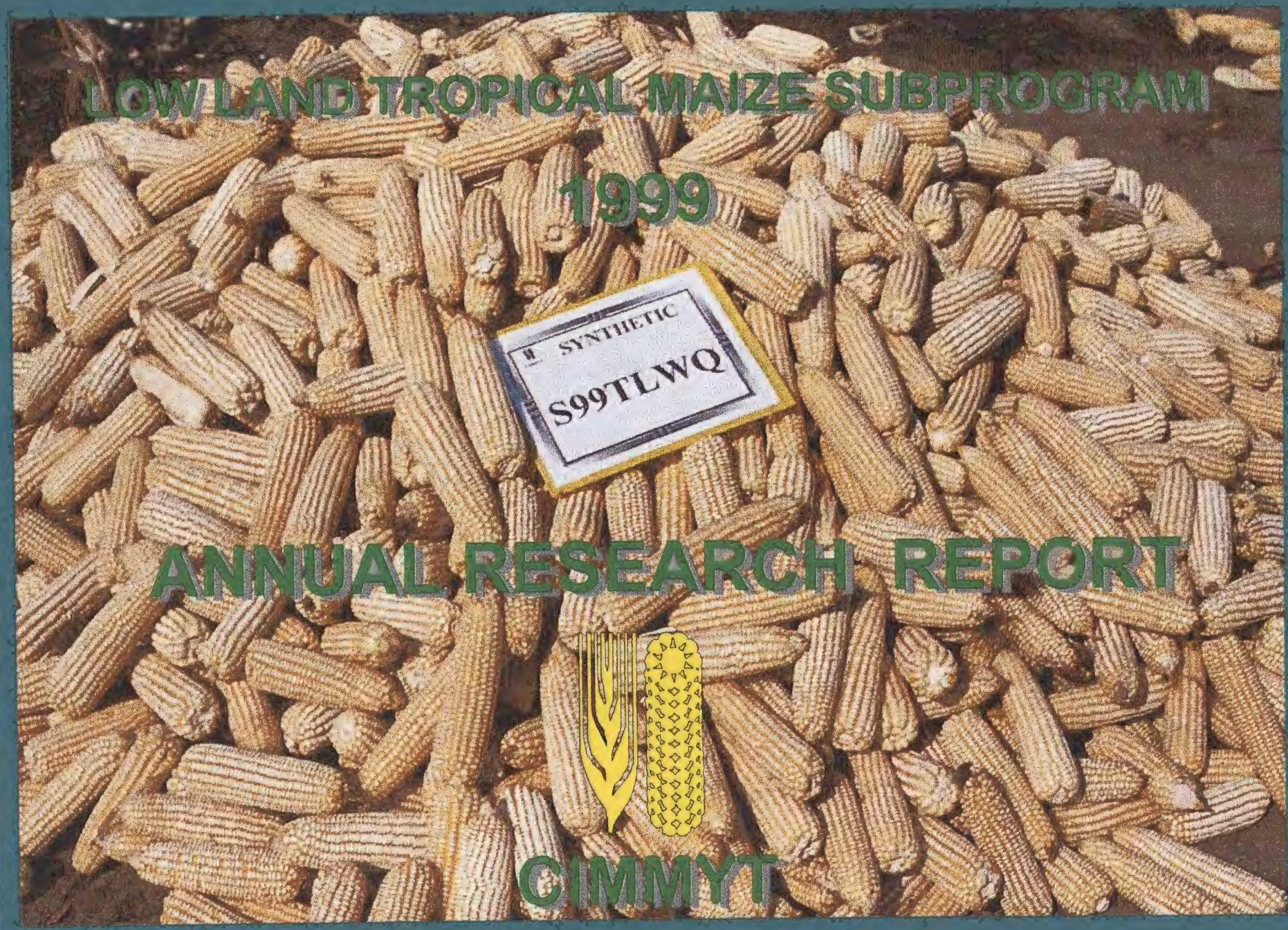

LOWLAND TROPICAL MAIZE SUBPROGRAM

1999

ANNUAL RESEARCH REPORT

CIMMYT

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LOWLAND TROPICAL - HQ
MAIZE SUBPROGRAM

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CIMMYT Maize Program

ANNUAL RESEARCH REPORT 1999

LOWLAND TROPICAL MAIZE SUBPROGRAM AT HEADQUARTERS

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I. General Comments

During 1998 and 1999 the Tropical Lowland Subprogram experienced two years of continued progress toward the implementation of new strategies in hybrid breeding and population improvement, two areas that have been enhanced with the extremely helpful collaboration of the TLL Subprogram staff national and international and support units: Entomology, Pathology and Physiology.

Based on the information collected from single-cross diallels, testcrosses and three-way cross hybrid trials, tested in five locations in Mexico and international hybrid trial (CHTTW98) planted in twenty five locations during 1998, eight tropical late white and four yellow inbred parents were selected as candidates for announcement as CMLs.

Descriptive characteristics were presented to the Maize Direction for consideration for releasing in November, 1999. Announcements were sent to collaborators in national programs and the seed industry in developing countries in November 2000.

Based on the performance of 22 advanced testcross trials each one planted in 1997 across eight locations, 8 – 10 superior performing elite inbred lines were selected and all possible single crosses formed to constitute the synthetic F_1 in each category and maturity in Tlaltizapán 1998B.

The new synthetics are:

Early maturity	**Late maturity**	
STEW97HGA	STLW97HGA	STLW97HGB
STEW97HGB	STLW97HG A&B (1)	STLY97HGA (2)
STEW97HGA&B (1)	STLW97HGB (3)	STLW97HGA&B (4)
STEW97HGA&B (2)	STLY97HGA	STLY97HGB
STEW97HGA&B (3)	STLY97HGA&B (1)	STLY97HGA (2)
STEY97HGA&B (1)	STLY97HGB (3)	STLY97HGA&B (4)
STEY97HGA&B (2)		
STEY97HGA&B (3)		
STEY97HGA&B (4)		

In 1999A the new synthetics, developed from pedigree breeding, were advanced to F_2 and tested in international EVT (14A, 14B, 12 and 13) together with the regular EV's developed from the population improvement projects. Information indicates that the new synthetics are similar in yield to the best checks but earlier, lower ear placement, and more uniform than the regular varieties from the population improvement projects in all maturity categories.

The new varieties are intermediate products between hybrids and regular EV's. It is expected that the new synthetics be more attractive to farmers. The formation of this type of synthetics will be a continuous progress derived from the pedigree selection activities.

Eighty-one white late single crosses and 52 yellow single cross hybrids were coded on the basis of the performance of single crosses and three-way cross hybrids evaluation across seven locations during 1998. All hybrids were formed with lines derived from

populations 21, 22, 25 and 43 and from F_2 pedigree populations. Some hybrids yielded up to 10.5 t/ha at Cotaxtla and Poza Rica, 1.5 tons more than CML247 x CML254. The 20 new superior hybrids are being tested internationally in 2000.

Strong interaction with GP2 was initiated early 1999 and continues throughout the year in QPM and normal germplasm enhancement and improvement with the Tropical, Subtropical and Highland subprograms, specially to develop new products and seed production of the most important hybrids and varieties.

Important activities were conducted as a field seminar in Cycle A and field days in Cycle B at Tlaltizapan, Poza Rica and El Batan. All 3 main subprograms and Pathology, Entomology, Physiology and Pre-breeding Bank activities, attended the events that were highly ranked for the quality of discussions professionally conducted. Strong collaboration in germplasm enhancements for biotic and abiotic stresses was conducted with the support of all units mentioned above for all six projects included in GP2.

Collaboration with RP2 and RP5 was enhanced via exchange of germplasm and trials from the tropical subprogram in Thailand, Guatemala and Cali locations which are key sites for the evaluation of tropical advanced and early generation testcrosses as part of GP2-RP5 coordination activities. Hugo Córdova traveled to Guatemala to the PCCMCA meeting and Brazil to the Latin America maize meeting and Venezuela, presented a conference and actively participated in the PRM and Maiceros meeting using his experience to define future breeding strategies. As part of FP4 activities we have identified seven tropical QPM lines for release early in April 2001. This is the most important milestone established in FP4.

The support from ABC in identifying the homozigous O2 recessive genes in the F2 (Elite Normal x QPM) population is the key in the new approach.

More than 45 working days were spent in collaboration with colleagues in NARS and CIMMYT Outreach in developing ideas, strategies, preparing work plans, reports, meetings and field days for promoting QPM germplasm in developing countries, among them: China, Guatemala, El Salvador and Mexico. The QPM project funded by The Nippon Foundation provided US$75,000.00 for enhancing parents seed production and dissemination of hybrids, it is expected that more than 11,000 hectares of hybrid seed will be planted in 2000.

In El Salvador and Guatemala, we designed a strategy for the promotion of QPM, which involves:

1. Planting on-farm trials in ten locations during 1998.
2. Seed production of the best three performing hybrids and increase of parents in November 1998 to March 1999.
3. Validation trials planted in more than 100 farmers' locations during summer of 1999.
4. Releasing hybrid in early November 1999.

In China the hybrid Shondan 9604 was released as scheduled in August 1999. Maize program and CIMMYT directors, NEB and Nippon Foundation authorities attended the release of the hybrid that sometime in the future will cover new 200,000 hectares of QPM maize.

In Mexico 50 clusters of validation trials including QPM hybrid were planted on farmer's fields in the tropics and subtropics. More than 100 field days were conducted at different locations. Twenty-two hybrids and four QPM open-pollinated varieties were registered for seed productions – hybrid seed of the parents was planted in 300 hectares and the harvest started middle of October. INIFAP expectation of hybrid seed is more than 500 tons. Good for planting 12,000 hectares of commercial seed.

In Cotaxtla, Veracruz 6 tropical hybrids and two OPV cultivars were released to the seed industry in October 8, 1999. Subtropical hybrids were released in November 14.

In El Salvador and Guatemala 80 and 50 validation plots were established respectively in 1999B. Following the strategy established in 1998.

Information from El Salvador strip tests indicates that hybrid HQ-61 yielded 6.4 ton/hectare in semi-commercial plots (27 plots) outyielding the seed industry non-QPM hybrids with 15% yield and resistance to ear rot and other stresses. Release of hybrid HQ-61 (CML144 x CML159) CML176 took place in November 8, 1999. Similar results are coming from Guatemala but the release was postponed to February 2000 because of November elections.

Ethiopia and India will conduct validation trials in 2000.

In collaboration with the SAMP we have shipped to Venezuela 10 hybrids for on-farm testing together with another six hybrids from acid soils project at Cali. The sixteen hybrids plus seed industry checks were tested in seven locations in the state of Portuguesa. Hugo Córdova traveled to Venezuela and spent one week visiting the trials and scoring the different agronomic traits. His observations coincide in 99% with the result at harvest. CIMMYT hybrids yielded up 10.5 ton/hectare, 3.0 tons more than the best seed industry check and 1.5 more than our CML247 x CML224 check. Four hybrids from TLL subprogram and two from Cali were selected for strip tests in farmer's fields in 2000B. Hybrid seed for these trials will be produced by SC and collaborators, we have shipped enough seed (1.5 to 5kg) of the parents to produce the single cross hybrids.

We can predict that our CIMMYT hybrids can effectively contribute to increase maize productivity in Venezuela in the near future.

Collaboration with the South America program was strengthened in 1999. We have other projects moving in Colombia, Peru, Bolivia, Ecuador and Paraguay.

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II. Inbred Line Development, Nurseries and Seed Increases.

Four types of nurseries were planted in Poza Rica Station in 1999A&B.

1. Germplasm Development Nursery.

Consisted of 100 elite x elite F_2 pedigree populations (60 white endosperm and 40 yellow endosperm). Every F_2 population was planted in 20 rows bulk in low (42,000 plants/hectare) and high density (84,000 plants/hectare). Self pollinations are executed only in high density, only plants with good ASI are selected, while low density are left without glassine bags and are inoculated with *B. maydis* and Fusarium stalk rots. Information on husk cover and response to disease is collected in low density before harvest time and used at harvest to eliminate bad populations or lines. The selection criteria in high density includes the selection of plants with good ASI and good roots (good standability).

2. Breeding Nursery (S_2 to S_5).

More than 10,000 S_2 to S_5 lines were planted in the same faction explained before. Selection criteria includes resistance to *B. maydis*, Fusarium ear/stalk rot, standability and yield and response to high density, root and stalk quality. Selection pressure is 10 to 20%.

3. Advanced Nursery (S_5 to S_8).

Near 1000 lines are planed including late, early, white and yellow. Selection criteria includes resistance to *B. maydis*, Fusarium ear/stalk rot, standability and yield and response to high density, root and stalk quality. Selection pressure is 10 to 20%.

4. Elite Lines Nursery (S_8 to S_{10}).

This nursery includes the elite lines that have been selected on the basis of the response to GCA and SCA in crosses for yield, ear rot and other biotic and abiotic stresses and are candidates to CML's.

Ten ears of each selected line are harvested from the advanced line nursery and are planted ear to row at 66,666 plants/hectare. This nursery is intended to increase seed to be used (Genetic -1) as original seed.

Additional information such as pollen shedding interval, tassel size, tassel structure, yield, stalk quality is collected from this nursery to provide collaboration with the preliminary information for the potential use as male or female in hybrid combinations.

5. Testcrosses Formation.

Early and advanced generation testcrosses and hybrids were produced in both cycles in Poza Rica and Cycle A in Tlaltizapan, using inbred and advanced lines crossed to two testers.

1 = Early white early generation testcrosses =	48
2 = Early yellow early generation testcrosses =	56
3 = Late white early generation testcrosses =	620
4 = Late yellow early generation testcrosses =	196
5 = Early white double crosses =	40
6 = Early yellow double crosses =	25
7 = Late white advanced generation testcrosses =	222
8 = Late yellow advanced generation testcrosses =	70
9 = Single and TWC white late hybrids =	102
10 = Single and TWC yellow late hybrids =	70
Total	1449

6. Synthetic Increases.

32 synthetics OPV were advanced to F_2 and tested in 40 locations in 1999.

III. Experiment and Results.

1. Population Improvement.

Our program was handling 12 populations until 1998. Ten of them were being improved under Reciprocal Recurrent Selection schemes. In P21 (Tuxpeño-1) and P32 (ETO Blanco) the method used is modified half sib reciprocal recurrent selection (MRRS-HS). Population 22 (Mezcla Tropical Blanca) and P43 (La Posta), P23 (Blanco Cristalino-1) and P49 (Blanco Dentado-2), P24 (Antigua-Veracruz 181) and P27 (Amarillo Cristalino-1), and P28 (Amarillo Dentado) and P36 (Cogollero), are being improved in a modified full sib reciprocal recurrent selection scheme (MRRS-FS). The other three populations, P25 (Blanco Cristalino-3), P30 (Blanco Cristalino-2), and P31 (Amarillo Cristalino-2) are being improved using FS recurrent selection. In all populations, S_2 progenies are generated to produce FS or HS families to be evaluated in the International Progeny Testing Trials (IPTTs). As with the gene pools, these breeding schemes allow an integral breeding system linking germplasm development and population improvement with hybrid research; the best S_2 families are further advanced in inbreeding. In 1999 we introduced important changes to the population improvement activities.

1. All populations being improved by FSRRS were shifted to MRRS-HS.
2. We paired Pop. 21 with Pop. 25 (Pop. 32 was put in the shelf).
3. In Pops. 30 and 31 scheme of selection was changed to S_2 x tester method, some of the important reasons for the change are: In the FS scheme only one S_2 plant represents the orientation of a family with a random selection, in the HS scheme, every family is represented by a minimum of 10 plants. In the FS there is practically no tester involved, because individual plants are crossed to individual plants of the opposite population, in the HS all families are crossed to the same tester of the opposite population. Plant height of all populations has grown to the sky, probably because of lack of control, in HS it is easier to control plant height.

In 1999 we formed the S_1 and S_2 lines in each population and in 2000A we formed the testcrosses and 12 IPPT's (S_2 x tester) progenies are being internationally tested in key sites in 2000. Our goal is to complete one cycle of S_2 recurrent selection in two years and we are in or way to accomplish the task with the collaboration of our colleagues in outreach: Colombia, Turipana, Guatemala, Cuyuta and La Maquina and Thailand, Suwan Farm and Tak Fa.

2. Hybrid Development and Testing.

Development of lines exhibiting superior characteristics continues to be an important activity in the LLT sub-program. Lines are derived from gene pools and populations as part of the on-going breeding schemes, and from F_2 pedigree populations formed after crossing elite lines with good agronomic characteristics and excellent GCA, i.e. recycling superior lines belonging to the same population. High yielding single hybrids involving lines from different heterotic groups are also subjected to selfing. In the process of inbreeding, lines are evaluated for different biotic and abiotic stresses, and top crossed to testers at early and advanced inbreeding stages, to determine the GCA and

SCA incrosses for yield and other traits such as ear rot. Selection is also strongly emphasized on important morphological traits such as low ear placement, good husk cover, standability, good ear aspect and ear rot.

2.1 Evaluation of tropical early white inbred lines. LEITEW9901.

49 early white inbred lines with origin in Thailand, Kenya and TLL, HQ were evaluated across four locations in Mexico, Colombia and Thailand. Table 1 presents the performance of 8 superior lines tested across locations. The top performing lines *per se* were entries 20, 34 and 43 with yield up to 4.5 tons/ha. The superior inbred lines are now participating in single and TWC combinations and synthetics formation. Tables A1 to A5 present the performance of all lines at individual locations and across locations respectively.

2.2 Evaluation of tropical early yellow inbred lines. LEITEY9902.

50 early yellow tropical inbred lines with origin at Thailand and TLL, HQ were tested at four locations in Mexico, Colombia and Thailand. Table 2 shows the performance of the 8 top yielding tropical yellow early inbred lines. Superior entries were 8, 5, 44 and 16 that yielded up to 4.0 ton/ha with the exception of Turipana, Colombia, at least 4 lines outyielded the best check (Tables A6 to A10).

2.3 Evaluation of tropical late white inbred lines. LEITLW9903.

One hundred tropical white inbred lines developed from diverse source populations with origin in the tropical lowland Entomology and Pathology units, HQ, Thailand and Kenya were tested across four locations in Mexico, Colombia and Thailand. 10 lines outyielded the best checks across key sites and showed better ear rot resistance than the check. Six lines yielded from 1.5 to 2.0 tons more yield than the best RE CML247 and doubled the yield of CML254 that yielded 4 and 3 ton/ha respectively. Entries 76, 73, 9 and 1 yielded 6.3, 5.9, 5.8 and 5.4 respectively (Table 3) and showed good stability at individual and across locations (Tables A11 to A15).

Superior lines are participating in SC and TWC hybrid combinations and synthetics are being tested internationally in 2000B.

2.4 Evaluation of tropical late yellow inbred lines. LEITLY9904.

54 tropical late yellow inbred lines were tested across four key sites in Mexico, Colombia and Thailand. Lines were provided by the ARMP and HQ but included lines resistant to biotic and abiotic stresses. The 8 best performing inbred lines entries 51, 28 and 26 yielded 4.2, 3.6 and 3.3 tons/ha while the best check yielded 3.4 t/ha (Table 4). The best 3 lines also showed good resistance to ear rot and root lodging. Best performing lines across locations are resistant to Downy Mildew, Low N, Drought, SCB, FAW, tar spot and other foliar diseases.

Tables A16 to A20 include the performance of all lines at individual and across locations.

Table 1. LEITEW_9901. Mean data of the 8 top yielding tropical early white lines at across 3 Locations.
Poza Rica & Cotaxtla; México, Turipana; Colombia. 1999 B.

Ent	PEDIGREE	Yd	MF	FF		PH	EH	EH/	RL	SL	EA	PA	BH	NE	NP	ER
		t/ha	days	days	ASI	cm	cm	PH	%	%	1-5	1-5	%	#	#	%
20	G 19 C3MH104-3-1-B-2-3-BB	4.54	55	54	-0.5	174	87	0.49	4.1	0.0	2.5	2.3	0.5	19	14	22.7
34	SPEC7F60-1-2-1-1-1-BBBBB	4.51	54	54	0.2	182	86	0.47	7.1	16.2	2.9	3.0	0.7	19	11	39.6
43	(P49-SR(BC6S3) HS#HS#-120-4-#1-B1-B1	4.13	57	57	-0.2	160	68	0.42	17.2	2.6	2.8	2.8	0.7	12	13	24.7
42	(P49-SR(BC6S3) HS#HS#-120-3-#1-B1-B1	3.93	57	56	-0.5	182	85	0.46	0.0	1.2	3.0	3.0	0.7	13	14	32.0
25	G 19 C3MH375-2-2-B-3-3-BB	3.46	55	55	0.0	191	81	0.42	0.0	2.4	3.4	3.4	0.5	13	13	18.6
15	G 16 C23MH173-1-2-B-3-2-BB	3.42	53	53	0.0	162	68	0.43	2.4	0.0	3.7	3.7	28.9	13	13	55.8
44	(P49-SR(BC6S3) HS#HS#-120-6-#1-B1-B2	3.18	57	57	-0.2	163	64	0.40	4.2	0.0	2.8	2.9	9.1	11	12	23.9
16	G 16 C23MH314-1-1-B-1-2-BB	2.97	55	55	-0.2	161	75	0.46	1.3	10.9	2.9	4.0	1.7	14	12	36.0
46	PR8549-1-1*P23C2-1-1)-5-1-3-BBB RE	3.77	55	55	0.2	129	50	0.38	0.0	0.0	3.1	2.7	24.2	12	12	27.7
48	LOCAL CHECK-1	4.10	57	57	0.2	155	82	0.53	12.1	17.3	2.9	3.3	32.8	14	13	42.3
49	LOCAL CHECK-2	4.09	56	55	-1.5	161	87	0.54	2.5	17.8	2.7	3.4	14.0	15	13	26.9
	LSD 0.05	1.29	5.3	5.5	1.4	16.8	14.0	0.1	18.7	19.3	1.0	0.8	18.8	4.5	2.3	32.6
	CV %	27.3	4.3	4.4		8.5	14.1	11.4	14.6	11.5	15.5	15.1	10.5	18.7	13.5	12.8
	CORRELATION WITH Yd		-0.04	0.01	0.02	0.17	-0.13	0.14	0.15	0.19	0.01	0.23	-0.15	-0.22	0.26	-0.22

Table 2. LEITEY_9902. Mean data of the top 8 yielding tropical early yellow lines at across 3 Locations
Poza Rica & Cotaxtla; México, Turipana; Colombia. 1999 B.

Ent	PEDIGREE	Yd	MF	FF		PH	EH	EH/	RL	SL	EA	PA	BH	NE	NP	ER
		t/ha	days	days	ASI	cm	cm	PH	%	%	1-5	1-5	%	#	#	%
8	G21C4MH 7-1-B-1-1-B-1-1-BB	4.06	57	57	0.2	161	74	0.46	7.5	1.4	3.6	3.5	10.4	13	11	38.2
5	G 18 C25MH 86-2-1-B-2-3-BB	3.59	51	52	1.3	166	84	0.49	18.4	7.1	3.5	3.6	10.2	16	12	33.1
44	TEY-DMRPOPC1-MH1#-1-1-3-BBBB	3.59	57	56	-0.4	145	69	0.47	0.0	0.0	3.2	3.2	31.0	13	12	27.6
16	G21MH586-1-B-3-1-B-3-5-BB	3.52	52	52	-0.2	138	72	0.51	19.4	1.1	3.6	3.4	14.2	14	12	36.5
41	EY-DMR-G-C5-S2-BB-2-B	3.43	52	51	-0.3	131	76	0.57	0.0	6.3	3.3	3.2	21.1	12	11	18.2
25	P31C4S5B-85-##-3-BB	3.25	52	53	1.0	161	84	0.51	3.5	4.9	3.2	3.3	27.3	12	12	45.4
10	G21C4MH159-1-B-2-1-B-1-2-BB	3.21	54	54	0.0	174	83	0.47	25.4	4.8	3.0	2.9	15.4	13	12	32.3
46	G17TSRMH5-2-4-7-1-1-1-BBBBB	3.14	51	52	1.0	128	43	0.32	0.0	0.0	3.2	3.9	25.1	12	12	39.2
48	P31DMR#1-55-2-3-2-1-BBBBB RE	2.29	53	53	0.0	170	76	0.45	1.9	0.0	3.4	3.4	28.5	8	9	28.0
49	LOCAL CHECK-1	3.25	53	53	0.0	125	59	0.47	1.2	1.3	2.8	2.6	21.2	14	13	21.9
50	LOCAL CHECK-2	4.52	54	53	-0.5	205	95	0.47	2.3	3.8	2.3	3.2	11.4	14	12	31.6
	LSD 0.05	1.39	3.0	2.9	1.3	22.1	17.4	0.1	21.3	12.0	1.0	1.0	33.4	4.5	2.4	24.0
	CV %	21.6	2.8	3.1	11.7	8.2	10.1	11.6	12.4	15.1	14.2	14.9	8.4	18.5	17.9	11.7
	CORRELATION WITH Yd		0.02	-0.04	-0.12	0.23	0.32	0.08	0.05	0.26	0.13	0.10	0.30	-0.35	-0.25	-0.31

Table 3. LEITLW_9903. Mean data of the top 10 yielding tropical late white lines at 3 locations.

Poza Rica & Cotaxtla; México, Turipana; Colombia. 1999 B.

Ent	PEDIGREE	Yd	MF	FF	PH	EH	EH/	RL	SL	EA	BH	NE	NP	ER
		t/ha	days	days	cm	cm	PH	%	%	1-5	%	#	#	%
76	(CML247/LaPostaSeq.C3-H16-3-2-4-1-1-#)-B-26-5-1-B	7.94	62	61	180	94	0.52	15.5	2.1	2.3	26.0	14	14	12.9
73	(SEGR-6-5-#xNPH28-1)-1-1-1-B-B-1-2-B-B	7.42	61	60	166	69	0.41	9.0	0.0	3.7	3.7	11	12	43.4
9	P32MRRS F2-C2-10-2-BBBBBB	6.98	62	62	193	100	0.51	29.0	2.6	3.2	16.8	12	12	43.2
68	[P NVA. BCO.(S/D)xNPH-100] F.S 4-B-2-2-1-B	6.87	61	61	187	101	0.53	9.7	0.0	2.9	0.0	14	12	23.5
71	[P NVA. BCO.(S/D)xAC8243] F.S 4-B-3-B-1-1-B	6.81	61	61	176	100	0.57	8.5	0.0	2.8	1.2	17	13	29.0
60	FAWGCAWHITE-3-3-1-5-1-BBB	6.67	58	58	188	93	0.49	1.3	0.0	3.1	9.5	14	14	31.7
1	P21C5HC57-1-2-B-#*9-1-BBBB-B	6.63	63	63	196	105	0.53	39.1	1.3	3.3	8.9	12	12	20.9
81	[(CML264xCML271)xSW-1/Lin.IITA*MpHibC1SCB-F72-1-1-1-1-#(MIRTS3-46-1)]-1-3-4-2-B	6.56	58	59	176	76	0.43	15.5	0.0	3.5	13.3	14	12	60.5
29	LPSC1-340-1-2-1-4-2-1-BB	6.34	61	60	198	98	0.50	0.0	11.9	2.9	4.5	13	13	8.2
82	(CML247/TS6C1-F228-2-2-3-1-2-#)-B-33-3-3-B-B	6.26	61	60	175	82	0.47	7.0	0.0	2.9	13.0	14	14	34.7
97	CML247 RE	5.02	62	62	156	77	0.48	1.5	0.0	3.1	13.6	11	12	29.1
98	CML254 RE	3.90	62	62	168	87	0.52	0.0	0.0	3.5	0.2	13	12	33.7
99	LOCAL CHECK-1	4.85	60	59	179	88	0.49	1.7	0.0	2.9	0.8	12	11	29.3
100	LOCAL CHECK-2	4.88	60	60	184	93	0.51	15.3	2.8	3.2	2.4	12	11	28.5
	LSD 0.05	2.35	3.4	3.7	17.3	15.9	0.1	19.3	12.4	0.8	22.6	4.0	2.7	31.9
	CV %	21.4	2.6	2.7	7.0	13.1	10.6	16.5	11.5	15.9	13.1	23	17	12.6
	CORRELATION WITH Yd		0.1	0.0	0.37	-0.08	0.26	0.24	-0.01	0.0	0.13	-0.2	0.1	-0.04

Table 4. LETY_9904 Mean data of the top 8 yielding tropical yellow late lines at across 3 locations.

Poza Rica & Cotaxtla; México, Turipana; Colombia. 1999 B.

Ent	PEDIGREE	Yd	MF	FF	PH	EH	EH/	E/P	RL	SL	EA	PA	BH	NE	NP	ER
		t/ha	days	days	cm	cm	PH		%	%	1-5	1-5	%	#	#	%
28	PIO.3011F2-3-5-3-1-BB	3.98	63	62	181	85	0.46	1.27	2.5	1.7	3.3	2.9	5.7	14	11	29.3
20	DTP1YC6F21-1-#-1-1-1-1-BBB	3.96	57	56	162	80	0.49	1.05	24.2	0.0	3.2	2.3	13.6	13	12	40.5
26	AMATLCOHS71-1-1-2-1-1-1-BBB	3.90	59	60	190	105	0.55	1.06	5.0	1.3	4.1	2.8	29.8	13	13	37.0
17	Ac8328BNC6-166-1-1-1-BB	3.76	57	57	179	84	0.47	1.39	22.9	1.5	3.6	2.6	5.5	17	12	26.3
13	S.AM.TSR-76-2-1-1-2-BBBB-##-B-B-B-B-B-B-B-B	3.64	56	56	191	93	0.49	1.00	16.5	9.4	2.8	2.7	1.6	13	13	21.1
5	(P26STE-27*26STE-39)-BBBB-#-BBB-#-BB-B-B	3.59	57	57	168	71	0.41	1.14	43.4	11.7	4.1	2.9	11.4	14	11	28.3
42	G26SEQF135-3-3-1-1-1-2-BB	3.34	59	59	175	93	0.52	1.56	25.8	7.1	3.8	2.8	1.6	15	11	46.8
6	P27C5HC71-3-1-B-###-BBB-B-B	3.26	59	59	155	82	0.53	1.02	8.2	7.0	3.3	2.6	2.8	13	12	27.2
51	(P24F26*P27F1)-4-1-B-1-1-BB-f-####-BBB-B RE	5.04	59	58	188	87	0.46	1.10	8.7	2.6	3.0	2.4	3.4	14	13	27.7
53	LOCAL CHECK-1	2.48	57	57	169	75	0.44	0.99	14.2	0.0	3.7	2.8	0.6	12	12	33.4
54	LOCAL CHECK-2	3.89	60	60	158	84	0.54	0.94	7.1	0.0	3.5	2.5	12.4	11	12	50.2
	LSD 0.05	1.52	3.3	3.4	26.7	17.2	0.1	0.3	32.2	16.3	0.9	0.9	21.0	4.4	3.4	24.5
	CV %	23.8	1.7	2.2	7.0	10.9	9.5	21.6	15.8	12.1	10.7	19.3	11.6	18.2	16.9	11.7
	CORRELATION WITH Yd		-0.13	0.23	0.09	0.05	0.12	0.26	-0.01	0.17	0.05	0.16	0.26	-0.01	0.03	-0.19

This set of four trials evaluation of inbred lines *per se* in key sites was planned by GP2 members in January 1999, reporting week contribution of ARMP (Vasal), Kenya (Diallo) and Tropical Lowland, Pathology and Entomology units HQ. This work exposed the best inbred materials to the interested breeders and maize scientists in the maize program. For the TLL gave us the opportunity to select in the superior inbred materials for new hybrid combinations. Synthetics formation and formation of elite x elite F_2 pedigree populations. Same trials were planted under biotic and abiotic stresses and will be discussed in Chapter III-4.

2.5 Evaluation of tropical early white single crosses. TSCW99A01.

28 single crosses among 8 early white elite inbred lines, crossed in a diallel mating design and two checks were included in 5x6 alpha lattice design with 2 replications, and tested in four locations in Mexico. 3 early single crosses outyielded H-512 the best hybrid late maturity CLO4938 x CLO4930 topped the trial with 8.7 t/ha and showed resistance to ear rot and root lodging (Table 5).

CLO4038 x CLO4030 showed the largest and significant SCA effects that can be exploited in the formation of three way cross (TWC) hybrids using CML420 as male that presented the best GCA value (Table 6).

Early germplasm is of outmost value because it is very scarce and can help farmers in developing countries to increase the maize productivity by planting two crops in relay or multi-crop planting. Early three way cross hybrids are in the process of formation and will be tested internationally in 2001.

The performance of all 30 single crosses at individual and across locations is included in Tables A21 to A25.

2.6 Evaluation of tropical early white single crosses resistant to Downy Mildew. TSCW99A02.

This trial includes the evaluation of a diallel among tropical white early inbred lines resistant to DM classified as Heterotic Group "B". The fifteen single crosses plus a check were tested at four locations in Mexico. Table 7 shows the performance of the best 6 single crosses that yielded from six to seven tons/hectare similar to the best local check but more resistant to ear rot and root lodging.

GCA estimates for lines P4 and P5 were positive and statistically significant (Table 8). These lines can be used as male parents in TWC hybrid combination with crosses Heterotic Group "A" described in 2.5. Synthetics formed with these lines were internationally tested in 1999.

Single cross hybrids are being tested in CHTTEW 2000.

Entry 12 topped the trial across locations but also performed well at individual locations ranking 2^{nd}, 3^{rd}, 3^{rd} and 2^{nd} at Poza Rica 99A, Cotaxtla 99A, Tlaltizapan 99A and Cotaxtla 99B respectively. Entry 9 ranked 5^{th}, 1^{st}, 2^{nd} and 3^{rd} at the same location and 2^{nd} across locations (Tables A26 to A30). This performance shows the yield stability of the new single cross hybrids.

Table 5. TSCW_99A01. Mean data of top 6 yielding tropical early white single crosses, Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999 A

Ent	PEDIGREE	Yd1 t/ha	Yd2 t/ha	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	PA 1-5	ER 1-5	BH %	NE #	NP #	ER %	M %
13	P3 04938 x P5 04930	8.52	8.66	68	69	0.9	193	88	0.45	0.98	6.2	0.0	2.0	2.6	2.4	1.7	52	53	1.6	23.6
17	P4 04901 x P5 04930	8.09	8.21	68	69	0.8	192	82	0.43	0.99	5.2	0.0	2.4	2.6	2.1	1.0	51	52	1.5	25.2
15	P3 04938 x P7 04933	7.75	8.01	69	69	-0.2	210	101	0.48	0.98	26.4	1.1	2.2	3.3	2.1	1.3	49	50	3.2	25.9
20	P4 04901 x P8 04934	7.56	7.64	71	72	1.0	212	108	0.51	1.01	18.9	0.3	2.5	3.1	2.2	3.1	53	53	1.0	27.8
16	P3 04938 x P8 04934	7.55	7.80	69	70	0.8	205	107	0.52	1.00	10.0	0.6	2.6	3.1	2.3	7.5	53	53	3.2	25.9
1	P1 G16C20MH44-#-3-3-1-B*5 x P3 04938	7.55	7.72	67	67	0.1	212	106	0.50	0.99	4.0	1.8	2.7	2.7	2.1	2.0	47	48	2.2	22.1
27	CL-04933 x CML-420 RE	7.28	7.41	68	68	0.2	207	108	0.52	1.07	16.5	2.0	2.8	3.3	2.3	3.5	50	47	1.8	23.6
30	LOCAL CHECK	7.36	7.88	70	71	0.3	211	109	0.52	1.04	3.5	1.5	2.9	3.2	3.0	19.3	54	52	6.6	26.0
	LSD 0.05		0.90	2.4	2.4	0.9	11.7	11.4	0.0	0.1	18.4	2.8	0.5	0.6	0.9	15.3	3.7	2.8	3.7	4.4
	CV %		6.39	1.5	1.5	2.6	3.7	9.0	7.0	5.9	6.1	6.7	12.8	9.2	15.4	7.1	4.5	4.4	7.1	6.5
	CORRELATION WITH Yd2		1.87	-0.64	0.25	0.33	-0.32	-0.17	0.56	0.27	0.17	0.24	0.02	0.19	0.79	0.33	0.20	0.47	0.18	0.07

Table 6. TSCW_99A01. Mean yields, GCA & SCA effects of tropical early white lines, Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999 A

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	P7	GCA	Yield t/ha
					SCA					
G16C20MH44-#-3-3-1-B*5	P1								0.0571	7.03
CML-420 G16C19MH219-5-1-1-3-2-B-#-B	P2	-0.7062*							0.2838	6.89
04938 Ikene8149-SR-68-3-#-2-BBB-1-BBBBBBBBBB	P3	0.4488	0.0321						0.0087	6.89
04901 Ikene8149-SR-68-3-#-2-BBB-3-B*11	P4	0.3405	0.3938	-3.6312**					-0.1729	6.70
04930 (P49C2MH12-1-4xPR8549-1-1)-1-1-3-BBBBB-B	P5	0.4155	-0.0212	1.3538	1.0855				0.0921	6.88
04932 (P49C2MH12-1-4xPR8549-1-1)-1-4-2-BBBBB-B	P6	-0.8129*	0.5405	0.6355	1.0971	-1.2579			-0.4896	6.38
04933 (P49C2MH12-5-4xPR8549-1-1)-1-5-3-BBBBB-B	P7	0.4105	0.1938	0.7188	0.2505	-1.1945	-0.2929		0.0771	6.93
04934 (P49C2MH12-5-4xP23C2-11-1)-2-2-2-BBBBBBB	P8	-0.0962	-0.4329	0.4421	0.4638	-0.3812	0.0905	-0.0862	0.1437	6.97

*: Estimation of missing crosses was based on Eckhardt paper

**: Estimation was based on entries of 3 locations

S.E. GCA 0.2610

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.5837

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.5220

Table 7. TSCW_99A02. Mean data of top 6 yielding tropical early white single crosses. Across 4 Location.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	PA 1-5	BH %	NE #	ER %	M %
12	P4 EW-DMR G C7 HS389-2-B-1-B-B	x P5 G SPE-1-3-3-B-B	6.93	7.19	69	70	228	123	0.54	1.1	0.3	2.4	2.8	10.5	55	3.7	24.7
9	P3 EW-DMR G C7 HS190-2-B-1-B-B-B-B	x P4 EW-DMR G C7 HS389-2-B-1-B-B	6.86	7.32	69	70	225	124	0.55	3.9	2.5	3.2	3.0	11.6	51	6.4	23.5
4	P1 EW-DMR-G-C6-S2-BB-3-B-B	x P5 G SPE-1-3-3-B-B	6.64	7.02	69	70	232	146	0.63	1.5	2.0	2.7	2.9	3.0	60	5.3	21.9
10	P3 EW-DMR G C7 HS190-2-B-1-B-B-B-B	x P5 G SPE-1-3-3-B-B	6.62	7.39	68	69	232	135	0.58	7.4	1.2	2.9	3.0	21.6	60	10.5	24.4
13	P5 G SPE-1-3-3-B-B	x P6 CML-419	6.34	6.77	65	67	216	121	0.56	9.5	0.3	3.0	3.0	4.2	58	6.4	24.3
11	P3 EW-DMR G C7 HS190-2-B-1-B-B-B-B	x P6 CML-419	6.23	6.89	65	65	205	118	0.58	9.2	11.1	3.3	3.6	21.0	51	9.5	21.4
14	TEW-G-69-2-#1-1-#1-#-#3-B-B-BB	x CML-420 RE	5.58	6.30	63	64	190	93	0.49	3.9	0.7	3.2	2.4	2.9	47	11.5	18.9
15	CL-04933	x CML-420	6.36	6.67	66	67	206	110	0.53	33.5	1.0	2.7	3.1	4.9	49	4.6	22.2
16	LOCAL CHECK		6.83	7.31	67	69	213	105	0.49	5.7	2.2	2.9	2.9	22.9	51	6.6	24.2
		LSD 0.05		0.89	3.3	2.8	15.0	13.7	0.0	25.8	12.8	0.6	2.9	17.8	6.0	4.6	3.4
		CV %		7.04	1.5	1.7	3.5	6.7	5.3	6.1	10.0	9.8	65.9	10.6	7.1	6.1	5.3
		CORRELATION WITH Yd2			0.14	-0.22	0.72	-0.30	0.57	0.31	-0.04	0.07	0.66	0.06	0.03	-0.14	0.45

Table 8. TSCW_99A02. GCA&SCA effects for yield (t/ha) of tropical early white lines, Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	GCA	Yield t/ha
				SCA				
EW-DMR-G-C6-S2-BB-3-B-B	P1						-0.743	6.07
EW-DMR G C7 HS1-1-B-2-B-B	P2	0.083					-0.366	6.37
EW-DMR G C7 HS190-2-B-1-B-B-B-B	P3	-0.425	-0.063				0.002	6.67
EW-DMR G C7 HS389-2-B-1-B-B	P4	0.000	-0.538	0.295			0.357	6.95
G SPE-1-3-3-B-B	P5	0.390	0.7825*	0.015	-0.540		0.707	7.23
CML-419 G15C22MH131#-1-3-4-1-1-BB	P6	-0.048	-0.265	0.178	0.7825*	-0.648	0.044	6.70

*: Estimation of missing crosses was based on Eckhardt paper
**: Estimation was based on entries of 3 locations S.E. GCA 0.3141

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.5440

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.4442

2.7 Evaluation of 40 tropical early white single crosses among lines Heterotic Groups A and B. TSCW99A3.

38 single cross combinations among tropical early white inbred lines Heterotic Groups A and B, plus 2 checks were included in 5x8 alpha lattice design with 2 replications and tested at four locations in Mexico.

Five single crosses outyielded the best checks and showed ear rot resistance while the check suffered 8% ear rot damage that reduced the yield.

CL4938 x G-SPE-4-2-3-B yielded 8.3 tons per hectare across four locations (Table 9). Information of response of single cross hybrids at individual and across sites locations presented in Tables A31 to A35.

2.8 Yield performance and combining ability of 10 tropical early white inbred lines Heterotic Groups A & B and resistant to DM and SR.

A diallel among 10 tropical early white lines (6 Heterotic Group A and 4 Heterotic Group B) was formed and the 45 possible single crosses evaluated under an alpha lattice design with one check. Trials were planted at four locations with two replication/sites.

Five crosses topped the yield trials yielding more than the best check.

P5 x P8 and P4 x P10 yielded 8.4 tons/hectare showing resistance to ear rot and root lodging and good stalk quality and flowered 4 days earlier than the best late maturing check, ear placement for both hybrids was 0.41 and the best local check 0.51, securing good standability to the new hybrid combination (Table 10). P1 x P10 topped the yield trial with 8.6 tons per hectare and showed the highest SCA estimates. P8 and P10 presented the best GCA estimates (Table 11).

P1 x P10 = Downy mildew resistant x streak resistant combination can effectively be used as female in TWC hybrid combination using P8 (with good general combining ability) as male. The TWC early hybrid combination possessing resistance to DM. and SR could play an important role in increasing maize productivity in Southern and Eastern Africa. Synthetic varieties formed using the lines tested in this experiment were formed and tested in EVT-14B in 1999.

P2 x P10 showed excellent yield stability at individual locations ranking 1st, 4th, 2nd and 1st at Poza Rica 99A, Cotaxtla 99A, Tlaltizapan 99A and Cotaxtla 99B respectively. Same hybrid topped the trial across four locations (Tables A36 to A40).

The early elite synthetic, lines and hybrid combination suggested and selected in the last 4 projects could play an important role in maize research in Eastern Africa.

2.9 Yield performance of tropical early white single crosses.

25 single crosses among early white inbred lines were tested across four locations in Mexico. Best 8 performing single crosses are shown in Table 12, Tables A41 to A45 show the results at individual and across locations.

Table 9. TSCW_99A03 Mean data of top 8 yielding tropical early white single crosses. Across 4 Location

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	Silk days	PH cm	EH cm	RL %	SL %	EA 1-5	BH %	NE #	NP #	ER %
26	P5 04938	x P7 G-SPE-4-2-3-B	8.10	8.28	67	67	195	102	13.2	0.7	2.3	0.5	48	48	2.2
3	P1 G16C20MH69#-2-4-2-B-2-12-B-B-B	x P5 04938	8.06	8.31	67	68	225	118	22.6	2.0	2.0	1.6	49	50	3.0
25	P5 04938	x P6 CML-419	7.78	7.98	66	66	206	108	21.1	1.1	2.2	2.4	48	48	2.5
29	P5 04938	x P10 EW-DMR-G-C7HS-68-2-B-2-B	7.73	7.91	69	70	210	111	25.3	0.7	2.2	1.1	49	51	2.2
27	P5 04938	x P8 P30 C6 HC93-B-7-BBBBB-B-B	7.71	7.94	69	70	208	100	11.6	0.6	2.6	5.5	51	53	2.8
28	P5 04938	x P9 TEW-G-69-2-#1-1-#1-#-#2-B-B-B-B	7.52	7.81	65	66	195	84	6.6	0.0	2.6	1.6	48	50	3.7
36	P8 P30 C6 HC93-B-7-BBBBB-B-B	x P9 TEW-G-69-2-#1-1-#1-#-#2-B-B-B-B	7.47	7.58	67	67	195	95	7.4	0.3	3.0	15.5	53	53	1.5
15	P3 G16C20MH69#-2-6-3-BBBB-B-B	x P5 04938	7.40	7.63	65	66	208	97	17.1	0.3	3.0	1.0	49	50	2.9
38	TEW-G-69-2-#1-1-#1-#-#3-B-B-BB	x CML-420 RE	6.41	7.00	65	65	187	90	18.1	0.7	3.5	7.6	48	49	8.4
40	LOCAL CHECK		7.66	8.27	69	69	201	103	3.9	0.0	2.9	22.6	53	52	7.3
		LSD 0.05		0.99	2.4	2.4	14.0	12.3	15.9	1.5	0.6	12.8	3.8	2.4	4.3
		CV %		6.76	1.4	1.7	4.3	7.6	5.5	4.2	12.1	8.2	5.3	3.7	6.5
		CORRELATION WITH Yd2			-0.31	0.03	0.00	-0.15	0.24	-0.11	0.79	0.13	-0.1	0.31	-0.3

Table 10. TSCW_99A04. Mean data of top 8 yielding tropical early white single crosses. Across 4 Location.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	PA 1-5	BH %	ER %	M %
15	P2 EW-DMR-G-C7HS-(S1B)-9-B-3-B	x P10 IKENE8149-SR-68-3-#-2-BBB-1-B*7	8.72	8.85	69	70	232	114	0.49	4.4	1.0	2.0	2.6	3.8	1.5	24.4
7	P1 EW-DMR-G-C7-HS-(S1 B)-9-B-1-B-B-B-B	x P10 IKENE8149-SR-68-3-#-2-BBB-1-B*7	8.47	8.61	69	69	235	114	0.48	4.8	0.3	2.0	2.8	2.3	1.7	24.4
31	P5 TEW-G-69-2-#1-1-#2-#-#1-B-B-B-B	x P8 04929	8.27	8.38	65	65	192	79	0.41	9.7	0.0	2.1	2.6	0.2	1.3	23.4
28	P4 TEW-G-69-2-#1-1-#1-#-#1-B-B-B-B	x P10 IKENE8149-SR-68-3-#-2-BBB-1-B*7	8.03	8.33	65	67	190	82	0.43	3.2	0.3	2.5	2.4	1.5	3.6	25.4
26	P4 TEW-G-69-2-#1-1-#1-#-#1-B-B-B-B	x P8 04929	7.72	7.99	65	67	180	76	0.43	3.9	1.0	3.0	2.9	2.7	3.4	24.3
5	P1 EW-DMR-G-C7-HS-(S1 B)-9-B-1-B-B-B-B	x P8 04929	7.72	8.28	70	70	227	101	0.44	3.0	0.3	2.5	2.9	32.2	6.7	23.1
39	P8 04929	x P10 IKENE8149-SR-68-3-#-2-BBB-1-B*7	7.57	7.63	69	69	189	81	0.42	5.0	0.7	2.1	2.8	0.0	0.7	25.8
40	P9 04934	x P10 IKENE8149-SR-68-3-#-2-BBB-1-B*7	7.50	7.69	70	70	215	110	0.51	16.4	0.3	2.6	2.8	3.2	2.5	26.3
42	CL-04933	x CML-420	6.66	6.94	66	66	200	101	0.50	23.9	1.0	2.7	3.4	13.7	3.9	22.3
43	P30C6HC93-B-7-BBBBB-B	x CML-419	6.32	6.90	65	65	194	108	0.56	17.6	1.3	3.4	3.6	19.0	8.4	20.4
44	LOCAL CHECK		7.49	7.95	70	70	219	113	0.51	2.8	1.3	3.0	3.3	38.3	5.8	24.0
		LSD 0.05		0.94	2.8	3.1	14.8	13.9	0.1	18.6	3.8	0.7	0.5	22.4	9.4	3.1
		CV %		8.25	1.3	1.3	4.9	9.1	9.6	7.7	5.9	11.1	9.0	5.8	6.6	6.5
		CORRELATION WITH Yd2			-0.37	0.09	0.23	-0.6	0.38	0.33	0.30	0.23	0.29	0.46	-0.14	0.45

Table 11. TSCW_99A04. GCA&SCA effects for yield (t/ha) of tropical early white lines, Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	P7	P8	P9	GCA	Yield t/ha
						SCA						
EW-DMR-G-C7-HS-(S1 B)-9-B-1-B-B-B-B	P1										-0.2475	6.30
EW-DMR-G-C7HS-(S1B)-9-B-3-B	P2	-3.6172**									0.1725	7.17
EW-DMR G C7 HS315-1-B-1-B-B	P3	0.1153	-0.0847								-0.3000	6.46
TEW-G-69-2-#1-1-#1-#-#1-B-B-B-B	P4	0.7340	0.8940	0.2265							-0.3288	6.62
TEW-G-69-2-#1-1-#2-#-#1-B-B-B-B	P5	0.4365	0.7065	0.0790	-3.3922**						-0.5012	6.62
CML-419 G15C22MH131#-1-3-4-1-1-BB	P6	0.1240*	-0.0760	0.1965	0.2953	0.5378					-0.5288	5.79
CML-420 G16C19MH219-5-1-1-3-2-B-#-B	P7	0.2415*	0.8715	-0.0360	-0.0472	0.2253	-0.9272*				-0.1563	5.99
04929 (P49C2MH12-1-4xPR8549-1-1)-1-1-2-B*7	P8	0.6665	0.1565	-0.5310	0.4578	1.0203	0.1778	-0.0347*			0.7388	7.43
04934 (P49C2MH12-5-4xP23C2-11-1)-2-2-2-B*7	P9	0.4415	0.4715	0.1140	0.1728	0.4453	-0.2472	-0.0097	-0.8047		0.2737	7.20
IKENE8149-SR-68-3-#-2-BBB-1-B*7	P10	0.8578	0.6778	-0.0797	0.6590	-0.0585	-0.081*	-0.2835	-1.1085	-0.5835	0.8775	7.45

*: Estimation of missing crosses was based on Eckhardt paper

**: Estimation was based on entries of 3 locations

S.E. GCA 0.2365 0.2365

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.6257

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.5793

Table 12. TSCW_99A05. Mean data of top 8 yielding tropical early white single crosses. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1	Yd2	MF	FF	PH	EH	EH/	RL	SL	EA	PA	BH	NE	NP	ER
			t/ha	t/ha	days	days	cm	cm	PH	%	%	1-5	1-5	%	#	#	%
20	P7 PR8549-1-1xP23C2-1-1)-5-1-3-B*5	x P8 CML-419	7.93	8.13	66	66	208	101	0.48	16.6	0.9	2.0	2.6	1.7	53	53	2.4
17	P4 04931	x P8 CML-419	7.75	7.93	66	66	204	97	0.47	14.8	0.0	2.4	2.8	0.8	52	52	2.3
10	P2 G16C20MH44-#-3-5-3-B*5	x P6 04934	7.66	7.77	65	66	195	97	0.50	10.8	0.0	2.8	2.6	14.7	54	52	1.5
11	P2 G16C20MH44-#-3-5-3-B*5	x P7 (PR8549-1-1xP23C2-1-1)-5-1-3-B*5	7.59	7.91	69	68	201	90	0.44	11.4	0.4	2.6	2.1	10.4	50	51	4.0
15	P4 04931	x P6 04934	7.22	7.60	69	70	205	94	0.46	20.0	0.0	2.9	2.5	11.7	50	53	5.0
9	P2 G16C20MH44-#-3-5-3-B*5	x CL-04933	7.11	7.42	67	68	202	97	0.48	10.6	0.7	2.6	2.7	2.2	51	49	4.1
16	P4 04931	x P7 (PR8549-1-1xP23C2-1-1)-5-1-3-B*5	7.04	7.37	70	71	197	79	0.40	16.6	0.0	2.7	2.6	1.3	51	51	4.6
12	P2 G16C20MH44-#-3-5-3-B*5	x P8 CML-419	7.01	7.32	65	65	198	101	0.51	12.7	0.0	2.8	2.9	3.0	51	50	4.3
21	TEW-G-69-2-#1-1-#1-#-#3-B-B-BB	x CML-420 RE	6.52	6.93	63	63	188	93	0.49	8.3	0.7	3.2	2.9	7.4	47	49	5.9
23	P30C6HC93-B-7-BBBBB-B	x CML-419	7.15	7.56	68	69	201	109	0.55	14.4	2.8	2.8	3.3	24.2	52	51	5.5
24	LOCAL CHECK		7.31	7.95	69	69	212	104	0.49	9.8	0.3	3.2	3.2	28.1	49	49	8.1
		LSD 0.05		0.93	2.5	2.5	13.1	12.5	0.1	11.6	1.8	0.6	0.8	23.6	6.2	3.0	10.4
		CV %		6.45	1.1	1.2	5.6	8.4	11.5	7.1	3.7	12.8	14.2	6.9	8.8	4.4	7.0
		CORRELATION WITH Yd2			0.49	-0.50	0.39	0.17	-0.04	-0.11	0.02	-0.3	0.26	0.50	-0.38	0.23	-0.41

2.10 Combining ability and cross performance of tropical early yellow elite inbred lines.

Early yellow elite germplasm is very scarce across the world but represents one third of the area planted in maize farming systems in developing countries in the tropical mega-environment. Farmers planting early varieties are generally located in the marginal areas with drought prone circumstances or with erratic rainfed conditions, therefore any effort to develop elite early germplasm will help to reduce maize losses, and provide farmers with new opportunities to obtain better market prices and better competition in multiple or relay cropping systems, at the same time will reduce the risk of the farmers investing in fertilizer and other inputs avoiding losses by drought or erratic rainfed production areas. Experiments TSCY99A 06 to TSCY99A 09 include evaluation of four diallels including 9, 11, 10 and 7 early to intermediate maturity elite inbred lines.

The objectives of this experiments were: 1st To estimate the combining ability of the lines and cross performance for yield and other agronomic traits. 2nd Identify superior single crosses and lines with good general combining ability to be used as female and male respectively in TWC combination. 3rd Confirm the potential synthetic formation. All possible combinations in each diallel were evaluated under the corresponding α lattice design with two replications in four locations, winter and summer plantings at Cotaxtla, Ver. and Poza Rica, Ver. Cycle A and Tlaltizapan, Mor. and Cotaxtla, Cycle B.

2.11 TSCY99A06.

42 single crosses were evaluated in this trial. Table 13 shows the performance of the superior yellow early single crosses identified in the experiments, yield across location was 6.8 to 7.4 ton/ha. Two single crosses yielded 10% more than the best local checks, were similar in maturity and presented less percentage rotten ears and resistance to lodging. The potential of superior single crosses to be used as female in TWC combination permits attractive seed production purposes and the resistance to ear rot predicts good quality seed. The lines included in these experiments are mostly Heterotic Group "B". Three lines showed positive general combining ability (P_3, P_7 and P_9), but P_7 and P_9 showed two and three times the value of the SE for GCA confirming their value in general performance. P_9 participated in the formation of the best four single crosses (Table 14). The cross performance of $P_7 \times P_9 = 7.6$ tons/ha topped the trial (Table 13).

The single cross ($P_7 \times P_9$) can effectively be used as female parent in TWC combination with early lines Heterotic Group "A". Parents P_7 and P_9 can serve as male parents in TWC combination with single crosses Heterotic Group "A". In some countries the flint type is more attractive for farmers, in this case $(P_3 \times P_5)P_9$, $(P_3 \times P_5)P_7$ and $(P_5 \times P_7)P_9$ could play an important role in tailoring hybrids with resistance to D. mildew, for these special circumstances. The suggested TWC are in the process of formation and will be tested in international CHTTEY in 2001. The best 8 lines formed synthetic tropical early yellow Heterotic Group "B" (flint). Tables A46 to A50 showed the performance of all crosses at individual and across locations.

Table 13. TSCY_99A06. Mean data of top 8 yielding tropical yellow early single crosses. Across 4 locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	PA 1-5	ER 1-5	ER %
34	P7 CML-421	x P9 G 21-225-3-#4-3-#-#-#2-B-B-B-B	7.40	7.58	66	67	220	110	0.51	0.97	6.4	0.4	2.5	3.1	1.6	2.5
21	P3 CML-422	x P9 G 21-225-3-#4-3-#-#-#2-B-B-B-B	7.36	7.62	66	66	207	102	0.50	1.23	18.4	7.4	2.7	3.2	1.6	3.4
15	P2 G 17 C25H.S.45-1-1-1-#-#2-B-B-B-B	x P9 G 21-225-3-#4-3-#-#-#2-B-B-B-B	7.09	7.60	63	64	199	109	0.57	1.02	12.7	6.9	2.8	3.3	1.9	6.8
26	P4 EY-DMR-G-C5-S2-BB-1-B-B	x P9 G 21-225-3-#4-3-#-#-#2-B-B-B-B	7.07	7.79	67	69	221	123	0.56	0.98	9.3	4.1	3.3	3.8	2.6	9.2
28	P5 EY-DMR-G-C5-S2-BB-2-B-B	x P7 CML-421	7.06	7.43	65	65	212	112	0.53	0.99	11.3	1.1	2.7	3.1	1.8	5.0
33	P7 CML-421	x P8 CML-423	6.94	7.36	64	64	214	98	0.46	0.96	1.8	1.1	3.0	3.3	2.2	5.8
13	P2 G 17 C25H.S.45-1-1-1-#-#2-B-B-B-B	x P7 CML-421	6.81	7.33	64	65	214	104	0.49	1.04	10.7	1.9	2.7	3.3	1.9	7.2
17	P3 CML-422	x P5 EY-DMR-G-C5-S2-BB-2-B-B	6.80	7.34	65	66	198	98	0.49	1.01	18.1	2.9	3.1	3.3	2.4	7.4
40	CL-G1802	x CL 03103	6.60	7.19	62	64	209	102	0.48	0.99	1.4	0.2	3.0	3.0	2.5	8.1
41	ACROSS 9331		7.01	7.50	65	66	219	115	0.52	1.00	4.8	6.9	2.5	3.1	2.6	6.5
42	LOCAL CHECK		6.71	7.08	64	65	201	109	0.55	1.04	10.1	1.8	3.1	3.3	2.1	5.2
		LSD 0.05		0.85	2.2	2.3	15.5	12.1	0.1	0.1	16.4	4.6	0.5	0.6	0.8	7.5
		CV %		6.62	1.6	1.3	5.3	7.4	8.3	11.7	7.4	7.6	12.0	8.6	15.4	8.1
		CORRELATION WITH Yd2			-0.35	0.15	0.05	-0.26	0.05	-0.09	0.34	0.08	-0.03	0.26	0.66	0.19

Table 14. TSCY_99A06. GCA&SCA effects for yield (t/ha) of tropical early yellow lines. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	P7	P8	GCA	Yield t/ha
						SCA					
G 17 C25H.S.45-1-1-#-#-#2-B-B-B-B	P1									-0.6424	6.09
G 17 C25H.S.45-1-1-1-#-#2-B-B-B-B	P2	-1.7429**								-0.1181	6.44
CML-422 G17TSRMH5-2-4-7-1-1-1-B*7	P3	0.3214	0.0471							0.2076	6.73
EY-DMR-G-C5-S2-BB-1-B-B	P4	-0.2857	0.4100	-0.1057						0.0048	6.55
EY-DMR-G-C5-S2-BB-2-B-B	P5	0.3686	0.0443	0.5086	-0.8586**					-0.1595	6.42
TEY-G-146-1-#1-1-#2-#-#2-B-B-B-B	P6	0.4357	0.4214	-0.4243	-0.1214	0.3829				-0.2067	6.37
CML-421 P31DMR#1-55-2-3-2-1-BBBBBBB	P7	0.0143	0.2600	-0.2757	0.0771	0.4014	-0.5314			0.4048	6.94
CML-423 G18C19MH100#-4-1-1-B*7	P8	0.6529	0.1886	-0.1371	0.4457	-0.7100*	-0.0129	0.2257		-0.0538	6.56
G 21-225-3-#4-3-#-#-#2-B-B-B-B	P9	0.2357	0.3714	0.0657	0.4386	-0.1371	-0.1500	-0.1714	-0.6529*	0.5633	7.10

*: Estimation of missing crosses was based on Eckhardt paper

**: Estimation was based on entries of 3 locations

S.E. GCA 0.2297 0.2297

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.5625

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.5135

2.12 TSCY99A07

This diallel included 11 lines, six Heterotic Group "A" and five Heterotic Group "B" (sister lines were eliminated from the synthetics). The 55 single crosses and four checks were tested in four locations mentioned in the introduction.

The top performing 8 yellow single crosses are presented in Table 15. P_2 x P_9, yielded 8.5 tons/ha, showed resistance to ear rot and root lodging while the local best check yielded 7.6 tons/ha, showed bad standability and matured one week later, days to silk were 64 because winter evaluation was included, in summer sites the days to flower were 49 (see Table A54). Lines P_7 and P_{11} showed the best GCA (0.97 and 0.8 ton/ha respectively) estimates belonging to Heterotic Group "B" but from different populations.

The best performing cross P_2 x P_9 is AxB and could be used as the female parent in hybrid (P_2 x P_9) x P_7, P_7 is the line with the best GCA, the TWC combination will posses also resistance to D. mildew and tar spot (P_9 and P_7) respectively.

P_7 x P_{10} (BxB) second performing hybrid could play an important role as female parent in TWC (P_7 x P_{10}) P_6. P_6 is line Heterotic Group "A" and posses good GCA and still maintains 66% flint pedigree and tolerance to D. mildew. Additional possible TWC combinations include (P_2 x P_9) x P_{11}, semi-flint MDR; (P_7 x P_{10}) P_{11} flint MDR. (P_9 x P_{11})P_7 flint, DMR, TSR, best single crosses with lines with good GCA, all female parents will have good yield potential, one of the most important attributes for early hybrid formation, all selected males posses good general combining ability and good hybrid performance can be predicted (Tables 15 and 16).

The synthetic A&B formed include the best 8 lines with good general combining ability.

Tables A51 to A55 include the performance of hybrid combination at individual sites and across locations.

2.13 TSCY99A08

Evaluation of 36 yellow early single crosses across 3 locations. The results of this project were not very encouraging but the best performing 8 single crosses are shown in Table 17. Tables A56 to A59 present the performance of all crosses at individual and across locations.

2.14 TSCY99A09

This project includes the evaluation of 21 single crosses among seven lines Heterotic Group "B" resistant to D. mildew and tar spot.

The best performing single cross hybrid P_1 x P_7 yielded 7.5 t/ha 450 kg/ha more than the best local check. Eight single crosses were similar in yield than the local check four days later (Table 18).

P_1 showed the best GCA, estimated 2.5 times the SE for GCA (Table 19). Tables A60 to A64 demonstrates the performance of all single crosses at each site and across sites. Possible TWC combination (P_4 x P_6) x P_1 (AxB).

Table 15. TSCY_99A07. Mean data of top 8 yielding tropical early yellow single crosses. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	Ant days	Silk days	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	PA 1-5	BH %	ER %	M %
15	P2 G18C19MH100#-4-1-1-1-5-BBBB-B-B	x P9 P31DMR#1-55-2-3-2-1-3-BBBB-B-B	7.96	8.47	63	64	212	101	0.48	0.99	2.2	0.7	2.4	3.0	48.0	5.9	22.7
45	P7 CML-422	x P10 EY-DMR-G-C5-S2-BB-2-B-B	7.88	8.22	66	66	199	102	0.51	1.06	17.3	2.2	2.6	3.0	12.3	4.2	21.4
42	P6 G18C23-61-3-1-1-B-B-B	x P11 CML-424	7.76	8.09	65	65	216	117	0.54	1.06	9.6	1.0	2.6	2.8	2.4	4.1	20.5
49	P9 P31DMR#1-55-2-3-2-1-3-BBBB-B-B	x P11 CML-424	7.45	7.81	62	62	199	96	0.48	0.95	5.3	1.0	2.1	3.5	24.3	4.6	20.8
7	P1 G1803	x P8 CML-421	7.42	7.79	62	63	199	101	0.52	1.01	2.0	0.6	2.5	3.4	37.2	4.7	22.1
35	P5 G 18 C21H.S.1-2-3-1-#-#1-B-B-B	x P9 P31DMR#1-55-2-3-2-1-3-BBBB-B-B	7.39	7.60	63	63	200	93	0.46	1.03	5.8	2.2	2.2	2.9	8.0	2.7	21.7
38	P6 G18C23-61-3-1-1-B-B-B	x P7 CML-422	7.39	7.71	67	67	200	95	0.48	1.02	26.1	0.3	2.8	3.6	2.6	4.2	23.7
44	P7 CML-422	x P9 P31DMR#1-55-2-3-2-1-3-BBBB-B-B	7.38	7.79	65	67	189	89	0.47	1.00	7.3	0.6	2.8	3.3	17.1	5.3	22.6
51	CL-G1802	x CL 03103 RE	6.89	7.49	63	64	205	95	0.46	1.00	2.1	2.6	2.8	3.3	36.4	7.9	22.5
53	CL-G1704	x CL-G1808	7.77	7.95	62	63	193	94	0.49	1.01	6.0	2.3	2.4	2.7	7.7	2.3	21.2
54	LOCAL CHECK		7.24	7.67	65	66	203	107	0.53	1.03	18.2	1.0	2.7	3.4	17.2	5.6	21.4
		LSD 0.05		0.98	2.0	2.1	15.5	10.4	0.1	0.1	13.3	2.7	0.6	0.7	21.4	7.0	2.4
		CV %		7.15	1.3	1.5	5.7	9.3	10.8	7.6	6.9	5.8	12.1	12.4	7.6	7.6	5.3
		CORRELATION WITH Yd2			-0.43	0.06	-0.15	-0.30	0.20	0.42	0.45	0.17	-0.16	0.62	0.14	-0.35	-0.2

Table 16. TSCY_99A07. GCA&SCA effects for yield (t/ha) of tropical early yellow lines. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	GCA	Yield t/ha
						SCA							
G18C19MH100#-4-1-1-1-4-BBBBBBB	P1											-0.6086	6.21
G18C19MH100#-4-1-1-1-5-BBBB-B-B	P2	-3.2562**										-0.1519	6.42
G18C20MH81#-2-1-1-#-BBBB-B-B	P3	0.4927	0.2360									-0.2508	6.53
G18C20MH144#-2-4-2-BBBB-B	P4	0.3693	0.4027	-0.8584								-0.2875	6.42
G 18 C21H.S.1-2-3-1-#-#1-B-B-B	P5	-0.0862	-0.0829	-0.6340	-0.7973							-0.0919	6.45
G18C23-61-3-1-1-B-B-B	P6	-0.1051	-0.0318	-0.3029	-0.0562	-0.5718						0.3870	7.05
CML-422 G17TSRMH5-2-4-7-1-1-1-B*7	P7	0.2004	-0.1462	0.0427	-0.4107	-0.4062	-0.3151					0.9714	7.41
CML-421 P31DMR#1-55-2-3-2-1-BBBBBBB	P8	2.2693	-0.8273*	0.9116	1.1282	0.7627	0.3738	0.5993				-0.5375	6.32
P31DMR#1-55-2-3-2-1-3-BBBB-B-B	P9	1.4027	1.7460	0.5249	0.4216	0.8160	0.1971	-0.0573	-3.9984**			0.2092	6.93
EY-DMR-G-C5-S2-BB-2-B-B	P10	-1.2896*	1.3438	0.0927	0.4893	0.9738	0.5549	1.0004	-1.9107*	-1.2073*		-0.4186	6.64
CML-424 G21C22MH169#-1-2-1-1-BBBBB-B-B	P11	0.0027	0.6160*	-0.5051	-0.6884	0.0260	0.2571	-0.5073	0.6916	0.1549	-0.0473	0.7792	7.41

*: Estimation of missing crosses was based on Eckhardt paper

**: Estimation was based on entries of 3 locations

S.E. GC 0.2336 0.2336

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.6608

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0..6181

Table 17. TSCY_99A08. Mean data of top 8 yielding tropical early yellow single crosses. Across 3 Locations.

Poza Rica, Cotaxtla , Tlaltizapán; México. 1999 A

Ent	PEDIGREE	Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	BH %	NE #	ER %
14	P3 G17E Sint.-11-2-#-B-2-8-B-B-B-B-B x P10 G1817 G18C19MH100#-4-1-1-1-3-BBBBB-B-B	6.69	6.83	65	66	170	82	0.48	23.8	1.0	2.6	25.5	50	1.9
10	P2 G17ESIN11-2-#-BBBB x P10 G1817 G18C19MH100#-4-1-1-1-3-BBBBB-B-B	6.59	6.72	65	65	169	76	0.45	4.9	1.0	2.7	17.3	53	1.9
22	P5 G17E Sint.-11-2-#-B-4-2-B-B-B x P9 G1802 G18C19MH100#-4-1-1-1-1-BBBBB-B-B	6.51	6.62	65	67	178	87	0.49	8.7	3.0	2.6	24.7	49	1.7
21	P5 G17E Sint.-11-2-#-B-4-2-B-B-B x P8 CML-423 G18C19MH100#-4-1-1-B*7	6.48	6.57	65	66	178	89	0.50	12.8	1.9	2.8	28.6	52	1.3
18	P4 G17E Sint.-11-2-#-B-2-10-B-B-B x P10 G1817 G18C19MH100#-4-1-1-1-3-BBBBB-B-B	6.41	6.54	66	66	170	81	0.48	26.4	0.5	2.7	16.8	50	2.0
29	P7 P146C3MH223#-2-6-1-BBB x P9 G1802 G18C19MH100#-4-1-1-1-1-BBBBB-B-B	6.33	6.49	65	67	160	72	0.45	6.3	0.0	2.6	4.1	53	2.5
28	P7 P146C3MH223#-2-6-1-BBB x P8 CML-423 G18C19MH100#-4-1-1-B*7	6.31	6.49	65	67	161	77	0.47	0.5	0.5	3.1	5.6	48	2.7
9	P2 G17ESIN11-2-#-BBBB x P8 CML-423 G18C19MH100#-4-1-1-B*7	6.29	6.37	66	66	171	79	0.47	5.5	2.0	2.8	21.0	52	1.2
34	CL-G1802 x CL 03103	7.92	7.98	67	69	186	87	0.46	1.5	0.5	2.2	47.6	52	0.7
35	P1 G17E Sint.-10-2-#-B-1-3-B-B-B-B-B x P6 G17EC3MH226#-1-2-1-BBBB-B-B	5.65	5.74	63	63	148	67	0.45	10.0	0.5	3.1	44.8	49	1.7
36	LOCAL CHECK	5.26	5.50	68	68	165	72	0.44	18.6	0.6	3.0	7.7	43	4.5
	LSD 0.05	0.44	0.9	0.9	7.3	8.3	0.1	21.6	2.2	0.3	9.8	4.1	3.2	
	CV %	7.11	1.3	1.2	4.0	10.1	10.3	10.1	4.8	9.2	7.2	7.1	7.5	
	CORRELATION WITH Yd		-0.25	-0.09	0.76	0.81	0.45	-0.42	-0.21	-0.86	0.63	0.38	-0.71	

Table 18. TSCY_99A09. Mean data of top 8 yielding tropical early yellow single crosses . Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE	Yd1 t/ha	Yd2 t/ha	MF days	PH cm	EH cm	E/P	RL %	SL %	EA 1-5	BH %	ER %
4	P1 G1704 G17TSRMH5-2-4-#-1-1-BBB-B-B x P5 TEYP001 TEY-DMRPOPC1-MH1#-1-1-1-BBBBB-B-B	6.89	7.11	66	195	91	0.95	10.3	5.6	2.5	16.1	3.0
6	P1 G1704 G17TSRMH5-2-4-#-1-1-BBB-B-B x P7 G2102 G21C21MH52-1-2-4-BBB-1-BBBBB-#-BB	6.87	7.45	68	204	103	0.95	15.3	5.2	2.7	10.0	7.8
15	P4 03103 P31DMR#1-55-2-3-2-1-4-B-#-BBBBB x P6 G1805 G18C19MH100#-4-1-1-1-BB-#-BBBBB	6.83	7.19	63	205	101	1.00	1.7	0.3	2.4	26.1	4.9
2	P1 G1704 G17TSRMH5-2-4-#-1-1-BBB-B-B x P3 CML-421	6.82	7.27	65	195	94	0.99	7.3	1.6	2.9	23.9	6.2
16	P4 03103 P31DMR#1-55-2-3-2-1-4-B-#-BBBBB x P7 G2102 G21C21MH52-1-2-4-BBB-1-BBBBB-#-BB	6.78	7.20	67	210	103	0.93	3.4	0.6	2.4	18.8	5.9
1	P1 G1704 G17TSRMH5-2-4-#-1-1-BBB-B-B x P2 G1706 G17C22MH111#-1-4-3-3-BBB-B-B	6.77	7.03	64	189	88	0.98	13.0	3.7	3.1	16.6	3.8
5	P1 G1704 G17TSRMH5-2-4-#-1-1-BBB-B-B x P6 G1805 G18C19MH100#-4-1-1-1-BB-#-BBBBB	6.73	6.98	64	192	96	0.98	9.5	4.7	2.5	3.9	3.5
13	P3 CML-421 x P6 G1805 G18C19MH100#-4-1-1-1-BB-#-BBBBB	6.58	7.04	63	208	101	0.98	9.2	1.9	2.6	21.8	6.6
20	CL-G1802 x CL 03103 RE	6.33	6.95	62	206	97	0.99	1.0	0.3	2.8	36.5	8.9
21	LOCAL CHECK	6.32	6.82	62	188	86	0.98	3.4	2.3	2.9	25.7	7.4
	LSD 0.05		0.97	2.0	11.8	10.5	0.1	12.1	6.5	0.7	18.2	6.8
	CV %		5.92	1.3	4.3	8.2	4.6	9.6	6.5	12.1	8.9	6.2
	CORRELATION WITH Yd2			-0.54	-0.09	0.21	-0.12	-0.22	0.28	-0.19	0.02	###

Table 19. TSCY_99A09. GCA&SCA effects for yield (t/ha) of tropical early yellow lines, Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	GCA	Yield t/ha
				SCA					
G1704 G17TSRMH5-2-4-#-1-1-BBB-B-B	P1							0.7609	7.00
G1706 G17C22MH111#-1-4-3-3-BBB-B-B	P2	-0.1393						-0.0991	5.94
CML-421 P31DMR#1-55-2-3-2-1-BBBBBBB	P3	0.8047	0.6647*					-0.8031	5.36
03103 P31DMR#1-55-2-3-2-1-4-B-#-BBBBB	P4	0.2727	0.2027	-2.6033**				-0.5311	6.18
TEYP001 TEY-DMRPOPC1-MH1#-1-1-1-BBBBB-B-B	P5	-0.2733	0.2367	0.3607	0.2487			0.1149	6.68
G1805 G18C19MH100#-4-1-1-1-BB-#-BBBBB	P6	-0.5913	-0.5913	1.0327	0.9107	-0.5353		0.3029	6.68
G2102 G21C21MH52-1-2-4-BBB-1-BBBBB-#-BB	P7	-0.0733	-0.3733	-0.2593*	0.9687	-0.0373	-0.2253	0.2549	6.60

*: Estimation of missing crosses was based on Eckhardt paper

**: Estimation was based on entries of 3 locations S.E. GCA 0.3075

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.6151

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.5327

Lines selected as male for TWC hybrids in these projects are:

1. G18 C_{23}-61-3-1-1-B-B-B
2. CML 421
3. G21-225-3-#-#-3-#-#-#-2-B-B-B-B
4. CML 422
5. CML 424
6. G17-11-2-#-B-2-B-B-B-B-B-B-B
7. G1704
8. G1805

All three way cross early yellow tropical combination identified from these projects are being formed at Tumbadero and will be tested internationally in 2001 in CHTTEY. Synthetics were tested in 1999. The TWC and synthetics produced from this project could definitively help to increase maize productivity in marginal drought prone areas in tropical mega-environment if extensively tested.

Combining ability and cross performance of tropical late white inbred lines Heterotic Groups "A" and "B".

The activities conducted in these subprojects are oriented toward one of the most important goals of Global Project 2, Subproject 3 "Development of late maturing, high-yielding, stress tolerant, and stable performing hybrids and OPVs for subsistence and commercial farmers in the tropical lowlands". The yield potential in maize growing areas of Latin America, Africa and some countries in Asia such as India, Indonesia, Philippines among others in the tropical lowland mega-environment is high, however, the actual mean yield is low. The genetic diversity of the inbred lines tested in this subproject could give original germplasm (synthetics and hybrids) suitable for marginal environments due to several stresses applied in the selection processes of the inbred lines included in this study. All products developed from this subproject should be tested under biotic and abiotic stresses in Mexico and further, the superior germplasm tested through the projects in AMS in eastern Africa and southern Africa.

Six different diallels including tropical white late elite inbred lines Heterotic Groups A&B. Experiments TSCW99A10 to TSCW99A15 were tested at four locations in Mexico, Poza Rica and Cotaxtla 99A, Tlaltizapan and Cotaxtla 99B. The objectives of these experiments were:

1. To estimate the combining ability of the inbred lines to further utilize them in hybrid combinations according to their response.
2. Identify single cross combination AxA and BxB to be used as female in TWC combination.
3. Identify superior single cross combination for testing in CHTTW internationally in 2001.
4. Confirm the heterotic grouping of the lines and
5. Identify superior combinations for synthetics.

2.15 TSCW99A10

A diallel was formed with 8 elite lines initially identified as Heterotic Group "A", at the same time a synthetic was formed and the F_1 was advanced to F_2 and internationally tested in 1999B.

The 28 possible single crosses plus 2 checks were included under a $\propto$ lattice design 5x6 with 2 replications, 2 rows 5 meters long per plot and evaluated in four locations.

Table 20 shows the top performing 8 single crosses with a maximum yield of 9.75 ton/ha in CML407 x CML254 one ton more yield than the reference entry CML247 x CML254 and 2 tons per hectare more than the best check of the seed industry Pioneer P3001 W. Seven additional single crosses outyielded the seed industry check and showed resistance to ear rot and root lodging while P3001W presented 28% root lodging and 7% rotten ears.

Four elite inbred lines P_5, P_6, P_7 and P_8 showed positive and significant GCA estimates 0.69, 0.59, 0.99 and 0.59 t/ha respectively. The GCA estimate for P_7 was almost three times S.E. for GCA. Confirming its excellency for GCA. The highest SCA ability estimated was demonstrated by $P_3 \times P_5 = 1.059$ ton/ha. It showed across performance of 9.0 tons/ha. $P_3 \times P_7$ also showed high SCA estimated of 0.87. The best performing single cross hybrid included the parents with the highest GCA estimates (Table 21).

P_7 participated in 4 of the best 8 top yielding single crosses and showed the highest GCA estimates, that excellent performing ability makes P_7 a perfect male parent in TWC combination using the single cross $P_5 \times P_6$ as female parent. This will make the perfect combination because P_7 combines well with P_5 and P_6, such combination ranked 2nd and 3rd in the trial. Other TWC combination could be $(P_5 \times P_8) \times P_7$ and $(P_3 \times P_5)$ P_7 with the female single crosses yielding 9.6, 9.4 and 9.0 tons per hectare respectively.

P_5, P_6, P_7 and P_8 can also be used as male parents in combination with single crosses Heterotic Group "B". Single cross $P_6 \times P_7$ can be used as dent single cross *per se* because it yielded 9.6 tons per hectare (Table 20) and P_6 = P43LPSC$_3$-S$_2$-1-3-B*S is good seed yielder. The best 3 single crosses will be tested in international trial CHTTW in 2001.

All the objectives established in this project were exceedingly achieved.

Tables A65 to A69 show the performance of all possible single crosses at individual and across locations. $P_7 \times P_8$ ranked first, second, third and second at Poza Rica 99A, Cotaxtla 99 and Tlaltizapan and Cotaxtla 99 respectively.

The results obtained indicate that high yielding single crosses can be obtained within heterotic groups and can be used effectively in TWC combination to develop hybrids with dent endosperm that are preferred in several countries in the developing world, using a line with good general combining ability as male that will guarantee the delivering of superior products to farmers.

Table 20. TSCW_99A10. Mean data of top 8 yielding tropical late white single crosses. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1	Yd2	MF	FF	PH	EH	EH/	RL	SL	EA	BH	NE	NP	ER
			t/ha	t/ha	days	days	cm	cm	PH	%	%	1-5	%	#	#	%
28	P7 CML-407	x P8 CML-254	9.57	9.75	76	76	241	131	0.53	10.0	6.9	2.1	1.1	51	52	1.8
26	P6 P43 POSTA SEQ C3-S2-1-3-B*6	x P7 CML-407	9.55	9.61	78	78	239	122	0.49	6.6	0.7	2.1	1.7	47	47	0.6
24	P5 P43 C10HC169-B*8	x P7 CML-407	9.37	9.57	76	74	247	123	0.50	9.5	3.7	2.6	9.7	51	51	2.1
11	P2 P22TSRC4-158-2-7-B-B-2-BBB	x P6 P43 POSTA SEQ C3-S2-1-3-B*6	9.28	9.50	80	81	224	117	0.51	8.9	4.5	2.5	7.6	51	52	2.3
25	P5 P43 C10HC169-B*8	x P8 CML-254	9.24	9.40	75	76	243	128	0.52	3.7	0.5	2.3	1.2	52	52	1.7
23	P5 P43 C10HC169-B*8	x P6 P43 POSTA SEQ C3-S2-1-3-B*6	9.23	9.56	76	77	229	108	0.47	11.6	0.5	2.7	4.8	53	52	3.4
15	P3 P22 AC8222-6-2-2-B-##-2-BBB-2-#-B-##-B*6	x P5 P43 C10HC169-B*8	8.91	9.00	72	73	219	109	0.50	5.7	1.0	2.7	4.8	50	51	1.1
17	P3 P22 AC8222-6-2-2-B-##-2-BBB-2-#-B-##-B*6	x P7 CML-407	8.77	9.12	72	73	212	113	0.53	16.9	6.2	2.4	2.0	51	52	3.8
29	CML-247	x CML-254 RE	8.74	8.88	76	77	206	113	0.55	4.9	2.2	2.4	7.3	51	51	1.6
30	LOCAL CHECK P-3001 W		7.38	7.95	74	75	225	124	0.54	28.4	8.0	3.5	4.4	48	51	7.2
		LSD 0.05		1.34	2.0	2.2	18.7	12.2	0.1	11.1	7.6	0.7	11.3	5.4	2.2	6.2
		CV %		7.85	1.1	1.1	4.5	7.1	9.8	9.4	7.1	11	8.7	5.9	3.3	6.5
		CORRELATION WITH Yd2			-0.5	0.18	-0.44	-0.43	0.18	0.01	0.25	0.0	0.22	-0.92	0.03	-0.6

Table 21. TSCW_99A10. GCA&SCA effects for yield (t/ha) of tropical late white single crosses. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	P7	GCA	Yield t/ha
					SCA					
P21C6S1MH125-3-B-1-1-1-BBB-1-##-B*9	P1								0.0350	8.28
P22TSRC4-158-2-7-B-B-2-BBB	P2	0.2317							-0.1467	8.23
P22 AC8222-6-2-2-B-##-2-BBB-2-#-B-##-B*6	P3	0.6200	-0.0583						-1.1450	7.36
P22 AC8222-6-2-2-B-##-2-BBB-4-#-B-#-2-B*7	P4	0.7117	-0.1567	-4.1483**					-1.6067	7.13
P43 C10HC169-B*8	P5	-0.8117	-0.3800	1.0583	1.0400				0.6867	8.79
P43 POSTA SEQ C3-S2-1-3-B*6	P6	-0.2217	0.6600	0.7183	0.6100	-0.1133			0.5867	8.98
CML-407 (G24TSR19*P21F199)-1-1-B-2-2-BBB-1-###-B*7	P7	-0.3533	-0.0217	0.8667	0.6383	-0.5150	-0.3750		0.9983	9.19
CML-254 TSEQ-149-2-BBB-##-1-BB-f-##-B*6	P8	-0.1767	-0.275	0.9433	1.3050	-0.2783	-1.2783	-0.2400	0.5917	8.75

*: Estimation of missing crosses was based on Eckhardt paper
**: Estimation was based on entries of 3 locations

S.E. GCA 0.3897

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.8714
S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.7794

2.16 TSCW99A11

A diallel was formed with 7 elite lines initially identified as heterotic Group B, at the same time a synthetic was formed and the F_1 was advanced to F_2 and internationally tested in 1999B.

The 21 possible single crosses plus 3 checks were included under a α lattice design 4x6 with 2 replications, 2 rows 5 meters long per plot and evaluated in four locations.

Table 22 shows the best 3 single crosses that topped the trial and yielded 7.5 tons/ha outyielding the seed industry check but not CML247 x CML254. The 3 single crosses are Heterotic Group "B" (flint) and can be used as female parent in TWC combinations with the 4 lines selected in Project 2.15 as male parents.

P_3, P_4 and P_6 showed positive combining ability (Table 23). Performance of all 21 single crosses at individual and across locations are shown in Tables A70 to A74.

2.17 TSCW99A12

A diallel was formed with 9 elite lines, five initially identified as Heterotic Group "A", and four Heterotic Group "B" at the same time a synthetic was formed and the F_1 was advanced to F_2 and internationally tested in 1999B.

The 36 possible single crosses plus 4 checks were included under a α lattice design 5x8 with 2 replications, 2 rows 5 meters long per plot and evaluated in four locations.

P43C_{10}HC169-B*8 x CML407 yielded 10.0 tons per hectare superior to the seed industry check in 3 tons per hectare and 25% more yield than the RE CML247 x CML254. The best single cross showed also excellent standability and ear rot resistance while the seed industry check presented 22% root lodging and 7% rotten ears. Four crosses outyielded the seed industry check with 1.8 to 3 tons per hectare and resistance to root lodging and ear rot. CML407 was parent in five of the best eight single crosses that topped the trial (Table 24) while this trial included combinations amongst lines Heterotic Groups A&B, the best 3 single crosses were combinations AxA and combining ability played an important role in the heterotic response. Lines P_2, P_3, P_4 and P_5 showed positive and highly significant GCA estimates up to 5 times the SE for GCA. All lines Heterotic Group "B" (P_6, P_7, P_8, P_9) showed negative GCA (Table 25). Possible suggested TWC hybrid combinations here are (P_3 x P_7)P_4 = AxBxC, C=P_4 or the line with the best general combining ability (P_5 x P_6) P_4 = AxBxC: (P_1 x P_3) P_4; (P_4 x P_6) P_3.

Entry 10 ranked 1st , 2nd , 2nd , and 4th at Poza Rica, Cotaxtla Cycle A and Tlaltizapan and Cotaxtla Cycle B, and first across locations demonstrating good yield stability (Tables A75 to A79).

Lines selected from this subproject are P_2, P_3, P_4, P_5. Single crosses for international testing: P_2 x P_4, P_3 x P_4, P_4 x P_5 and P_1 x P_3.

2.18 TSCW99A13

The 28 possible single crosses plus 2 checks were included under a α lattice design 5x6 with 2 replications, 2 rows 5 meters long per plot and evaluated in four locations.

Table 22. TSCW_99A11. Mean data of top 8 yielding tropical late white single crosses. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	BH %	NE #	NP #	ER %
19	P5 G 23 C26 HS179-1-4-2-3-BBB	x P6 G 23 C26 HS235-7-1-1-5-B	7.18	7.48	71	73	210	117	0.54	31.7	16.5	2.8	1.1	48	51	4.0
8	P2 P32(MRRS)F2(C2)-138-1-B*5	x P4 G 23 C26 HS170-1-1-1-1-BBB	7.16	7.49	72	73	225	119	0.51	30.1	8.3	3.0	9.1	46	50	4.5
12	P3 (G19TSR16*20TSR20)-1-2-B-1-2-BBB-3-B-#-B*6	x P4 G 23 C26 HS170-1-1-1-1-BBB	7.13	7.57	72	74	219	110	0.51	15.9	2.6	3.2	23.3	44	46	5.9
14	P3 (G19TSR16*20TSR20)-1-2-B-1-2-BBB-3-B-#-B*6	x P6 G 23 C26 HS235-7-1-1-5-B	6.96	7.43	73	75	203	109	0.53	6.4	0.7	3.5	16.5	48	51	6.3
15	P3 (G19TSR16*20TSR20)-1-2-B-1-2-BBB-3-B-#-B*6	x P7 CML-247	6.90	7.23	75	77	201	105	0.50	19.0	4.6	3.3	8.3	47	50	4.5
16	P4 G 23 C26 HS170-1-1-1-1-BBB	x P5 G 23 C26 HS179-1-4-2-3-BBB	6.88	7.08	73	75	222	117	0.52	11.9	10.8	3.1	4.7	49	50	2.8
6	P1 P23 C3 HC-71-B*8	x P7 CML-247	6.84	6.91	73	76	217	115	0.53	3.6	3.2	2.9	2.0	48	52	1.0
5	P1 P23 C3 HC-71-B*8	x P6 G 23 C26 HS235-7-1-1-5-B	6.84	7.15	71	74	208	113	0.54	22.8	5.4	3.1	0.8	46	50	4.4
22	CML-9	x CL-02510 P25HC246-3-1-BB-2-#-B*7	6.53	6.80	74	75	213	112	0.52	27.7	3.5	3.4	5.2	44	50	3.9
23	CML-247	x CML-254 RE	8.36	8.45	76	77	204	114	0.55	1.9	0.6	2.5	5.1	52	52	1.2
24	LOCAL CHECK		6.71	7.09	75	75	218	118	0.52	21.7	4.6	3.6	5.1	47	50	5.5
		LSD 0.05		1.30	2	2	17	12	0.06	24.8	12.1	0.6	10.8	5	3	5.1
		CV %		11.66	2	1	5	7	5.55	13.8	12.3	13.7	8.7	7	5	7.3
		CORRELATION WITH Yd2			0.33	-0.1	-0.32	-0.29	-0.10	0.24	-0.15	0.08	0.22	-0.57	-0.24	-0.4

Table 23. TSCW_99A11. GCA&SCA effects for yield (t/ha) of tropical late white lines. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	GCA	Yield t/ha
				SCA					
P23 C3 HC-71-B*8	P1							-0.2311	6.73
P32(MRRS)F2(C2)-138-1-B*5	P2	-0.5193						-0.3571	6.62
(G19TSR16*20TSR20)-1-2-B-1-2-BBB-3-B-#-B*6	P3	0.1167	0.0227					0.2269	7.11
G 23 C26 HS170-1-1-1-1-BBB	P4	-0.1333	0.7327	0.2287				0.1969	7.08
G 23 C26 HS179-1-4-2-3-BBB	P5	0.0927	-0.1513	-0.4953	0.0447			-0.0791	6.85
G 23 C26 HS235-7-1-1-5-B	P6	0.2067	-0.0273	0.0287	-0.5313	0.3847		0.2569	7.13
CML-247 (G24F119*G24F54)-6-4-1-1-BB-f-##-B*6	P7	0.2367	-0.0573	0.0987	-0.3413	0.1247	-0.0613	-0.0131	6.91

*: Estimation of missing crosses was based on Eckhardt paper S.E. GCA 0.4129

**: Estimation was based on entries of 3 locations

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.8257

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.7151

Table 24. TSCW_99A12. Mean data of top 8 yielding tropical late white single crosses. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	BH	NE	NP	ER
			t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	%	#	#	%
10	P2 P43 C10HC169-B*8	x P4 CML-407	9.41	9.99	75	74	-1.6	271	136	0.52	0.97	2.3	2.1	2.4	10.4	49	51	5.8
16	P3 P43 POSTA SEQ C3-S2-1-3-B*6	x P4 CML-407	9.29	9.50	76	76	0.0	249	129	0.51	1.02	1.5	0.0	2.2	0.1	51	50	2.2
22	P4 CML-407	x P5 CML-254	9.14	9.60	74	74	-0.1	264	139	0.54	0.90	1.9	0.5	2.2	1.8	47	52	4.8
2	P1 P22TSRC4-158-2-7-B-B-2-BBB	x P3 P43 POSTA SEQ C3-S2-1-3-B*6	8.64	9.10	77	79	1.9	253	136	0.55	0.95	3.7	3.8	2.3	6.2	49	52	5.0
19	P3 P43 POSTA SEQ C3-S2-1-3-B*6	x P7 P32(MRRS)F2(C2)-138-1-B*5	8.50	8.71	75	75	0.1	250	124	0.52	0.99	7.1	0.5	2.5	1.0	50	50	2.5
24	P4 CML-407	x P7 P32(MRRS)F2(C2)-138-1-B*5	8.48	8.91	71	71	0.2	263	133	0.54	0.96	17.2	2.0	2.6	4.2	50	51	4.8
23	P4 CML-407	x P6 P23 C3 HC-71-B*8	8.48	8.96	69	73	4.2	260	120	0.46	0.95	2.0	0.5	2.3	2.8	50	53	5.3
27	P5 CML-254	x P6 P23 C3 HC-71-B*8	8.47	8.83	73	75	1.9	270	138	0.54	0.96	1.8	0.5	2.1	1.7	50	52	4.0
30	P5 CML-254	x P9 CML-247 RE	8.00	8.18	75	76	0.9	229	127	0.59	0.96	2.7	1.9	2.8	1.2	50	52	2.2
39	P3001 W		6.50	7.05	75	76	1.1	244	128	0.56	0.93	21.6	3.9	3.6	1.1	47	51	7.8
40	LOCAL CHECK		6.36	6.98	74	75	0.6	266	132	0.54	0.93	6.5	4.9	3.8	5.0	45	48	9.0
		LSD 0.05	1.14	1.19	2.1	2.0	1.1	21.2	9.5	0.1	0.1	20.0	4.4	0.5	14.0	3.6	3.0	4.9
		CV %	1.99	9.18	1.2	1.1	2.7	2.6	4.9	5.1	9.4	7.1	7.2	13.4	7.1	7.9	3.7	8.3
		CORRELATION WITH Yd2			0.06	0.18	-0.38	-0.38	-0.37	-0.22	0.06	0.31	-0.24	0.38	0.37	-0.32	-0.08	-0.41

Table 25. TSCW_99A12. GCA&SCA effects for yield (t/ha) of tropical late white lines. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	P7	P8	GCA	Yield t/ha
					SCA						
P22TSRC4-158-2-7-B-B-2-BBB	P1									-0.6043	7.40
P43 C10HC169-B*8	P2	-0.1957								0.5000	8.37
P43 POSTA SEQ C3-S2-1-3-B*6	P3	1.1814	-0.2829							0.5929	8.45
CML-407 (G24TSR19*P21F199)-1-1-B-2-2-BBB-1-###-B*7	P4	-0.4986	0.4671	-0.1157						1.0929	8.89
CML-254 TSEQ-149-2-BBB-##-1-BB-f-##-B*6	P5	-0.3471	-0.5614	-0.4143	0.0157					0.5614	8.42
P23 C3 HC-71-B*8	P6	-0.1671	-0.3714	-0.0743	-0.0543	0.3471				-0.0086	7.92
P32(MRRS)F2(C2)-138-1-B*5	P7	0.6571	-0.3871	0.2800	-0.0200	0.2814	-0.4886			-0.0929	7.85
(G19TSR16*20TSR20)-1-2-B-1-2-BBB-3-B-#-B*6	P8	-0.7686	0.8771	-1.1657	-0.0757	1.2257	0.3657	0.2900		-1.1171	6.95
CML-247 (G24F119*G24F54)-6-4-1-1-BB-f-##-B*6	P9	0.1386	0.4543	0.5914	0.2814	-0.5471*	0.4429	-0.6129	-0.7486*	-0.9243	7.12

*: Estimation of missing crosses was based on Eckhardt paper

**: Estimation was based on entries of 3 locations

S.E. GCA 0.2170

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.5316

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.4853

The 8 lines included in this diallel were 5 Heterotic Group "A" and 3 Heterotic Group "B".

The top yielding hybrid in this experiment was CML407 x CLO2510 (A&B) with 9.50 tons per hectare, 31% more than Pioneer W3001W best seed industry check and 15 more than our RE: CML247 x CML 254. Eight single crosses significantly outyielded the best hybrid checks (Table 26). The best 3 single crosses selected in this trial are crosses AxB, that can be used as females in TWC combination with male inbred lines with excellent GCA selected in 2.16.

The only 3 lines with GCA positive estimates were CML407, CML 254 and CLO2182 (Table 27).

Tables A80 to A84 present all hybrids evaluated at individual and across locations.

2.19 TSCW99A14

The 18 single crosses plus 2 checks were included under a $\propto$ lattice design 4x5 with 2 replications, 2 rows 5 meters long per plot and evaluated in four locations.

Best hybrid selected CML 264 x CML269 yielded 9.2 tons per hectare, one ton more than P-3001W and similar to RE: CML 247 x 254 (Table 28).

Only CML 398 and CML269 showed positive GCA estimates 0.66 ton/ha and 0.53 ton/ha respectively, CML264 x CML269 showed the highest SCA estimate (1.15 ton/ha) (Table 29).

Tables A85 to A89 present all hybrids evaluated at individual and across locations.

2.20 TSCW99A15

28 single crosses plus 2 checks were included under a $\propto$ lattice design 5x6 with 2 replications, 2 rows 5 meters long per plot and evaluated in four locations.

Table 30 shows the top 8 single crosses identified in this experiment, only two crosses more than the RE. Table 31 shows the GCA and SCA estimates in this trial, combinations among sister lines were eliminated from these trials.

Tables A90 to A94 present all hybrids evaluated at individual and across locations.

Table 26. TSCW_99A13. Mean data of top 8 yielding tropical late white single crosses. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE			Yd1	Yd2	MF	Silk	PH	EH	EH/	RL	SL	EA	BH	ER
				t/ha	t/ha	days	date	cm	cm	PH	%	%	1-5	%	%
20	P4 CML-407	x	P6 02510 P25C5HC246-3-1-BB-2-#-B*9	9.38	9.50	73	73	243	128	0.53	23.2	0.3	2.7	8.7	1.3
24	P5 CML-254	x	P7 CML36	9.07	9.18	76	76	249	142	0.57	8.0	1.3	2.5	0.0	1.2
22	P4 CML-407	x	P8 CML-247	9.05	9.29	75	75	228	124	0.54	12.4	3.7	2.7	3.7	2.6
8	P2 02182 P21C5HC218-2-3-B-f-6#-BBBB-2-####-B*7	x	P3 04332 (AC7643*P43)-2-3-4-2-BBB-1-B-#-B*8	8.85	9.23	76	76	237	137	0.57	2.2	0.6	3.1	9.1	4.1
6	P1 CML9	x	P7 CML36 P32C4HC20-3-4-B-ff-###-B-B-B-B	8.72	8.92	74	75	229	120	0.52	20.6	0.6	2.7	0.2	2.3
19	P4 CML-407	x	P5 CML-254	8.70	8.86	77	76	242	133	0.54	20.1	4.0	2.5	2.4	1.8
15	P3 04332 (AC7643*P43)-2-3-4-2-BBB-1-B-#-B*8	x	P5 CML-254	8.65	8.81	77	78	226	129	0.57	3.0	1.3	2.7	1.8	1.8
10	P2 02182 P21C5HC218-2-3-B-f-6#-BBBB-2-####-B*7	x	P5 CML-254	8.62	8.73	77	77	228	124	0.54	1.7	3.1	2.7	0.3	1.3
25	P5 CML-254	x	P8 CML-247 RE	8.16	8.28	77	78	222	126	0.57	2.3	1.3	2.7	6.3	1.5
29	P3001 W			7.03	7.24	74	75	237	135	0.58	36.2	3.2	3.1	3.2	3.0
30	LOCAL CHECK			6.35	6.81	74	76	232	130	0.53	21.6	12.2	3.8	6.6	6.7
			LSD 0.05		1.20	2	2	15	10	0.03	20.4	5.4	0.6	12.0	3.9
			CV %		8.25	0.9	0.8	4.0	6.2	5.3	8.7	7.5	9.7	8.1	7.5
			CORRELATION WITH Yd2			0.23	0.0	-0.31	0.19	0.27	-0.18	0.45	0.18	0.29	-0.27

Table 27. TSCW_99A13. GCA&SCA effects for yield (t/ha) of tropical late white lines. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	P7	GCA	Yield
					SCA					t/ha
CML9 P21C5HC219-3-1-B-ff-####-B-B-B-B	P1								-0.3029	8.09
02182 P21C5HC218-2-3-B-f-6#-BBBB-2-####-B*7	P2	-0.2005							0.2737	8.58
04332 (AC7643*P43)-2-3-4-2-BBB-1-B-#-B*8	P3	-0.3188	0.7845						-0.1779	8.20
CML-407 (G24TSR19*P21F199)-1-1-B-2-2-BBB-1-###-B*7	P4	-0.2221	-0.7588	0.1629					0.6354	8.89
CML-254 TSEQ-149-2-BBB-##-1-BB-f-##-B*6	P5	0.0579	-0.3388	0.1929	-0.5705				0.4454	8.73
02510 P25C5HC246-3-1-BB-2-#-B*9	P6	0.5695	0.3529	-0.8155	0.8412	0.2412			-0.3263	8.07
CML36 P32C4HC20-3-4-B-ff-###-B-B-B-B	P7	0.9812	-0.2155	0.0562	-0.1971	0.4929	-1.0955		-0.1079	8.26
CML-247 (G24F119*G24F54)-6-4-1-1-BB-f-##-B*6	P8	-0.8671	0.3762	-0.0621	0.7445	-0.0755	-0.0938	-0.0221	-0.4396	7.97

S.E. GCA 0.3492

*: Estimation of missing crosses was based on Eckhardt paper

**: Estimation was based on entries of 3 locations

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.7808

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.6984

Table 28. TSCW_99A14. Mean data of top 8 yielding tropical late white single crosses. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	BH %	NE #	NP #	ER %	M %
11	P3 CML-264	x P5 CML-269	9.04	9.17	72	72	0.2	212	106	0.49	0.99	2.9	0.4	2.5	1.4	50	50	1.4	22.8
16	CML-247	x CML-254	8.95	9.10	75	76	0.5	208	116	0.56	0.99	4.2	0.3	2.3	4.9	52	52	1.6	27.6
4	P1 CML-398	x P5 CML-269	8.93	9.07	72	73	0.3	220	108	0.49	0.99	2.1	0.7	2.7	0.6	52	52	1.5	20.4
5	P1 CML-398	x P6 CL-00303	8.49	8.75	72	73	1.2	215	111	0.52	0.98	16.7	1.6	2.6	4.7	51	53	3.0	22.0
8	P2 CML-9	x P5 CML-269	8.47	8.63	71	71	0.3	202	103	0.51	0.97	3.6	0.6	3.0	1.2	51	53	1.9	22.7
1	P1 CML-398	x P2 CML-9	8.26	8.54	75	74	-0.8	220	111	0.51	0.96	4.2	1.0	2.8	0.8	50	53	3.3	22.9
17	CML-9	x CL-02510	8.17	8.57	73	73	0.6	231	112	0.48	0.97	2.0	0.4	2.9	13.8	49	51	4.6	25.8
13	P4 P21C6S1HC247-5-B-1-1-2-BBB-1-#*4-BBBB	x P5 CML-269	8.13	8.25	70	70	0.0	201	108	0.54	0.98	3.2	1.6	3.0	0.5	52	53	1.5	20.3
18	P25C4HC-179-BBBBBB-BB	x CML-254	8.63	8.79	74	74	0.1	234	131	0.56	0.99	4.7	0.5	2.3	2.5	52	52	1.9	23.1
19	P3001 W		6.37	7.02	75	75	0.4	237	129	0.56	0.88	26.5	1.3	3.3	4.4	44	51	9.3	23.5
20	LOCAL CHECK		7.11	7.86	75	76	0.9	224	122	0.53	0.92	23.5	4.8	3.4	5.0	47	51	9.6	23.6
		LSD 0.05		1.35	2.6	2.6	1.1	19.7	14.5	0.1	0.1	17.3	7.5	0.6	5.8	3.7	2.0	5.9	2.8
		CV %		6.66	1.7	1.5	3.7	2.9	4.9	4.0	4.3	7.8	5.1	11.6	7.2	4.7	3.5	6.5	7.3
		CORRELATION WITH Yd2			-0.76	0.43	-0.2	-0.4	0.02	0.43	-0.12	0.42	0.0	0.0	-0.07	-0.49	-0.35	-0.6	-0.3

Table 29. TSCW_99A14. GCA&SCA effects for yield (t/ha) of tropical late white lines. Across 4 Locations.

Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México. 1999

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	GCA	Yield t/ha
				SCA				
CML-398	P1						0.6642	8.43
CML-9	P2	0.5070					-0.7058	7.57
CML-264	P3	0.1645	-2.4255**				-0.5933	7.65
P21C6S1HC247-5-B-1-1-2-BBB-1-#*4-BBBB	P4	-0.4655	0.5045	0.4720			0.0867	8.14
CML-269	P5	-0.2005	0.7295	1.1570	-0.4430		0.5317	8.30
CL-00303	P6	-0.0055	0.6845	0.6320	-0.0680	-1.2430	0.0167	7.93

*: Estimation of missing crosses was based on Eckhardt paper S.E. GCA 0.4765

**: Estimation was based on entries of 3 locations

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.8253

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.6738

Table 30. TSCW_99A15. Mean data of top 8 yielding tropical late white single crosses. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	ER 1-5	BH %	NE #	NP #	ER %
19	P4 CML-271	x P5 CML-254	9.08	9.21	78	78	0.1	214	122	0.56	1.01	0.8	1.5	2.4	1.5	3.7	53	53	1.5
4	P1 CML-9	x P5 CML-254	8.71	9.00	77	77	-0.1	226	118	0.51	1.01	1.7	0.3	2.6	1.9	2.6	52	52	3.3
24	P5 CML-254	x P8 CML-247 RE	8.54	8.61	76	76	0.3	204	110	0.55	0.99	0.9	0.6	2.4	1.3	4.3	51	52	0.8
23	P5 CML-254	x P7 SINT.BCO.TSR-7-3-1-2-3-BB-##-BB	8.49	8.66	76	77	0.7	212	118	0.55	0.99	3.9	3.2	2.6	1.9	1.2	51	52	1.9
11	P2 CML-264	x P6 CML-269	8.45	8.63	72	73	0.7	211	99	0.46	0.98	0.7	0.0	2.7	1.9	0.8	51	52	2.0
10	P2 CML-264	x P5 CML-254	8.45	8.61	78	77	0.1	221	118	0.51	0.99	1.4	0.9	2.6	1.6	1.2	52	53	1.9
22	P5 CML-254	x P6 CML-269	8.38	8.45	73	73	0.4	220	121	0.55	1.04	2.6	0.3	2.8	1.3	0.9	53	52	0.8
5	P1 CML-9	x P6 CML-269	8.34	8.46	71	73	1.5	201	102	0.51	0.96	1.3	0.6	2.9	1.5	0.8	50	52	1.4
28	CML-9	x CL-02510 P25HC246-3-1-BB-2-#-B*7	8.28	8.68	73	74	1.1	221	113	0.51	1.00	1.5	0.3	2.8	2.4	20.6	51	51	4.6
29	LOCAL CHECK-1		7.67	7.85	74	75	0.2	235	130	0.56	0.98	18.4	5.1	2.7	1.8	1.8	50	51	2.3
30	LOCAL CHECK-2		7.88	8.30	74	75	0.7	229	125	0.55	0.96	12.2	6.9	3.4	2.6	5.1	49	50	5.1
		LSD 0.05		1.02	1.8	2.0	1.1	14.8	11.4	0.1	0.1	9.2	5.4	0.5	0.9	6.7	3.8	2.2	3.4
		CV %		6.66	1.1	1.3	3.2	4.0	6.7	5.5	5.0	8.1	5.1	9.8	21.7	7.0	5.1	2.9	6.4
		CORRELATION WITH Yd2			-0.53	0.23	-0.30	-0.47	-0.03	0.46	0.53	0.43	-0.4	0.03	0.72	-0.08	-0.14	0.06	-0.19

Table 31. TSCW_99A15. GCA&SCA effects for yield (t/ha) of tropical late white lines. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999

PEDIGREE	PARENTS	P1	P2	P3	P4 SCA	P5	P6	P7	GCA	Yield t/ha
CML-9	P1								-0.4362	7.05
CML-264	P2	-2.4412**							-0.3279	7.20
CML-270	P3	0.9421	0.9938						-0.3112	7.17
CML-271	P4	-0.8512	-1.2395	0.4938					-0.4279	6.86
CML-254	P5	0.9605	0.4621	-2.2045	1.1621				0.8304	8.05
CML-269	P6	0.6538	0.7155	0.1088	0.3955	-0.6229			0.5971	7.86
SINT.BCO.TSR-7-3-1-2-3-BB-##-BB	P7	0.4105	0.7321	0.2255	0.0021*	0.0538	-0.9529		0.1304	7.32
CML-247 (	P8	0.3255	0.7771	-0.5595	0.0371	0.1888	-0.2979	-0.4712	-0.0546	7.29

*: Estimation of missing crosses was based on Eckhardt paper S.E. GCA 0.2965

**: Estimation was based on entries of 3 locations

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.6631

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.5931

Combining ability and cross performance of tropical late maturity yellow endosperm inbred lines.

More than 20 million hectares are planted yearly with maize yellow germplasm in Asia and Latin America in the tropical mega-environment, Nevertheless more than 50% of this area is still planted to local varieties with low yield potential and susceptibility to foliar diseases. Tropical Lowland Subprogram has oriented activities toward the formation of new hybrids and synthetic varieties with good yield potential and characteristics that attract the farmers for adoption and increase productivity.

These activities are included in GP2 Subproject 3 "Development of late maturing, high-yielding, stress tolerant, and stable performing hybrids and OPVs for subsistence and commercial farmers in the tropical lowlands" and involved the evaluation of six diallels (TSCY99A16 to TSCY99A21) amongst lines Heterotic Groups "A" and "B" and combination of groups of lines. The grouping permits a more efficient use of the potential of the lines. Each experiment was tested in four locations in Mexico. The objectives of these experiments were to: 1st Estimate the combining ability of the lines and crosses, to identify superior inbreds A or B with good GCA to be used as males in TWC combination and synthetic formation and specific single crosses AxA or BxB to utilize as female parents in seed production. 2nd Identify superior AxB single cross with good yield potential to include in international hybrid trials, CHTTY 2001.

2.21 TSCY99A16.

A diallel among eight inbred yellow lines Heterotic Group "A" was formed and the 28 single crosses and two checks were evaluated under an alpha lattice design with 2 replications by location and one row per plot. The yield is reported in tons per hectare at 15% moisture and other important agronomic traits such as ear rot and root lodging in percentage of the constraint.

Table 32 shows the information collected for the top high yielding entries in this experiment. Three single crosses AxA yielded similar to the RE: CML287 x CML413 AxB. P_4 x P_7, P_7 x P_8 and P_6 x P_7 respectively. They also showed better standability than CML287 x CML413. The 3 single crosses can effectively be used as female parents for yellow late TWC formation using lines Heterotic Group "B" as male parent. Four lines P24SIEC$_1$HC16-1-3-3-1-2-B*3#4B*7, P24STEC$_2$-29-B*4-3B*7, 626C$_2$5HS45-3-2-3-2B and CML 287 showed the highest and significant GCA estimates and can be used as male parents of AxB single cross to form high yielding single crosses (Table 33). Tables A95 to A99 show the performance at individual and across sites.

2.22 TSCY99A17

Included the evaluation of a diallel among 3 lines Heterotic Group "B" and 4 sister lines of CML 413 also Heterotic Group "B". 3 single crosses BxB: P_5 x P_7, P_6 x P_7 and P_4 x P_7 yielded similar to RE287 x 413 (AxB), they can be used as female to form TWC combinations with males Heterotic Group "B" identified in the experiment 2.21. Single crosses among sister lines Heterotic Group "B" do not express the necessary yield potential to consider in the modified single cross hybrids (Table 34). Two lines with excellent GCA were identified to be used as males with the single crosses AxB identified in 2.21 (Table 35). Performance of all crosses are shown in Tables A100 to A103.

Table 32. TSCY_99A16. Mean data of top 8 yielding tropical late yellow single crosses. Across 3 Locations. Poza Rica, Cotaxtla, Tlaltizapán; México, 1999 A.

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	BH %	NE #	NP #	ER %
21	P4 02420 P24STEC1HC21-3-1-2-1-1-BBB-2-##-B*8	x P7 G26C25HS45-3-2-3-2-B	8.45	8.62	79	81	223	129	0.57	7.4	2.9	2.7	3.8	49	51	2.0
28	P7 G26C25HS45-3-2-3-2-B	x P8 CML-287	8.22	8.41	79	80	236	122	0.50	25.3	0.5	2.5	3.7	51	52	2.2
26	P6 P24STEC2-29-BBBB-#-3-B*7	x P7 G26C25HS45-3-2-3-2-B	8.19	8.59	78	79	221	112	0.52	13.9	1.9	2.8	5.1	65	53	4.6
24	P5 P24STEC1HC21-3-1-2-2-1-BBB-1-##-B*8	x P7 G26C25HS45-3-2-3-2-B	7.87	8.17	77	78	211	119	0.57	1.1	5.7	2.5	0.4	51	51	3.7
18	P3 P24STEC1HC21-3-1-2-1-1-BBB-1-#*4-B*5	x P8 CML-287	7.86	8.02	82	83	222	122	0.54	14.9	3.0	2.7	6.3	49	50	2.0
3	P1 CL-02442 P24STEC1HC16-1-3-3-1-2-BBB-1-#*4-B*7	x P4 02420	7.75	8.01	78	81	194	118	0.57	9.9	1.5	2.7	0.0	49	51	3.3
25	P5 P24STEC1HC21-3-1-2-2-1-BBB-1-##-B*8	x P8 CML-287	7.60	7.92	80	81	219	129	0.57	13.5	0.5	3.0	9.7	49	52	4.2
27	P6 P24STEC2-29-BBBB-#-3-B*7	x P8 CML-287	7.41	7.66	80	81	216	115	0.49	15.4	0.5	2.9	28.0	52	52	3.3
29	CML-287	x CML-413 RE	8.55	8.66	81	82	221	118	0.52	30.9	0.5	2.5	26.9	48	48	1.3
30	LOCAL CHECK		8.35	8.51	82	83	224	126	0.54	24.3	1.9	2.3	2.0	53	53	1.9
		LSD 0.05		1.92	7.9	9.9	34.3	13.6	0.1	20.4	4.2	0.8	18.7	6.7	2.1	9.1
		CV %		10.48	1.8	0.9	5.2	5.4	6.5	8.6	6.9	13.8	6.5	8.9	3.0	9.5
		CORRELATION WITH Yd2			-0.95	0.69	-0.92	-0.7	-0.54	0.18	0.12	-0.43	-0.23	-0.34	-0.08	-0.2

Table 33. TSCY_99A16. GCA&SCA effects for yield (t/ha) of tropical late yellow lines. Across 3 Locations. Poza Rica, Cotaxtla, Tlaltizapán; México, 1999 A.

PEDIGREE	PARENTS	P1	P2	P3	P4 SCA	P5	P6	P7	GCA	Yield t/ha
P24STEC1HC16-1-3-3-1-2-BBB-1-#*4-B*7	P1								0.9617	7.23
P24STEC1HC21-3-1-2-1-1-BBB-1-##-B*8	P2	1.4643							-1.7417	4.91
P24STEC1HC21-3-1-2-1-1-BBB-1-#*4-B*5	P3	1.3926	-1.6940						-1.5300	5.09
P24STEC1HC21-3-1-2-1-1-BBB-2-##-B*8	P4	1.8276	-1.8790	-1.8207					-1.1850	5.39
P24STEC1HC21-3-1-2-2-1-BBB-1-##-B*8	P5	1.1710	-1.3357	-1.4074	-1.6224				-1.1783	5.40
P24STEC2-29-BBBB-#-3-B*7	P6	-2.3990	1.1943	1.2726	1.2176	1.0910			1.1417	7.38
G26C25HS45-3-2-3-2-B	P7	-1.6940	0.9793	0.6976	1.4526	0.9960	-0.9040		1.9467	8.07
CML-287(P24F*26*P27F1)-4-1-B-1-1-BB-f-#####-BBBB	P8	-1.7624	1.2710	1.5693	0.8243	1.1076	-1.4724	-1.5274	1.5850	7.76

*: Estimation of missing crosses was based on Eckhardt paper

**: Estimation was based on entries of 3 locations

S.E. GCA 0.4780

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 1.0731

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.9598

Table 34. TSCY_99A17. Mean data of top 8 yielding tropical late yellow single crosses. Across 3 Locations. Poza Rica, Cotaxtla, Tlaltizapán; México, 1999 A.

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	BH %	ER %
19	P5 SINT.AM.TSR-23-3-2-4-1-BBBB-###-7-B*5	x P7 SW 1 (S) C11-14-1-3-3-B	8.75	8.77	80	81	1.0	218	115	0.53	1.03	13.0	0.6	2.3	3.3	0.2
20	P6 SIN.AMA.TSR C2-86-2-1-BB-B	x P7 SW 1 (S) C11-14-1-3-3-B	8.61	8.91	82	84	1.7	227	122	0.53	0.96	25.4	1.0	2.6	4.5	3.4
17	P4 S.AM.TSR-23-3-2-4-1-BBBB-##-1-B*7	x P7 SW 1 (S) C11-14-1-3-3-B	8.28	8.75	80	81	0.6	216	113	0.52	1.03	13.8	0.4	3.1	5.8	5.4
14	P3 CML-413	x P7 SW 1 (S) C11-14-1-3-3-B	7.89	8.58	80	83	2.3	208	113	0.52	1.00	30.1	0.1	2.8	7.4	8.1
16	P4 S.AM.TSR-23-3-2-4-1-BBBB-##-1-B*7	x P6 SIN.AMA.TSR C2-86-2-1-BB-B	7.88	8.19	85	85	0.0	215	118	0.56	1.00	25.9	0.4	2.8	37.3	3.7
18	P5 SINT.AM.TSR-23-3-2-4-1-BBBB-###-7-B*5	x P6 SIN.AMA.TSR C2-86-2-1-BB-B	7.85	7.92	86	86	0.4	218	119	0.55	0.99	13.5	1.3	2.7	27.5	0.9
13	P3 CML-413	x P6 SIN.AMA.TSR C2-86-2-1-BB-B	7.56	7.84	84	85	0.9	215	126	0.59	1.02	23.2	0.0	3.1	16.5	3.6
5	P1 00368 SIN.AM.TSR-23-2-2-1-2-BBBB-#*4-B*7	x P6 SIN.AMA.TSR C2-86-2-1-BB-B	7.48	7.62	85	86	0.5	225	128	0.57	0.75	15.2	0.2	3.2	11.2	1.9
21	CML-287	x CML-413	8.68	8.70	83	83	0.0	228	123	0.54	1.02	22.8	0.6	2.2	16.4	0.2
22	SIN.AMA.TSR C2-88-2-2-BB-B	x CML-287	8.74	8.85	82	83	0.7	230	128	0.54	1.01	28.4	1.3	2.3	1.3	1.2
23	CL-02420	x CML-413	8.25	8.29	80	82	2.1	211	121	0.57	0.98	17.3	0.9	2.8	12.5	0.4
24	LOCAL CHECK		7.50	8.32	81	81	0.2	229	122	0.53	0.97	32.8	2.0	2.8	13.6	9.8
		LSD 0.05		2.38	5.0	5.5	1.4	35.6	10.9	0.0	0.4	19.6	2.2	0.9	24.0	8.1
		CV %		10.82	1.2	1.3	3.1	4.3	5.0	4.9	13.1	7.9	5.1	13.3	12.1	5.0
		CORRELATION WITH Yd2			-0.89	0.86	-0.23	-0.85	0.0	-0.31	0.70	0.58	0.0	-0.6	0.10	0.08

Table 35. TSCY_99A17. GCA&SCA effects for yield (t/ha) of tropical late yellow lines. Across 3 Locations. Poza Rica, Cotaxtla, Tlaltizapán; México, 1999 A.

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	GCA	Yield t/ha
				SCA					
00368 SIN.AM.TSR-23-2-2-1-2-BBBB-#*4-B*7	P1							0.2846	6.46
SIN.AM.TSR-23-3-2-3-2-BBBB-#*4-B*5	P2	0.7093						-1.4734	4.99
CML-413 SinAmTSR-23-3-2-3-2-BB-f-##-B*5	P3	0.3893	-0.8527					-1.2034	5.22
S.AM.TSR-23-3-2-4-1-BBBB-##-1-B*7	P4	0.2953	-0.3767	-0.6867				-1.3394	5.10
SINT.AM.TSR-23-3-2-4-1-BBBB-###-7-B*5	P5	-0.4627	-0.0747	-0.1047	-1.2787			-1.4014	5.05
SIN.AMA.TSR C2-86-2-1-BB-B	P6	-0.9307	0.2773	0.7773	1.2633	1.0553		2.0466	7.93
SW 1 (S) C11-14-1-3-3-B	P7	-0.0007*	0.3173	0.4773	0.7833	0.8653	-2.4427	3.0866	8.79

*: Estimation of missing crosses was based on Eckhardt paper

S.E. GCA 0.6465

**: Estimation was based on entries of 3 locations

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 1.2931

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 1.1998

2.23 TSCY99A18

A diallel among 10 parents yellow inbred lines, five Heterotic Group "A" and five Heterotic Group "B" were formed and the 45 single crosses evaluated in alpha lattice design 5x9, with 2 replications and 1 row per plot, two single crosses outyielded the RE: CML287 x CML413 but not the local check that yielded 9.3 ton/ha (Table 36). Nevertheless regular TWC can be formed using P_2 x P_8 x P_5 = AxBxC, P_5 as the male line with the best GCA estimates. Other lines with good GCA selected are CLO2410 and P_1 and P_4 (Table 37). Tables A104 to A108 show the performance of all single crosses at individual and across locations.

2.24 TSCY99A19

Included the evaluation of 16 single crosses among yellow lines Heterotic Groups "A"&"B" under a 4x4 alpha lattice design with 2 replications, 1 row per plot in four locations. CL2410 x CML287 and CML287 x CLO0356 outyielded the RE: CML287 x CML413 with 8.4 tons/hectare (Table 38). Complete information of the performance of the 16 single crosses is provided in Tables A109 to A113.

2.25 TSCY99A20

This experiment includes the evaluation of a diallel formed amongst 8 yellow inbred lines, seven Heterotic Group "A" and one Heterotic Group "B", only two single crosses yielded similar to the RE: CML287 x CML413, CML27 (Heterotic Group "B"), participated in four of the 8 top single crosses (Table 39), the two single crosses can be used as female parents. TWC formation with CML27 as male posses the highest GCA estimate (Table 40). A synthetic was formed using the 7 lines Heterotic Group "A". Tables A114 to A118 show the information at individual locations.

2.26 TSCY99A21

A diallel among 9 yellow late tropical inbred lines (seven Heterotic Group "A" and two Heterotic Group "B") were formed and the 36 possible single crosses were tested under 6x6 alpha lattice design with 2 replications per site and 1 row per plot. The top 8 single crosses across four locations are presented in Table (41). CL024HC17 x CML294, AxB cross outyielded the RE: CML287 x CML413 and showed tolerance to RL and ear rot while the RE yielded one ton less and showed susceptibility to both traits.

Table 42 presents the estimates for GCA, parents P_6, P_7 and P_8 and showed positive GCA estimates. Performance of all single crosses are shown in Tables A119 to A123.

2.27 Combining ability and testcross performance of tropical intermediate white lines Heterotic Group "A" - TSCW99A22.

23 lines derived from a synthetic resistant to Exerohilum turcicum (Et) were crossed to 2 testers TEW-69-2-#1-1-#1-##3-B*4, Heterotic Group "A" and CML20 Heterotic Group "B". The 46 testcrosses plus 3 checks were tested in four locations in Mexico: Poza Rica and Cotaxtla 99A, Tlaltizapan and Cotaxtla 99B, in a 7x7 alpha lattice design with 2 replications per location.

Table 36. TSCY_99A18. Mean data of top 8 yielding tropical late yellow single crosses. Across 3 Locations.
Poza Rica, Cotaxtla, Tlaltizapán; México, 1999 A.

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	BH %	ER %
14	P2 02410 P24STEC1HC21-3-1-1-#-BBB-#*5-##-BBB	x P-10 CML-413	8.46	8.70	78	80	213	123	0.58	7.5	1.1	2.5	5.1	2.8
29	P5 CML-287	x P8 S.AM.TSR-23-3-2-4-1-BBBB-##-1-B*7	8.38	8.51	82	82	242	125	0.52	27.5	-0.2	2.8	30.6	1.5
13	P2 02410 P24STEC1HC21-3-1-1-#-BBB-#*5-##-BBB	x P8 S.AM.TSR-23-3-2-4-1-BBBB-##-1-B*7	8.11	8.28	80	81	212	118	0.54	10.4	-0.5	2.5	8.9	2.1
30	P5 CML-287	x P9 S.AM.TSR-61-3-2-8-2-BBBB-##-B*10	8.09	8.50	82	82	239	126	0.53	36.3	0.8	2.7	15.5	4.8
18	P3 P24STEC1HC21-3-1-2-1-2-BBB-1-##-B*8	x P7 00368 SIN.AM.TSR-23-2-2-1-2-BBBB-#*4-B*7	7.86	7.98	81	82	223	131	0.61	3.5	0.4	2.9	2.4	1.5
11	P2 02410 P24STEC1HC21-3-1-1-#-BBB-#*5-##-BBB	x P5 CML-287	7.83	8.14	79	80	230	126	0.53	5.0	-0.6	2.7	3.1	3.8
9	P1 02442 P24STEC1HC16-1-3-3-1-2-BBB-1-#*4-B*6	x P-10 CML-413	7.75	8.07	82	83	220	128	0.59	22.1	0.2	2.7	1.9	4.0
21	P3 P24STEC1HC21-3-1-2-1-2-BBB-1-##-B*8	x P-10 CML-413	7.68	7.78	81	83	217	125	0.61	9.5	1.9	2.6	2.3	1.3
31	CML-287	x P10 CML-413 RE	7.42	7.84	80	81	230	128	0.55	23.0	2.8	2.5	22.9	5.4
42	SIN.AMA.TSR C2-88-2-2-BB-B	x CML-287	7.64	7.94	81	83	237	134	0.54	20.2	1.7	2.5	1.8	3.8
44	LOCAL CHECK		9.10	9.30	80	81	236	124	0.52	31.5	2.3	2.4	7.4	2.2
		LSD 0.05		1.49	3.3	3.2	19.3	11.4	0.1	23.7	4.6	0.7	19.2	6.6
		CV %		9.85	1.2	1.1	3.2	5.4	5.9	10.2	6.0	12.9	8.9	5.3
		CORRELATION WITH Yd2			-0.7	0.54	-0.2	0.1	-0.36	0.0	0.33	-0.1	-0.02	0.04

Table 37. TSCY_99A18. GCA&SCA effects for yield (t/ha) of tropical late yellow lines. Across 3 Locations.
Poza Rica, Cotaxtla, Tlaltizapán; México, 1999 A.

PEDIGREE	PARENTS	P1	P2	P3	P4	P5 SCA	P6	P7	P8	P9	GCA	Yield t/ha
02442 P24STEC1HC16-1-3-3-1-2-BBB-1-#*4-B*6	P1										0.4977	7.36
02410 P24STEC1HC21-3-1-1-#-BBB-#*5-##-BBB	P2	-0.0522									0.2502	7.22
P24STEC1HC21-3-1-2-1-2-BBB-1-##-B*8	P3	-0.5572	-0.8797*								0.4352	7.51
P24STEC2-29-BBBB-#-3-B*7	P4	-1.8847	-0.2072	-0.3422							0.2427	7.19
CML-287(P24F26*P27F1)-4-1-B-1-1-BB-f-####-BBBB	P5	-0.6410	0.1465	-0.6885	-0.9260						0.8990	7.80
00356 SinAmTSR-7-3-1-1-1-BB-f-#-B*5	P6	0.4140	-2.0285*	0.1665	0.4190	-0.1772					0.0940	7.21
00368 SIN.AM.TSR-23-2-2-1-2-BBBB-#*4-B*7	P7	0.3240	0.8915	0.6865	0.8890	-0.2372	0.9778				-0.5560	6.58
S.AM.TSR-23-3-2-4-1-BBBB-##-1-B*7	P8	0.6840	1.5115	0.5065	0.8790	0.9728	0.4978	-1.5222**			-0.7760	6.50
S.AM.TSR-61-3-2-8-2-BBBB-##-B*10	P9	0.5228	-0.9997*	0.6553	0.0878	0.9715	-0.6035	-0.5035	0.0465		-0.6048	6.58
CML-413 SinAmTSR-23-3-2-3-2-BB-f-##-B*5	P10	1.1903	1.6178	0.4528	1.0853	0.5790	0.3340	-1.5060	-3.576**	-0.1772	-0.4823	6.64

*: Estimation of missing crosses was based on Eckhardt paper S.E. GCA 0.3234

**: Estimation was based on entries of 3 locations

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.8556

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.7922

Table 38. TSCY_99A19. Mean data of top 8 yielding tropical late yellow single crosses. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999.

Ent	PEDIGREE		Yd1	Yd2	MF	FF	PH	EH	EH/	E/P	RL	SL	EA	BH	NE	NP	ER
			t/ha	t/ha	days	days	cm	cm	PH		%	%	1-5	%	#	#	%
1	P1 CL-02410	x P2 OML-287	8.03	8.22	75	75	233	127	0.54	1.03	27.3	2.2	2.7	2.4	53	52	2.4
7	P2 OML-287	x P6 00356	8.02	8.38	78	78	238	131	0.55	1.11	34.2	4.5	2.8	8.9	53	48	4.3
4	P1 CL-02410	x P7 OML-413	7.82	7.96	74	75	210	123	0.58	0.99	13.5	1.3	2.6	3.4	51	52	1.8
2	P1 CL-02410	x P3 P28TSR-33-3-3-B-1-1-BB-f-##-BBB	7.78	7.93	74	75	210	107	0.50	1.00	6.0	0.9	2.6	1.6	53	53	1.9
3	P1 CL-02410	x P4 G26SEQC3-6-1-2-2-1-B	7.02	7.32	73	74	190	99	0.52	0.99	21.1	0.6	3.0	3.4	52	52	4.1
5	P2 OML-287	x P3 P28TSR-33-3-3-B-1-1-BB-f-##-BBB	6.95	7.33	75	77	231	119	0.51	1.02	37.4	3.6	3.0	11.9	53	52	5.2
14	P6 00356	x P7 OML-413	6.73	7.09	78	79	212	118	0.56	1.02	28.5	2.0	3.1	12.4	52	51	5.1
6	P2 OML-287	x P4 G26SEQC3-6-1-2-2-1-B	6.49	6.74	75	76	209	108	0.51	0.94	16.3	0.3	3.2	27.5	48	51	3.7
8	P2 OML-287	x P7 OML-413 RE	7.81	8.05	76	76	229	128	0.55	0.98	28.9	1.0	2.8	14.3	50	51	3.0
15	SINAMA TSR C2-88-2-2-BB-B	x OML-287	6.99	7.11	76	78	234	132	0.56	1.01	16.0	0.6	2.8	2.1	52	51	1.6
16	CL-02420	x OML-413	6.69	7.09	74	76	209	112	0.54	0.95	17.5	1.3	3.1	6.7	50	52	5.6
		LSD 0.05		1.34	1.6	1.8	20.6	11.8	0.1	0.1	20.6	4.1	0.5	15.3	4.8	2.2	11.4
		CV %		9.89	1.4	1.6	5.5	9.7	12.1	9.9	11.3	6.7	11.0	7.1	10.3	3.2	8.7
		CORRELATION WITH Yd2			0.2	0.0	0.50	0.01	-0.24	0.53	-0.26	0.28	0.07	0.84	-0.49	-0.09	-0.6

Table 39. TSCY_99A20. Mean data of top 8 yielding tropical late yellow single crosses. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999.

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	BH %	ER %	M %
25	P5 CML-282	x P8 CML-27	7.09	7.67	72	73	235	111	0.50	1.00	15.6	1.3	2.7	1.8	7.5	18.4
18	P3 02443	x P8 CML-27	6.74	7.39	73	75	228	117	0.51	0.92	22.9	2.6	2.8	3.4	8.9	17.8
22	P4(P24STE-16*24STE-17)-BBBB-#-BBB	x P8 CML-27	6.74	8.03	72	73	243	123	0.50	0.99	14.7	1.5	3.4	29.0	16.1	18.9
23	P5 CML-282	x P6 P36HC144(S3FRIP)-##-12-BBB	6.67	7.23	68	69	226	124	0.54	0.98	18.5	19.9	3.1	1.4	7.7	17.0
24	P5 CML-282	x P7 P36STEC1HC20-2-2-2-1-1-BB-#*4-1-B	6.61	6.95	68	69	215	97	0.48	0.95	26.3	4.0	3.0	0.7	4.9	19.2
16	P3 02443	x P6 P36HC144(S3FRIP)-##-12-BBB	6.60	7.39	70	71	221	119	0.54	0.93	38.7	5.1	3.1	6.5	10.7	18.8
10	P2 P24STE C2-29-B*9	x P5 CML-282	6.56	7.24	71	72	230	117	0.51	0.97	23.8	5.2	3.0	5.3	9.3	17.1
13	P2 P24STE C2-29-B*9	x P8 CML-27	6.56	7.36	74	74	229	121	0.52	1.00	12.8	0.6	3.3	50.7	10.8	18.4
29	CML-287	x CML-413 RE	7.41	7.72	75	76	241	137	0.56	0.97	38.6	2.6	2.7	24.0	4.1	22.0
30	LOCAL CHECK		6.89	7.43	75	76	235	129	0.54	0.90	17.8	0.3	2.8	7.9	7.4	22.1
		LSD 0.05		1.53	1.8	2.1	12.1	10.9	0.0	0.1	25.5	9.7	0.6	18.8	13.3	2.4
		CV %		10.42	1.2	1.1	3.8	6.3	5.3	7.8	8.2	9.8	11.1	8.5	8.3	6.7
		CORRELATION WITH Yd2			0.02	0.04	0.59	0.18	0.20	-0.17	0.48	-0.13	0.16	0.39	0.21	-0.37

Table 40. TSCY_99A20. GCA&SCA effects for yield (t/ha) of tropical late yellow lines. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999.

PEDIGREE	PARENTS	P1	P2	P3	P4 SCA	P5	P6	P7	GCA	Yield t/ha
P24STEC1HC45-1-2-3-4-4-BB-f-B	P1								-0.3475	6.51
P24STE C2-29-B*9	P2	-0.3960							0.0042	6.81
02443 P24C5HC227-1-2-1-1-1-1-#####-BBB	P3	0.0190	0.3974						0.0292	6.83
(P24STE-16*24STE-17)-BBBB-#-BBB	P4	0.9374	-1.4543	-0.9093					-0.0292	6.78
CML-282 (G22F128*G22F25)-2-2-3-1-BB-f-B	P5	-0.3410	0.1774	-0.2676	-0.1493				0.2492	7.02
P36HC144(S3FRIP)-##-12-BBB	P6	-0.1343	0.454	0.5590	0.3274	0.1790			-0.0075	6.80
P36STEC1HC20-2-2-2-1-1-BB-#*4-1-B	P7	0.0290	0.7074	0.0824	0.4307	0.2224	-0.8710		-0.3308	6.53
CML-27 P27C5HC1-1-3-B-f-#-BB	P8	-0.1143	0.1140	0.1190	0.8174	0.1790	-0.5143	-0.6010	0.4325	7.18

*: Estimation of missing crosses was based on Eckhardt paper S.E. GCA 0.4446

**: Estimation was based on entries of 3 locations

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 0.9942

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.8893

Table 41. TSCY_99A21. Mean data of top 8 yielding tropical late yellow single crosses. Across 4 locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999.

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	BH %	ER %	M %
14	P2 P24STEC1HC17-1-2-1-1-1-BB-f-B	x P8 CML-294	8.19	8.55	75	75	244	131	0.55	1.00	17.0	3.0	2.5	17.3	4.2	20.8
13	P2 P24STEC1HC17-1-2-1-1-1-BB-f-B	x P7 CML-282	7.58	7.85	71	71	218	111	0.53	0.97	9.6	4.5	2.9	2.7	3.4	17.4
26	P5 (P24STE-16*24STE-17)-BBBB-###-BBB	x P6 P36STEC1HC20-2-2-2-1-1-BB-#*4-1-B	6.67	7.04	69	69	208	103	0.49	0.91	4.2	1.9	3.1	14.1	5.2	18.7
29	P5 (P24STE-16*24STE-17)-BBBB-###-BBB	x P9 CML-306	6.55	7.44	71	73	241	123	0.52	0.95	4.0	1.6	2.9	44.4	11.9	18.2
12	P2 P24STEC1HC17-1-2-1-1-1-BB-f-B	x P6 P36STEC1HC20-2-2-2-1-1-BB-#*4-1-B	6.41	6.70	69	70	184	101	0.60	0.94	14.0	6.0	3.0	5.7	4.3	18.0
7	P1 CML-286	x P8 CML-294	6.29	6.74	73	74	235	118	0.50	1.11	6.4	4.0	3.0	25.6	6.6	19.1
20	P3 P24STE C2-35-BBBBBBBBB	x P8 CML-294	6.19	6.62	72	73	219	98	0.45	0.96	5.8	2.4	3.3	25.2	6.5	20.2
27	P5 (P24STE-16*24STE-17)-BBBB-###-BBB	x P7 CML-282	6.18	6.80	70	72	231	103	0.45	0.95	7.5	1.6	2.9	9.2	9.2	17.4
34	CML-287	x CML-413 RE	6.92	7.86	75	76	230	129	0.56	0.91	32.0	1.8	2.9	13.5	12.1	20.4
35	SINAMA TSR C2-88-2-2-BB-B	x CML-287	7.06	7.52	75	76	245	137	0.56	0.92	16.9	0.0	2.4	2.0	6.1	19.4
36	LOCAL CHECK		6.92	7.43	72	74	225	120	0.56	0.96	9.2	0.7	2.7	5.5	6.8	20.8
		LSD 0.05		1.61	2.0	2.2	20.0	11.9	0.1	0.2	21.4	8.4	0.6	17.8	10.9	2.6
		CV %		13.55	1.4	1.6	5.5	7.7	10.1	11.7	11.0	7.2	15.1	8.0	11.9	8.0
		CORRELATION WITH Yd2			0.34	-0.08	0.59	-0.07	0.04	0.26	0.43	-0.1	0.00	0.26	-0.5	-0.1

Table 42. TSCY_99A21. GCA&SCA effects for yield (t/ha) of tropical late yellow lines. Across 4 Locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999.

PEDIGREE	PARENTS	P1	P2	P3	P4	P5	P6	P7	P8	GCA	Yield t/ha
					SCA						
CML-286 P24 STEC1HC16-1-3-3-1-2-BB-f-B	P1									-0.3338	5.79
P24STEC1HC17-1-2-1-1-1-BB-f-B	P2	-0.2761								0.4590	6.48
P24STE C2-35-BBBBBBBBB	P3	0.3696	-0.6232							-0.4667	5.67
P24C5HC227-1-2-1-1-1-1-###-BBB	P4	0.1811	-0.3218	-0.0361						-0.3381	5.79
(P24STE-16*24STE-17)-BBBB-###-BBB	P5	-2.1561	-0.4189	-0.7532	0.4482					0.0790	6.15
P36STEC1HC20-2-2-2-1-1-BB-#*4-1-B	P6	0.6425	-0.2404	0.9654	0.6268	0.7496				0.2805	6.33
CML-282 (G22F128*G22F25)-2-2-3-1-BB-f-B	P7	-0.0346	0.8025	0.0882	-0.2004	0.4025	-0.8289			0.3276	6.37
CML-294 SINT.AM.TSR 93-2-2-2-BB-f-B	P8	0.7054	1.1225	0.6382	-1.3404*	0.5225	-0.9889*	-0.0461		0.2276	6.28
CML-306 SINT.AM.TSR 19-1-2-3-1-BB-f-B	P9	0.5682	-0.0446	-0.6489	0.6425	1.2054	-0.9261	-0.1832	-0.6132*	-0.2352	5.88

*: Estimation of missing crosses was based on Eckhardt paper S.E. GCA 0.4327

**: Estimation was based on entries of 3 locations

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING ONE PARENT LINE IN COMMON = 1.0600

S.E. OF THE DIFFERENCE BETWEEN EFFECTS OF TWO CROSSES HAVING NO PARENT LINES IN COMMON = 0.9677

The objectives of this study were to identify lines with intermediate maturity, resistant to Et and excellent GCA that can serve as parent in three way cross combinations to form a tropical intermediate synthetic with the lines with best GCA and resistant to Northern Leaf Blight.

Ten testcrosses were statistically superior in yield, standability and ear rot resistance than the local checks and the cross among the two testers. S94P49ET-F_2-108-4-1-2-B x TEW-69-2-#1-1-#1-##3-B*4, yielded 8.60 tons per hectare while the cross T_1 x T_2 yielded 6.6 tons/hectare (Table 43). Surprisingly only one testcross with CML420 tester "B" was among the top 10 crosses, the majority of the lines testcross performance superiority was with tester "A" that posses excellent GCA, 8 lines with positive good to excellent GCA, estimates for yield were selected (Table 44) and will be used as parent in TWC combination. A synthetic is being formed and will be advanced to F_2 in 2001A, and further on tested under low N and drought together with the superior TWC formed at HQ and further on at AMS in Eastern Africa. Superior hybrids will be tested in CHTTEW and the synthetic in EVT14B with the new synthetics from Alpha.

Tables A124 toA128 demonstrates the performance of all crosses at individual and across locations.

2.28 Performance of 275 single cross hybrids among tropical white late lines Heterotic Groups "A" and "B" - TSCW99B06.

This experiment includes the evaluation of 275 single crosses between selected tropical late white lines Heterotic Group "A" and lines Heterotic Group "B". Lines "A" were crossed to lines "B".

The 275 AxB single crosses and five checks were evaluated under a 14x20 alpha lattice design with two replications in four locations. The objectives of this experiment were:

1) Identify superior single cross hybrids for international testing.
2) Identify potential single cross combinations to use as female parents. Three way cross hybrids. Identify superior lines to form synthetic varieties and the potential of lines for future testers.

The across analysis was performed with 3 locations because Turipana, Colombia has several plots missing.

The mean yield was 8.8, 8.7, 4.7, 4.9 and 7.4 t/ha, Poza Rica, Cotaxtla, Tapachula, Mexico, Turipana, Colombia and across locations respectively, ear rot mean: 15.3, 11.1, 36.0 and 20.6% at Poza Rica, Cotaxtla, Tapachula and across locations respectively.

CLO2181 x CML269, (AxB) ranked first across locations with 9.2 t/ha and tolerance to ear rot (6.7%).

CLO4356 x CLO2308 yielded 9.5 tons/hectare across locations and showed resistance to lodging and tolerance to ear rot (8.5%).

CLO2157 x CLO2306 yielded 9.2 tons/hectare and showed resistance to root lodging, stalk lodging and ear rot.

Table 43. TSCW_99A22. Mean data of top 8 yielding Intermediate top crosses white. Across 4 locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999.

Ent	PEDIGREE	Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	ER	BH	ER	M
		t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	%	%	%
42	S94P49ET-F2-108-4-1-2-B x TEW-G-69-2-#1-1-#1-#-#3-BBBB	8.33	8.60	71	71	-0.4	186	85	0.47	1.62	13.9	0.0	2.6	1.4	3.5	3.2	27.1
23	S94P49ET-F2-108-4-3-1-B x TEW-G-69-2-#1-1-#1-#-#3-BBBB	8.21	8.39	71	71	0.1	182	85	0.48	1.02	10.2	0.1	2.7	2.2	3.9	2.2	25.6
25	S94P49ET-F2-108-4-3-3-B x TEW-G-69-2-#1-1-#1-#-#3-BBBB	8.12	8.36	72	72	0.1	181	85	0.46	1.00	6.8	0.5	2.9	1.9	3.5	2.9	25.3
27	S94P49ET-F2-108-4-5-1-B x TEW-G-69-2-#1-1-#1-#-#3-BBBB	8.02	8.56	71	70	-0.6	187	88	0.47	0.97	4.6	0.6	2.9	2.5	10.1	6.3	23.4
40	S94P49ET-F2-131-3-6-1-B x G15TSRHC15-1-2-1-BBB-1-BBBB	7.92	8.21	71	72	0.5	187	96	0.52	1.01	7.8	1.0	2.9	2.1	0.9	3.6	23.2
11	S94P49ET-F2-48-3-4-2-B x TEW-G-69-2-#1-1-#1-#-#3-BBBB	7.89	8.31	70	70	0.3	172	82	0.50	0.97	5.7	0.4	3.0	1.7	7.2	5.1	23.0
43	S94P49ET-F2-108-4-8-1-B x TEW-G-69-2-#1-1-#1-#-#3-BBBB	7.71	8.01	71	70	-1.3	187	87	0.47	1.05	8.9	1.0	2.8	2.0	2.0	3.7	25.3
15	S94P49ET-F2-51-2-3-1-B x TEW-G-69-2-#1-1-#1-#-#3-BBBB	7.69	8.39	69	69	0.0	178	75	0.43	1.01	8.2	0.6	3.4	2.2	18.1	8.4	21.3
47	TEW-G-69-2-#1-1-#1-#-#3-BBBB x CML-420	5.93	6.56	65	65	0.4	171	81	0.48	0.99	5.5	1.1	3.9	2.8	7.6	9.7	18.9
48	LOCAL CHECK 1	6.10	6.52	67	67	0.6	179	88	0.51	1.13	16.4	1.7	3.4	2.5	20.9	6.6	21.2
49	LOCAL CHECK 2	7.28	7.70	68	69	0.3	185	97	0.53	1.06	17.2	0.0	3.2	1.9	5.0	5.5	20.0
	LSD 0.05		1.36	2.0	1.8	1.1	11.0	9.9	0.1	0.3	14.5	1.5	0.6	0.8	17.4	10.6	3.8
	CV %		10.32	1.5	1.5	4.0	4.5	9.2	7.9	26.7	10.8		13.9	23.0	11.2	10.5	7.8
	CORRELATION WITH Yd2			0.12	-0.30	-0.76	0.78	-0.67	0.59	-0.01	0.44	0.04	-0.28	0.79	0.37	0.02	-0.20

Table 44. TSCW_99A22. GCA of best top 8 yielding Intermediate lines white. Across 4 locations.
Poza Rica, Cotaxtla A, Tlaltizapán, Cotaxtla B; México, 1999.

Line	PEDIGREE	Yd1	Yd2	Yd2	Yd2	Yd2		MF	FF		PH	EH	EH/	E/P	RL	SL	EA	PA	ER	BH	NE	NP	ER
		t/ha	T1	T2	DIFF	t/ha	GCA	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	1-5	%	#	#	%
L8	S94P49ET-F2-51-2-3-1-B	7.63	8.39	7.92	0.47	8.15	*0.94*	71	71	-0.3	181	87	0.49	1.00	16.2	0.3	3.0	3.2	2.0	14.4	26	26	6.4
L13	S94P49ET-F2-108-4-3-3-B	7.88	8.36	7.81	0.55	8.08	*0.88*	74	73	-0.7	187	93	0.49	1.02	13.6	0.5	2.8	3.3	1.8	6.3	26	25	2.5
L14	S94P49ET-F2-108-4-5-1-B	7.54	8.56	7.31	1.25	7.93	*0.72*	73	72	-0.8	193	95	0.49	1.01	7.1	0.3	2.9	3.0	2.3	19.9	25	25	4.8
L6	S94P49ET-F2-48-3-4-2-B	7.59	8.31	7.49	0.82	7.90	*0.69*	71	71	0.1	175	87	0.51	0.95	3.9	0.3	3.0	3.1	2.0	11.0	25	26	3.8
L12	S94P49ET-F2-108-4-3-1-B	7.62	8.39	7.41	0.99	7.90	*0.69*	73	72	-0.5	189	92	0.50	1.00	15.3	0.2	2.9	3.4	2.0	5.3	26	26	3.6
L2	S94P49ET-F2-27-1-1-1-B	7.34	7.87	7.80	0.07	7.83	*0.62*	70	70	0.8	175	78	0.45	1.00	6.3	0.0	3.0	2.8	1.9	8.6	25	25	6.2
L5	S94P49ET-F2-48-3-2-2-B	7.39	7.67	7.72	-0.05	7.70	*0.49*	72	72	0.2	179	92	0.52	0.99	6.1	0.1	3.0	3.1	2.1	3.2	25	26	4.0
L11	S94P49ET-F2-106-6-4-1-B	6.89	7.11	7.97	-0.87	7.54	*0.33*	70	70	0.8	187	87	0.48	0.99	5.3	0.9	3.2	3.2	2.3	15.4	24	24	8.7
	GCA testers		0.15	-0.15																			
	MEAN LINE	6.76	7.36	7.06	0.30	*7.21*	*0.00*	71	71	0.2	182	87	0.49	0.99	8.8	0.4	3.1	3.2	2.2	10.0	23	24	6.3

T1: CL-TEWG007

T2: CL-G1525

These three hybrids outyielded the RE: CML247 x CML254 by 1.5 t/ha and the seed industry checks P30F94, Asgrow x M7754, Dekalb 9820 with 2 to 3.3 tons per hectare. The seed industry checks showed from 15 to 30% ear rot damage reducing the economic yield considerably after the reduction of the kernel damage by ear rot, considering the negative correlation with yield (Table 45). Some hybrids showed good yield stability at individual locations (Tables A129 to A133).

The 3 entries mentioned above and the best two entries at individual locations will be tested in international trials in 2001, to give NAR's and seed industry the opportunity to select new hybrid combinations to enhance hybrid seed production in developing countries.

Single cross combinations such as CLO2181 x CLO4353, CLO2199 x CLO2157 and CLO4353 x CLO2131 can be used as female parents with lines Heterotic Group "B" or good CGA as male parents. Lines "A" and lines "B" were selected to form new synthetics. Lines CLO2199 "A" and CLO2306 "B" have potential for becoming testers because of the high heterotic response.

In order to effectively use the information collected from this trial two groups of lines were formed: Group 1 includes lines Heterotic Group "A" crossed to 3 testers of Heterotic Group "B" and Group 2, lines Heterotic Group "B" crossed to testers of Heterotic Group "A".

11 lines Heterotic Group "A" showed positive GCA estimates of 0.13 to 1.11 t/ha grain yield and 8 lines Heterotic Group "B" showed positive GCA estimates 0.11 to 0.78 t/ha grain yield (Table 46).

2. 29 Combining ability and cross performance of tropical late yellow inbred lines heterotic Groups "A" and "B" - TSCY99B07.

In TL99A, 13 tropical yellow lines Heterotic Group A and 10 Heterotic Group B were crossed among groups in NCII mating design, all crosses plus 3 checks were evaluated under a 12x12 alpha lattice design, one row, five meters long, plot with 2 replications across eight locations: Poza Rica, Cotaxtla and Uxmal in Mexico; Cuyuta, Guatemala; Turipana, Colombia; El Ejido, Panamá; Bani, Dominican Republic; and Suwan Farm, Thailand.

The objectives of this trial were:

1. Identify superior lines with good GCA and SCA in in-crosses.
2. Evaluate the cross performance of the lines across locations.
3. Identify superior single cross hybrids for international testing.
4. Identify potential new candidates for testers.

The best performing single cross P8 x P37 yielded 8.3 t/ha across seven locations, outperformed the best local seed industry check, across locations with 3 tons/ha. This yellow hybrid also showed resistance to ear rot, stalk lodge and excellent standability (Table 47). Yield stability was confirmed by examining its performance at individual locations ranking 4^{th}, 1^{st}, 3^{rd} at Mexican locations and 5^{th}, 1^{st}, 15^{th}, 15^{th}, at Cuyuta, Ejido,

Table 45. TSCW_99B06. Mean data of top 8 yielding tropical late white single crosses. Across 4 Locations
Poza Rica, Cotaxtla, Tapachula; Mexico, Turipana; Colombia. 1999 B.

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	BH %	NE #	NP #	ER %
212	CL-02199	x CL- 02306	9.15	9.69	56	56	257	140	0.55	0.99	3.7	1.6	2.4	6.0	26	27	5.5
3	CL- 02181	x CML-269	9.03	9.68	56	56	263	142	0.54	0.95	8.7	1.2	2.5	4.0	25	26	6.7
23	CL-02157	x CL-G2308	8.57	9.05	56	56	258	132	0.51	0.88	2.5	7.9	2.6	6.7	22	26	5.4
259	CL-04353	x CL-02305	8.33	9.10	56	57	267	125	0.46	0.89	3.5	3.8	2.5	7.4	24	26	8.5
169	CL-G2419	x CL- 02306	8.17	9.60	59	59	288	164	0.56	0.93	6.9	5.5	2.7	15.9	25	26	14.9
33	CL-02131	x CL-03214	8.13	9.09	54	54	234	121	0.51	0.96	5.0	11.8	2.4	3.8	24	26	10.5
167	CML-407	x CL-G2309	8.10	8.85	55	55	256	139	0.54	0.98	3.8	7.1	2.4	2.9	24	26	8.6
104	P43 POSTA SEQ C3-S2-1-3-B*6	x CL- 02306	8.06	9.40	59	59	268	141	0.52	1.00	9.2	2.9	2.8	5.3	26	26	14.2
276	CML-247x CML-254		6.04	7.99	57	57	233	126	0.54	0.94	5.7	8.6	2.6	13.5	25	26	9.2
277	(CML-247x CML-254) x R1		5.16	6.96	55	55	233	128	0.50	0.89	11.8	16.5	3.5	14.5	24	26	24.4
278	LOCAL CHECK		5.59	6.54	57	58	233	136	0.57	0.90	9.5	2.9	3.5	7.9	21	25	25.8
279	LOCAL CHECK		5.11	7.35	56	56	248	134	0.51	0.91	5.8	3.4	3.0	5.5	23	26	14.5
		LSD 0.05		1.38	2.5	2.3	21.0	14.9	0.1	0.2			1.58		0.8	1.4	1.4
		CV %		13.6	2.8	2.6	6.1	8.5	22.0	19.1			16.1		2.4	3.9	3.9
		CORRELATION WITH Yd2			0.1	0.0	0.5	0.6	0.20	0.18			-0.64		0.5	0.45	-0.47

Table 46. TSCW_99B06. Mean data GCA&SCA of best tropical late white single lines at Across 4 Locations.
Poza Rica, Cotaxtla, Tapachula; Mexico, Turipana; Colombia. 1999 B.

GROUP 1

Lin no	PEDIGREE LINES	Yd1 t/ha	Yd2 T1	Yd2 T2	Yd2 T3	Yd2 t/ha	GCA	SCA T1	SCA T2	SCA T3	FF days	PH cm	EH cm	SL %	EA 1-5	BH %	ER %
15	CL-G2409 (G24TSR19*P21F199)-1-1-B-2-2-BBB-1-###-B*	6.44	8.20	8.97	7.91	8.36	1.11	-0.48	0.78	-0.30	58	267	134	4.7	3.0	17.1	23.0
20	P21MRRSC1-525-1-B1*12	6.97	8.31	8.59	8.09	8.33	1.08	-0.34	0.42	-0.08	58	257	129	3.4	2.9	12.4	16.3
12	(P43AC7643*43F7)-2-3-3-2-BBB-2-B-#-B*8	6.33	8.90	6.29	8.63	7.94	0.69	0.64	-1.49	0.85	59	263	135	4.4	3.0	21.8	21.5
3	P21C6S1MH125-3-B-1-1-1-B-1-##-B*9	6.29	7.98	7.34	8.44	7.92	0.67	-0.26	-0.41	0.68	58	245	126	12.2	3.2	10.3	20.8
24	P43C10HC169-BBBBBBBB	6.26	8.15	7.49	7.79	7.81	0.56	0.02	-0.15	0.14	57	270	128	3.4	3.4	17.3	19.9
11	CL-04324 FERKE8243-51-1-1-B-##-3-BB-#*5-#-#BB	5.64	7.62	8.44	7.27	7.78	0.53	-0.48	0.83	-0.35	55	246	128	6.9	3.1	7.6	27.3
7	CML266	5.44	9.14	6.96	7.20	7.77	0.52	1.05	-0.64	-0.41	59	259	135	4.9	3.3	24.0	30.7
25	AC8222-6-2-2-B-##-2-BBB-2-#-B-#-B*7	5.78	7.90	7.53	7.40	7.61	0.36	-0.03	0.09	-0.05	57	252	127	6.1	3.3	17.4	24.3
10	P43 POSTA SEQ C3-S2-1-3-BBBBBB	6.04	8.04	6.61	7.57	7.41	0.16	0.32	-0.63	0.32	59	252	119	6.2	3.1	7.8	18.8
9	CL-04336 P43C8HC11-2-1-BB-##-BBBB	6.59	8.10	7.01	7.04	7.38	0.13	0.39	-0.20	-0.19	58	264	134	3.2	2.7	4.1	10.9
19	CL-G2406 (G24TRS*P21F163)-1-1-1-2-BB-I-B*5	5.27	8.00	7.40	6.54	7.31	0.06	0.37	0.25	-0.62	56	234	119	3.4	3.1	12.8	29.2
	CROSSES MEAN		7.57	7.08	7.09	7.25					58	253	127	5.4	3.2	16.9	26.4
	GCA TESTERS		0.32	-0.17	-0.15												

TESTERS

T1 : CL-03211 P32C5HC9-2-2-BB-5-####-B*7
T2 : CL-03208 P32(MRRS)C1-66-1-B*9
T3 : (G23HS110-3*CACIMMYT-13)*P23-1-1-3-1-BB

GROUP 2

Lin no	PEDIGREE LINES	Yd1 t/ha	T1	T2	T3	T4	Yd2 t/ha	GCA	SCA T1	SCA T2	SCA T3	SCA T4	FF days	PH cm	EH cm	SL %	ER %
12	G23C26HS179-1-4-2-3-BBBB	6.88	8.77	8.05	7.83	7.79	8.11	0.78	0.20	-0.55	-0.23	0.58	55	242	134	10.7	15.3
6	P32(MRRS)F2(C2)-10-2-B*7	6.69	8.53	8.92	7.61	7.02	8.02	0.69	0.05	0.41	-0.36	-0.10	56	250	137	10.3	16.6
4	CL-03211 P32C5HC9-2-2-BB-5-#####-B*7	6.63	7.33	7.98	7.62	8.26	7.80	0.47	-0.92	-0.31	-0.13	1.37	57	257	135	8.7	14.9
8	SINT.BCO.TSR-3-1-2-3-2-BBBB-##-B*8	6.18	8.64	7.14	8.03	6.43	7.56	0.24	0.62	-0.91	0.52	-0.22	56	233	121	11.8	18.8
10	P32(MRRS)F2(C2)-197-3-B*7	6.50	7.83	8.14	7.18	7.02	7.54	0.22	-0.17	0.11	-0.32	0.38	56	245	127	8.3	13.9
2	(P23STE-44*23STE-49)-BBBB-#-B*9	6.31	7.52	8.62	7.06	6.94	7.53	0.21	-0.48	0.59	-0.43	0.31	56	254	136	5.6	16.3
14	(G23HS110-3*CACIMMYT-13)*P23-1-1-3-1-BB	5.34	8.13	8.44	7.27	5.92	7.44	0.11	0.23	0.51	-0.12	-0.62	58	246	128	4.3	29.0
7	P32(MRRS)F2(C2)-23-2-B*7	5.94	7.53	9.09	6.86	6.03	7.38	0.05	-0.31	1.22	-0.47	-0.45	54	235	122	12.6	20.6
	CROSSES MEAN	5.94	7.79	7.82	7.28	6.42	7.33						56	242	127	8.8	19.8
	GCA TESTERS		0.46	0.49	-0.05	-0.90											

TESTERS

T1 : CL-02157 P21C5HC218-2-3-B-###-B-1-I-B*6
T2 : P21C6S1MH125-3-B-1-1-1-B-1-##-B*9
T3 : CL-04324 FERKE8243-51-1-1-B-##-3-BB-#*5-#-#-BB
T4 : P29STEC1HC1-3-1-1-4-2-BBB-2-###-3-B*6

Turipana and Bani, Dominican Republic and at Suwan Farm, Thailand respectively (Tables A134 to A142). With the exception of Bani, Dominican Republic, at least 10 entries outyielded the RE: CML287 x CML413 with 1 to 3 tons/ha and the local seed industry checks with 2 to 4 tons/ha.

The yield drops below the mean and shows susceptibility to ear rot at this location, P10 x P32 (TLL line x ARMP line) yielded 8.2 tons/ha and showed resistance to ear rot. At Suwan Farm P10 x P30 and P20 x P30 also showed excellent performance, yielding 7.7 t/ha and very resistant to ear rot. These three entries outyielded the best seed industry check, Pioneer P3013 that yielded 5.7 tons/ha and 25% ear rot damage (Table A139).

P16 x P37, P9 x P30 and P16 x P24 also showed good performance at individual and across locations (Tables 47 and 142). These hybrids will be internationally tested in CHTTY in year 2001.

Combination of lines from the TLL program with ARMP can effectively enhance national programs in Asia and provide new germplasm with heterotic responses to increase maize productivity.

Lines P4, P8, P9 and P16 Heterotic Group "A" and P24, P28, P30 and P37, Heterotic Group "B" showed GCA estimates for yield four to six times the standard error for GCA (Table 48), confirming the good GCA. This group of lines Heterotic Groups A&B will form new yellow late synthetics S99TLYA-B.

The superior lines will also be crossed to single crosses AxA and BxB to form new three-way cross hybrids. It is strongly suggested that breeders at ARMP, SAM and PRM use the results of these experiments to effectively assist national programs with new hybrid focus.

2.30 Combining ability of tropical late white elite lines crossed to four testers Heterotic Groups "A" and "B" - TSCW99B08.

Twenty tropical late white elite lines were crossed to four elite line testers: CML254 (Heterotic Group "A") and CML247 (Heterotic Group "B") tropical and CML311 (Heterotic Group "A") and CML384 (Heterotic Group "B") subtropical.

The 80 testcrosses plus 8 checks were evaluated under an 8x11 alpha lattice design with 2 replications, in five locations in the tropical mega-environments of Poza Rica and Cotaxtla, Veracruz and Tapacula, Chiapas in Mexico, Turipana, Colombia, and Cuyuta, Guatemala. Two environments in the subtropical environment will be planted in 2000B.

Objectives:

1. Identify new single cross combination tropical x tropical and tropical x subtropical and yield stability.
2. Identify single cross combination within Heterotic Groups AxA and BxB for practical use as female parent in three-way cross combination.
3. Identify four lines with good GCA to be used as Heterotic Group "C" or male parents in three-way cross combinations.
4. Evaluate the heterotic response of testers.

Table 47. TSCY_99B07. Mean data of top 8 yielding tropical late yellow single crosses. Across 7 locations

Poza Rica, Cotaxtla, Uxmal; México, Cuyuta: Guatemala, Turipana; Colombia, El Ejido; Panama, Bani; Rep. Dom. 1999 B.

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	BH %	ER %
40	P8 CL-02453	x P37 CL-00388	8.07	8.30	53	54	0.7	267	151	0.57	0.98	0.5	2.9	2.5	2.9	2.7
90	P16 CL-02450	x P37 CL-00388	7.78	7.91	56	57	1.1	253	148	0.58	0.97	0.8	0.8	2.6	2.1	1.7
133	P9 CL-03619	x P30 CL-00390	7.76	7.99	57	57	0.1	255	142	0.56	0.96	1.8	0.5	2.9	3.4	2.9
83	P16 CL-02450	x P24 CL-02711	7.61	7.95	56	55	-1.2	239	126	0.52	0.98	0.3	2.4	2.6	5.2	4.3
3	P2 CL-02438	x P24 CL-02711	7.43	7.69	55	55	-0.7	250	128	0.51	0.97	0.6	1.9	2.8	7.4	3.4
120	P20 KC001	x P37 CL-00388	7.42	7.79	55	56	1.0	260	149	0.57	0.95	1.3	0.5	2.6	3.2	4.7
113	P20 KC001	x P24 CL-02711	7.41	7.87	56	56	-0.4	254	135	0.53	0.96	3.1	1.3	2.6	3.6	5.8
13	P4 CL-02420	x P24 CL-02711	7.40	7.66	55	54	-1.2	239	132	0.55	0.94	4.1	7.0	2.7	1.1	3.5
141	CML-287 xCML-413	RE	7.45	7.80	56	56	-0.3	256	147	0.57	0.99	2.5	4.9	2.9	17.6	4.5
142	CML-226 xCML-287		5.84	6.37	53	53	-0.6	236	126	0.54	0.94	3.0	3.2	2.9	4.7	8.4
144	LOCAL CHECK		5.15	5.71	54	56	0.5	236	130	0.55	0.93	7.4	3.1	3.3	11.0	9.8
		LSD 0.05		1.08	1.5	1.1	1.3	0.9	0.9	0.8	0.9	1.0	1.1	1.0	12.1	1.1
		CV %		15.61	2.0	1.8		0.4	0.7	147.7	86.7			29.2	10.9	14.7
		NUMBER OF LOCATIONS			0.15	-0.1	-0.07	0.35	0.23	0.10	-0.07	0.1	0.0	0.05	0.48	-0.2

Table 48. GCA & SCA effects for yield (t/ha); TSCY9907_; Across Locations 1,2,3,4,5,7,8; 1999 B.

Poza Rica, Cotaxtla, Uxmal; México, Cuyuta; Guatemala, Turipana; Colombia, El Ejido; Panama, Bani; Rep. Dom.

Group 1 \ Group 2	P-22	P-23	P-24	P-26	P-27	P-28	P-30	P-32	P-34	P-37	GCA Est	MEAN T/HA
	← SCA →											
P-2	0.546	-0.133	0.422	-0.484	-0.315	-0.096	-0.355	0.753	-0.216	-0.121	*0.03*	*6.59*
P-4	0.505	-0.162	0.303	-0.211	-0.482	-0.126	0.158	0.239	0.039	-0.262	*0.39*	*6.96*
P-7	0.368	-0.349	0.296	-0.664	0.165	-0.009	-0.627	0.680	0.385	-0.245	*-0.21*	*6.36*
P-8	0.069	-0.907	-0.651	0.275	-0.025	0.253	0.000	0.513	-0.095	0.568	*0.68*	*7.25*
P-9	-1.493	-0.108	-0.311	0.433	0.597	0.119	0.698	0.218	0.014	-0.167	*0.36*	*6.93*
P-10	0.037	-0.541	-0.167	0.228	0.180	-0.061	0.015	0.431	0.377	-0.499	*0.01*	*6.57*
P-11	0.018	1.625	0.080	-0.706	-0.607	-0.247	-0.028	0.101	-0.106	-0.129	*-1.37*	*5.20*
P-12	-0.020	-0.961	-0.711	0.653	0.149	0.495	0.629	0.074	0.091	-0.400	*-0.06*	*6.51*
P-13	-0.369	-0.154	-0.384	0.087	-0.229	-0.013	0.186	0.339	0.202	0.335	*-0.14*	*6.43*
P-16	-0.084	-0.022	0.259	-0.376	0.619	-0.279	-0.421	0.024	-0.060	0.340	*0.59*	*7.16*
P-17	0.152	0.528	0.051	0.616	-0.388	-0.433	-0.675	0.152	0.086	-0.090	*-0.22*	*6.35*
P-19	-0.292	0.757	0.179	-0.326	0.582	0.300	0.020	-0.901	-0.358	0.039	*-0.18*	*6.38*
P-20	0.562	0.428	0.634	0.473	-0.244	0.096	0.401	-2.623	-0.357	0.631	*0.13*	*6.70*
GCA Est.	*-0.093*	*0.155*	*0.576*	*-0.469*	*-0.534*	*0.258*	*0.274*	*-0.603*	*0.017*	*0.419*		
MEAN T/HA	*6.47*	*6.72*	*7.14*	*6.10*	*6.03*	*6.83*	*6.84*	*5.96*	*6.58*	*6.99*		

** Calculated using adjusted means

Locations mean 6.57

Std error of SCA est. 0.176

Std. error of GCA est., GROUP 1 0.1169

Std. error of GCA est., GROUP 2 0.0843

PEDIGREE LINES GROUP 1

P2 CL-02438 P24STEC1HC17-1-2-1-1-2-BBB-3-##-BBBBBBBBB
P4 CL-02420 P24STEC1HC21-3-1-2-1-1-BBB-2-##-BBBBBBBB
P7 CL-02456 P24C8HC12-B-2-BBBB-B-B-B
P8 CL-02453 P24C8HC93-B-1-BBBB-B-B-B
P9 CL-03619 P36C9HC71-B-4-BBBBB-B
P10 CL-03613 P36C9HC90-B-5-BBB
P11 G26SEQC3-52-1-1-1-1-B
P12 CML-411 P28C7-S4-#-BBBBBBBBBBBB
P13 CL-G2615 G26C25HS45-3-2-3-2-B
P16 CL-02450 P24STEC1HC16-1-3-3-1-2-BBB-1-###-9-BBBBBBBB
P17 CML-408 P24STEC2-29-BBBB-#-4-B*5-BBB
P19 CL-02443 P24C5HC227-1-2-1-1-1-1-#*4-BBBBB
P20 CL-KC001 KC3001/KC3002-22-2-2-B-3-BBBBBB

PEDIGREE LINES GROUP 2

P22 CML27 P27C5HC1-1-3-B-f-#-BB
P23 CL-02714 P27C6HC15-3-1-B-4-BB-4-BBB-3-##-B*7
P24 CL-02711 CAPITAN MIRANDA 8627-20-1-2-BBBBB-#-BBBBB
P26 CL-00368 SIN.AM.TSR-23-2-2-1-2-BBBB-#*4-BBBBBBB
P27 CL-00362 S.AM.TSR-23-3-1-2-4-BBBB-##-B-#-BBBB-B-B-B
P28 CML-413 SIN.AM.TSR-23-3-2-3-2-BBBB-#*4-BBBB-B
P30 CL-00390 S.AM.TSR-61-3-2-4-4-BBBB-##-BBBBBB
P32 KC3001/KC3002-22-2-1-B-##-B*7
P34 CL-SW002 SW 1 (S) C11-14-1-3-3-BB
P37 CL-00388 SIN.AM.TSR-C2-88-2-2-BBBB

Table 49 shows the performance of the best 8 single crosses. The superior 3 entries CLG2419 x CML384, CLO3218 x CML384 and CL2181 x CML384 were a combination of tropical x subtropical and yielded one ton/hectare, more than the next best tropical x tropical single cross confirming the heterotic response of tropical x subtropical.

CLG2419 x CML384 yielded 10 tons/hectare across five locations and showed resistance to root lodging and tolerance to ear rot (12%). The mean for ear rot incidence in this experiment was 22% and mean yield 7.4 t/ha, largely affected by the location in Tapachula, Chiapas, that presented ear rot mean of 47%, showing highly negative correlation with yield (r = -0.67) (Table 148).

CLO3218 x CML384 and CLO2181 x CML 384 yielded 9 and 9.2 tons/ha respectively and showed 12% ear rot damage.

The best tropical x tropical CLG2419 x CML254 yielded 9.1 tons/ha and 11% ear rot damage and 9% root lodging.

The superior tropical x subtropical single cross (CLG2419 x CML384) outyielded the RE: CML247 x CML254 by 25% (2 tons/ha) and the seed industry checks by 47%, that presented 19% of ears damaged by ear rot, reducing yield to 5.5 tons/ha, while in the best hybrids the yield reduction was only 12% giving 8.8 tons/ha of clean yield (Table 49). Best four hybrids will be internationally tested CHTTW in 2001.

Tropical x subtropical also contributed to yield stability, entry 80, CLG2419 x CML384 topped the trial across locations and ranked 1st at Poza Rica (12.6 tons/ha) 2nd at Cotaxtla (10.2 t/ha), 3rd at Turipana (8.8 t/ha), 2nd at Tapachula and 2nd at Las Vegas, Guatemala. Entries 52, 4 and 78 also showed good stability. Ear rot affects more tropical x subtropical at more humid tropic environments such as Tapachula, Mexico and Las Vegas, Guatemala (Tables A143 to A148). Single cross entries 52, 68 and 44, Heterotic Group "B" tropical x subtropical and entries 78 and 74, Heterotic Group "A", can effectively be used as female parent in three-way cross hybrid combinations, using lines with good general combining ability as male parents.

The male parents should be tropical lines in the case of hybrids for the humid tropic and subtropical for the subtropic environment. The final decision should be taken after harvesting the trial planted at Tlaltizapan and Guanajuato, subtropical environments.

Lines 20, 1, 19 and 4 showed the highest estimates of GCA for yield three to ten times SE for GCA and highest mean cross performance. Lines 2, 11, 8 and 13 showed positive GCA (Table 50). The 8 lines should be used to form synthetic varieties and lines 1, 3, 15 and 16 should be used as male parents in three-way hybrid combinations with adaptation to both tropical and subtropical environments.

Tester T1 showed the highest heterotic response for yield with Line 11, L12 x T1 (SCA=0.89), L11 x T4 and L16 x T4 presented significant SCA estimates (Table 50).

GCA effects for ear rot were also estimated, the lowest negative values for ear rot do not coincide with the best GCA lines for yield but intermediate values. Testers CML 254 and CML 384 showed the lowest negative estimate for ear rot among testers (Table 50).

Table 49. TSCW_99B08. Mean data of top 8 yielding tropical late white top crosses. Across 5 locations.
Poza Rica, Cotaxtla, Tapachula; México, Las Vegas; Guatemala, Turipana; Colombia. 1999 B.

Ent	PEDIGREE	Yd1 t/ha	Yd2 t/ha	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	PA 1-5	ER 1-5	BH %	NE #	NP #	ER %	M %
80	CL-G2419 x CML-384	8.77	9.96	56	55	-0.7	267	146	0.55	3.6	2.4	2.5	2.6	1.7	9.2	25	25	11.9	16.8
52	CL-03218 x CML-384	7.99	9.04	55	54	-1.1	269	144	0.53	5.0	21.6	2.7	2.9	2.3	0.0	25	26	11.6	15.4
4	CL-02181 x CML-384	7.95	9.18	56	56	0.4	264	144	0.54	4.6	4.7	2.5	2.9	2.1	10.4	26	26	13.4	15.6
78	CL-G2419 x CML-254	7.95	9.13	56	56	0.0	271	150	0.55	9.4	4.1	2.6	2.9	2.1	15.7	24	25	13.0	18.0
74	CML-407 x CML-254	7.68	8.58	55	54	-1.2	257	135	0.53	2.8	5.3	2.5	2.9	1.9	8.4	24	25	10.6	15.7
66	CL-00301 x CML-254	7.62	8.43	56	56	0.2	240	130	0.54	4.3	14.3	2.8	2.3	1.9	4.9	25	24	9.6	15.8
68	CL-00301 x CML-384	7.43	8.53	55	56	1.0	241	126	0.52	2.7	16.7	2.6	2.1	1.9	1.8	24	25	12.9	15.3
44	CL-03211 x CML-384	7.33	8.09	56	56	-0.3	257	142	0.55	6.5	9.3	2.5	2.8	1.8	3.2	24	24	9.4	16.3
16	CL-02131 x CML-384	7.32	8.36	56	56	0.6	248	136	0.55	3.6	6.7	2.7	2.7	2.0	9.6	26	26	12.5	16.3
81	CML-247x CML-254 RE	7.08	8.18	56	56	-0.2	238	129	0.54	5.5	3.8	2.7	2.4	2.0	10.7	23	25	13.4	17.8
82	(CML-247x CML-254) x R1	5.38	7.09	55	53	-1.1	245	120	0.49	22.2	13.2	3.6	2.8	3.2	11.5	24	25	24.1	17.5
87	CML-254xCML-384	6.16	7.02	55	54	-0.6	228	120	0.53	3.7	1.9	2.8	2.4	2.1	0.8	25	24	12.2	15.8
88	LOCAL CHECK	5.53	6.81	55	55	-0.4	255	144	0.56	5.7	3.3	3.0	3.1	2.4	7.6	22	24	18.8	17.6
	LSD 0.05		1.29	1.1	1.3	0.8	10.3	9.6	0.0	8.9	13.4	0.6	0.7	0.9	15.5	3.3	2.3	17.7	1.7
	CV %		12.76	1.5	1.8	3.3	4.1	7.1	6.9	10.4	11.4	15.3	17.6	20.7	12.1	11.7	8.7	48.0	8.1
	CORRELATION WITH Yd2			0.87	-0.85	-0.51	0.93	0.43	-0.15	0.70	0.31	0.10	0.23	-0.08	0.38	0.40	0.40	0.75	-0.36

Table 50. TSCW_99B08. GCA&SCA effects for yield (t/ha) and Ear Rotten of 16 tropical late white lines.
Across 3 locations, Poza Rica, Cotaxtla, México, Las Vegas; Guatemala, 1999 B

LINE/TESTER	PEDIGREE LINES	Yield T1	T2	T3	T4	MEAN	GCA	SCA T1	T2	T3	T4
L20	L20 : G2419 (G24F119*G24F54)-6-3-2-1-BBB-1-B-#-B*4	9.68	10.36	11.06	10.89	10.50	2.08	-0.73	-0.21	0.77	0.18
L1	L1 : CL-02181 P21C5HC72-3-1-2-BBBB-##-2-BBB-####-B*8	9.88	9.16	8.94	10.11	9.52	1.11	0.45	-0.44	-0.38	0.37
L19	L19 : G2409(G24TSR19*P21F199)-1-1-B-2-2-BBB-1-###-B*7	9.08	9.59	8.86	9.51	9.26	0.85	-0.09	0.26	-0.20	0.03
L4	L4 : 02131 P21C6S1MH125-3-B-1-1-1-BB-f-##-B*5+A4	8.81	9.24	9.54	8.73	9.08	0.67	-0.19	0.08	0.67	-0.56
L13	L13 : P32(MRRS)F2(C2)-112-3-BBB	9.60	7.60	9.75	9.17	9.03	0.62	0.66	-1.51	0.92	-0.08
L2	L2 : 02157 P21C5HC218-2-3-B-###-B-1-f-B*6	8.89	8.58	8.52	9.15	8.78	0.37	0.19	-0.28	-0.06	0.15
L11	L11 : 03211 P32C5HC9-2-2-BB-5-####-B*7	8.51	8.62	8.59	8.92	8.66	0.24	-0.06	-0.11	0.13	0.04
L8	L8 : 02204 P22STEC1HC32-6-1-1-2-3-BB-f-##-BBB 266	9.08	8.74	8.38	8.37	8.64	0.23	0.52	0.02	-0.06	-0.49
L16	L16 : P43 POSTA SEQ C3-S2-1-3-B*6	9.10	9.07	8.08	7.99	8.56	0.15	0.63	0.44	-0.28	-0.79
L12	L12 : P32(MRRS)F2(C2)-23-2-B*6	8.39	7.95	8.50	8.79	8.41	-0.01	0.07	-0.53	0.30	0.16
L14	L14 : 04336 P43C8HC11-2-1-BB-##-BBBB	8.63	8.59	7.41	8.12	8.19	-0.22	0.53	0.33	-0.57	-0.28
L3	L3 : 02169 P21C5HC219-3-2-2-3-B-1-2-###-BBB	7.82	7.77	8.55	7.99	8.03	-0.38	-0.13	-0.34	0.72	-0.26
L17	L17 : SINT.BCO.TSR-3-1-2-3-2-BBBB-##-B*5	6.44	8.50	7.89	9.14	7.99	-0.42	-1.47	0.43	0.11	0.93
L15	L15 : P43CAMEROON-177-1-1-2-1-5-3-BB	8.13	6.71	8.04	8.90	7.94	-0.47	0.27	-1.31	0.30	0.74
L9	L9 : (P25F118*25(B)-1-BBB-1-B-###-B*8	7.47	8.21	7.92	8.13	7.93	-0.48	-0.38	0.20	0.20	-0.02
L6	L6 : 02192 (P21F218*G23TSR15)-1-2-2-1-BBB-1-B-#-B*9	7.31	8.21	7.80	8.01	7.83	-0.58	-0.44	0.31	0.17	-0.04
L5	L5 : 02179 (P21TSR-27*P29STE-3)-B*14	7.32	8.65	6.87	7.53	7.59	-0.82	-0.19	0.99	-0.52	-0.28
L10	L10 : CL-02904 POB.29STEC1HC25-6-4-1-#-BBB-f-##-BBB 271	7.25	8.18	7.88	6.87	7.55	-0.87	-0.21	0.56	0.54	-0.89
L7	L7 : P22TSRC4-158-2-7-B-B-2-BBB	7.50	7.85	6.65	8.03	7.51	-0.91	0.08	0.27	-0.65	0.31
L18	L18 : G2420 G24C20MH94-1-4-B-4-2-###-B*5	7.66	8.18	4.94	8.25	7.26	-1.16	0.49	0.85	-2.12	0.78
	GCA testers	-0.09	0.08	-0.20	0.22	8.41					

GCASE = 0.25216 SCASE = 0.25413

LINE/TESTER	PEDIGREE LINES	Ear Rotten T1	T2	T3	T4	MEAN	GCA	SCA T1	T2	T3	T4
L9	L9 : (P25F118*25(B)-1-BBB-1-B-###-B*8	13.83	6.37	7.87	5.33	8.35	-4.70	1.17	2.06	-3.00	-0.23
L12	L12 : P32(MRRS)F2(C2)-23-2-B*6	9.97	11.93	9.47	5.37	9.18	-3.87	-3.53	6.79	-2.23	-1.03
L14	L14 : 04336 P43C8HC11-2-1-BB-##-BBBB	10.63	5.07	18.03	3.33	9.27	-3.78	-2.95	-0.16	6.25	-3.15
L11	L11 : 03211 P32C5HC9-2-2-BB-5-####-B*7	12.70	13.40	6.30	5.40	9.45	-3.60	-1.06	7.99	-5.67	-1.27
L13	L13 : P32(MRRS)F2(C2)-112-3-BBB	12.57	11.40	7.47	6.73	9.54	-3.51	-1.29	5.90	-4.59	-0.02
L19	L19 : G2409(G24TSR19*P21F199)-1-1-B-2-2-BBB-1-###-B*7	10.73	7.67	5.77	14.23	9.60	-3.45	-3.18	2.11	-6.35	7.42
L16	L16 : P43 POSTA SEQ C3-S2-1-3-B*6	15.50	5.57	7.00	10.43	9.63	-3.42	1.56	-0.02	-5.14	3.59
L4	L4 : 02131 P21C6S1MH125-3-B-1-1-1-BB-f-##-B*5+A4	14.57	8.87	7.40	8.73	9.89	-3.16	0.36	3.02	-5.01	1.63
L1	L1 : CL-02181 P21C5HC72-3-1-2-BBBB-##-2-BBB-####-B*8	15.80	7.23	14.00	7.53	11.14	-1.91	0.35	0.13	0.34	-0.82
L17	L17 : SINT.BCO.TSR-3-1-2-3-2-BBBB-##-B*5	12.20	8.37	15.83	9.17	11.39	-1.66	-3.50	1.02	1.93	0.56
L10	L10 : CL-02904 POB.29STEC1HC25-6-4-1-#-BBB-f-##-BBB 271	11.00	5.70	25.43	7.83	12.49	-0.56	-5.80	-2.75	10.43	-1.87
L3	L3 : 02169 P21C5HC219-3-2-2-3-B-1-2-###-BBB	16.63	10.13	7.37	17.23	12.84	-0.21	-0.52	1.33	-7.99	7.18
L20	L20 : G2419 (G24F119*G24F54)-6-3-2-1-BBB-1-B-#-B*4	23.30	9.87	9.80	9.37	13.08	0.04	5.91	0.83	-5.80	-0.93
L6	L6 : 02192 (P21F218*G23TSR15)-1-2-2-1-BBB-1-B-#-B*9	29.07	9.63	14.27	4.17	14.28	1.24	10.47	-0.61	-2.53	-7.33
L15	L15 : P43CAMEROON-177-1-1-2-1-5-3-BB	13.43	4.80	24.70	16.10	14.76	1.71	-5.64	-5.92	7.43	4.13
L8	L8 : 02204 P22STEC1HC32-6-1-1-2-3-BB-f-##-BBB 266	23.33	9.00	16.67	14.80	15.95	2.90	3.07	-2.91	-1.80	1.64
L18	L18 : G2420 G24C20MH94-1-4-B-4-2-###-B*5	28.33	7.50	17.77	12.73	16.58	3.54	7.44	-5.04	-1.33	-1.07
L2	L2 : 02157 P21C5HC218-2-3-B-###-B-1-f-B*6	23.23	10.47	19.17	16.37	17.31	4.26	1.61	-2.80	-0.66	1.84
L5	L5 : 02179 (P21TSR-27*P29STE-3)-B*14	16.03	11.47	38.37	17.90	20.94	7.89	-9.22	-5.43	14.91	-0.26
L7	L7 : P22TSRC4-158-2-7-B-B-2-BBB	34.33	15.70	38.60	12.50	25.28	12.24	4.74	-5.54	10.80	-10.00
	GCA testers	4.31	-4.04	2.52	-2.79	13.05					

PEDIGREE TESTERS
T1 : CML 247
T2 : CML 254
T3 : CML 311
T4 : CML 384

2.31 Evaluation of test crosses among tropical late white lines crossed to three testers - TSCW99B09.

23 tropical late white elite lines were crossed to three elite line testers: CML254 (Heterotic Group "A") tropical and CML311 (Heterotic Group "A") and CML384 (Heterotic Group "B") subtropical.

The 69 testcrosses plus 8 checks were evaluated under a 7x11 alpha lattice design with 2 replications, in five locations in the tropical mega-environments of Poza Rica and Cotaxtla, Veracruz and Tapacula, Chiapas in Mexico, Turipana, Colombia, and Cuyuta, Guatemala.

Objectives:

1. Identify new single cross combination tropical x tropical and tropical x subtropical and yield stability.
2. Identify single cross combination within Heterotic Groups AxA and BxB for practical use as female parent in three-way cross combination.
3. Identify four lines with good GCA to be used as Heterotic Group "C" or male parents in three-way cross combinations.
4. Evaluate the heterotic response of testers.

Table 51 shows the performance of the best 8 single crosses. The best entry CLO2307 x CML311, was a combination, tropical x subtropical.

CLO2307 x CML311 yielded 9 tons/hectare across four locations and showed resistance to root lodging and tolerance to ear rot.

The best tropical x tropical CLG2309 x CML254 yielded 9 tons/ha and showed 12% ear rot damage.

The superior tropical x subtropical single cross (CLO2307 x CML311) yielded similar to the RE: CML247 x CML254 outyielding the seed industry checks by 20%, that showed 18% of ears damaged by ear rot, reducing yield to 6.5 tons/ha, while in the best hybrids the yield reduction was only 8% giving 8.3 tons/ha of clean yield (Table 51). Best four hybrids will be internationally tested CHTTW in 2001.

Lines CLO2307, CLO2510, CLO4355, and CLO4580 showed the highest GCA estimates for yield (Table 52).

Tables A149 to A155 include the information at individual and across locations.

2.32 Combining ability of yellow tropical late inbred lines crossed to three testers TSCY99B10.

25 tropical yellow lines Heterotic Groups A and B were crossed to 3 testers, all crosses plus 6 checks were evaluated under a 9x9 alpha lattice design, one row, five meters long, plot with 2 replications across six locations: Poza Rica, Cotaxtla and Uxmal in Mexico; Las Vegas, Guatemala; Turipana, Colombia; El Ejido, Panamá; and Suwan Farm, Thailand.

Table 51. TSCW_99B09 mean data of top 8 yielding tropical top crosses late white. Across 4 Locations.
Poza Rica, Cotaxtla, Tapachula; México, Las Vegas; Guatemala. 1999 B.

Ent	PEDIGREE	Yd1 t/ha	Yd2 t/ha	MF days	Silk days	ASI	PH cm	EH cm	EH/ PH	E/P	Rust 1-5	ER 1-5	EA 1-5	RL %	SL %	BH %	NE #	NP #	ER %
17	CL-02307 x CML-311	8.29	9.05	53	54	1.0	255	144	0.57	0.98	2.1	1.8	2.1	3.7	7.8	2.9	24	24	8.5
66	CL-G2309 x CML-254	7.74	8.55	55	55	0.0	258	150	0.57	0.97	2.0	2.1	2.6	6.6	6.0	8.4	24	25	9.5
16	CL-02307 x CML-254	7.47	8.14	54	54	0.4	262	155	0.59	1.12	2.3	2.1	2.6	5.5	3.9	0.6	26	24	8.3
26	CL-02504 x CML-384	7.44	8.47	54	53	-1.1	245	138	0.56	0.96	2.4	2.2	2.7	5.6	8.7	3.1	25	26	12.1
45	CL-04355 x CML-254	7.32	8.25	57	56	-0.5	271	170	0.62	0.95	2.2	2.0	2.8	6.5	1.1	6.6	25	26	11.3
24	CL-02510 x CML-384	7.31	8.66	55	55	0.0	254	141	0.55	1.05	2.3	2.5	2.9	5.4	4.3	10.6	26	26	15.6
22	CL-02510 x CML-254	7.16	8.20	56	57	0.2	267	148	0.55	1.10	2.1	2.1	2.8	4.7	3.8	25.1	28	25	12.6
55	CL-04380 x CML-384	6.97	8.38	56	57	0.5	258	138	0.53	0.92	2.5	2.4	3.4	4.3	2.6	23.8	24	26	16.9
69	CML 247 x CML 254 RE	6.51	8.59	56	55	-0.7	239	135	0.56	0.94	1.9	2.7	3.1	4.7	3.8	10.2	24	25	24.2
70	(CML-247x CML-254) x R1	6.28	7.53	54	54	-0.3	259	138	0.53	0.93	2.6	2.6	3.1	12.9	18.8	13.5	23	25	16.6
76	LOCAL CHECK	6.55	7.87	55	56	0.4	273	158	0.58	0.99	2.9	2.4	3.4	6.6	5.2	6.4	25	25	16.7
	LSD 0.05		1.41	1.8	1.6	1.4	12.4	11.3	0.0	0.1	1.2	0.8	0.6	7.7	9.4	23.0	3.6	1.9	16.6
	CV %		14.26	2.6	1.9	4.2	4.2	6.5	5.9	14.4	16.7	27.1	18.7	10.1	12.3	13.3	14.4	7.3	11.4
	CORRELATION WITH Yd2			0.34	-0.29	-0.1	0.41	0.06	0.44	0.19	-0.35	-0.29	0.90	0.22	-0.10	0.01	-0.16	-0.22	-0.38

Table 52. TSCW_99B09. GCA effects for yield (t/ha) of tropical late white lines & three testers. Across 4 locations.
Poza Rica, Cotaxtla, Tapachula; México, Las Vegas; Guatemala. 1999 B.

PEDIGREE LINES	Yd t/ha	Yd T1	Yd T2	Yd T3	Yd t/ha	GCA	SCA T1	SCA T2	SCA T3	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	BH %	NE #	ER %
CL-02307 P23 C3 HC-86-B*7	7.44	9.05	7.87	8.14	8.36	0.93	0.97	-0.65	-0.32	55	55	263	151	0.57	6.1	5.7	2.5	1.7	25	11.1
02510 P25C5HC246-3-1-BB-2-#-B*9	7.11	8.17	8.66	8.20	8.34	0.92	0.10	0.15	-0.25	55	56	260	143	0.54	4.6	3.7	2.8	14.8	26	14.8
CL-04355 P43STEC1HC11-9-2-2-1-6-BBB-4-##-B-#-B*7	6.58	7.40	8.00	8.25	7.88	0.46	-0.21	-0.05	0.27	56	56	267	162	0.60	8.3	3.3	3.0	11.1	23	16.8
CL-04380 (P43AC7643*43F7)-2-3-3-2-BBB-2-B-#-B-#-B*7	5.97	7.60	8.38	7.35	7.78	0.35	0.09	0.44	-0.53	56	56	257	138	0.54	4.7	2.2	3.5	22.8	22	23.4
CL-G2309 G 23 C26 HS179-1-4-2-3-B	6.55	7.02	7.14	8.55	7.57	0.14	-0.28	-0.59	0.88	54	54	255	144	0.56	6.4	11.7	2.8	5.7	23	13.7
CML-36 P32C4HC20-3-4-B-#*9-1-B*5	6.01	6.63	8.21	7.47	7.44	0.01	-0.54	0.60	-0.07	55	55	257	137	0.54	5.0	3.8	3.1	1.4	25	19.1
*LDMNTES8043-53-1-1-B-##-2-BBB-3-###-B*6	5.84	6.53	7.34	7.19	7.02	-0.41	-0.22	0.15	0.07	55	55	248	141	0.57	7.3	4.8	3.1	4.1	23	17.2
CL-02906 P29STEC1HC1-3-1-1-4-2-BBB-1-##-B*9	5.70	6.89	6.73	7.32	6.98	-0.45	0.18	-0.42	0.24	54	55	236	128	0.54	4.0	3.9	3.2	4.6	25	18.4
CL-G23005 G 23 C26 HS235-7-1-1-5-B	6.03	6.30	7.24	7.24	6.93	-0.50	-0.36	0.15	0.21	55	55	236	129	0.55	5.8	9.0	3.0	19.0	21	13.2
(P21STE-4*21STE-43)-BBBB-#-B*9	4.78	5.98	6.36	5.58	5.97	-1.46	0.28	0.22	-0.50	54	54	241	122	0.51	3.3	5.5	3.5	7.9	23	19.8
MEAN		7.16	7.59	7.53	7.43															
GCA testers		-0.27	0.17	0.10																

PEDIGREE TESTERS
T1 : CML-311
T2 : CML-384
T3 : CML-254

The objectives of this trial were:

1. Identify superior lines with good GCA and SCA in in-crosses.
2. Evaluate the cross performance of the lines across testers.
3. Identify superior single cross hybrids for international testing.

The best performing single cross CLO2455 x CML226 yielded 8.2 t/ha across five locations, outperformed the best local seed industry check, across locations with 3 tons/ha. This yellow hybrid also showed resistance to ear rot, stalk lodge and excellent standability (Table 53). This single cross also showed good yield stability at individual locations (Tables A156 to A163).

The yield drops below the mean and shows susceptibility to ear rot at Suwan Farm, CLO2455 x CML226, yielded 6.2 tons/ha and showed resistance to ear rot. At Suwan Farm CLO3613 x CML226 also showed excellent performance, yielding 8.3 t/ha and very resistant to ear rot. These entries outyielded the best seed industry check, Pioneer P3013 that yielded 4.4 tons/ha and 26% ear rot damage (Table A161).

Lines CLO2410, CLO2456, CLO2442 and CLO2441 Heterotic Group "A" showed excellent GCA (Table 54).

Also the superior lines will be crossed to single crosses BxB to form new three-way cross hybrids. It is strongly suggested that breeders at ARMP, SAM and PRM use the results of these experiments to effectively assist national programs with new hybrid focus.

2.33 Evaluation of testcrosses among tropical late white lines crossed to two testers - TSCW99B11.

43 tropical late white elite lines were crossed to two elite line tropical testers: CML254 (HG"A") and CML247 (HG"B").

The 86 testcrosses plus 4 checks were evaluated under a 9x10 alpha lattice design with 2 replications, in four locations in the tropical mega-environments of Poza Rica and Cotaxtla, Veracruz and Tapacula, Chiapas in Mexico, and Las Vegas, Guatemala.

Objectives:

1. Identify new single cross combinations.
2. Identify single cross combination within Heterotic Groups AxA and BxB for practical use as female parent in three-way cross combination.
3. Identify lines with good GCA to be used as Heterotic Group "C" or male parents in three-way cross combinations.

Table 55 shows the performance of the best 8 single crosses. The superior 3 entries CLRCW30 x CML254, CLRCW31 x CML254 and CLO3219 x CML254 yielded 9.5 to 10 t/ha, 1.5 t/ha more than the seed industry check that showed 20% ear rot damage.

CLRCW30 x CML254 yielded 10 tons/hectare across four locations and showed resistance to root lodging and to ear rot.

CLRCW31 x CML254 and yielded 9.2 tons/ha and showed resistance to ear rot damage.

Table 53. TSCY_99B10. Mean data of top 8 yielding tropical late yellow single crosses. across 5 locations

Poza Rica, Cotaxtla, Tapachula; México, Las Vegas; Guatemala, El Ejido; Panama. 1999 B.

Ent	PEDIGREE	Yd1 t/ha	Yd2 t/ha	Ant days	Silk days	ASI	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	Rust 1-5	EA 1-5	PA 1-5	ER 1-5	BH %	NE #	NP #	ER %
75	CL-02455 x CML-226	7.58	8.20	56	55	-0.9	251	145	0.57	0.97	8.5	0.6	2.0	2.9	2.9	1.8	12.3	24	25	7.6
50	CL-03613 x CML-226	6.96	7.92	55	55	-0.2	239	130	0.54	0.91	1.4	4.4	1.9	3.1	3.1	2.1	8.6	23	25	12.2
1	CL-02442 x CML-226	6.91	7.95	55	55	-0.5	248	138	0.56	0.98	0.7	1.9	2.5	3.2	3.0	2.3	3.7	23	24	13.1
64	CL-00390 x CML-226	6.75	7.51	56	56	0.2	240	132	0.55	0.95	5.1	5.1	2.0	3.0	3.0	2.0	3.6	23	25	10.0
8	CL-02410 x CML-287	6.71	7.89	55	54	-1.0	253	142	0.56	0.96	2.0	0.0	2.5	2.7	2.9	1.8	16.5	25	25	15.0
46	CL-00392 x CML-226	6.66	7.15	55	55	-0.2	232	124	0.53	0.92	0.0	2.6	2.2	2.9	2.6	1.9	2.1	23	25	6.8
17	CL-02441 x CML-287	6.51	7.19	57	55	-1.3	251	142	0.56	0.93	9.1	5.9	2.4	2.6	2.7	1.3	13.3	25	25	9.4
19	CL-02456 x CML-226	6.48	7.97	55	54	-0.5	256	138	0.54	1.02	4.5	7.9	2.2	2.8	3.1	1.7	8.3	24	24	18.7
77	CML-287 x CML-413 RE	6.20	6.79	56	56	-0.5	259	150	0.58	0.96	9.5	1.3	2.1	3.0	3.2	1.9	32.8	24	24	8.7
80	LOCAL CHECK-1	5.24	6.06	53	54	0.5	237	123	0.52	0.91	2.9	11.4	2.4	3.3	3.1	2.0	13.3	20	21	13.4
81	LOCAL CHECK-2	4.51	5.47	54	54	0.4	235	126	0.53	0.92	1.6	6.5	2.3	3.6	3.2	2.5	11.2	19	21	17.6
	LSD 0.05		1.51	1.3	1.5		13.3	10.2	0.0	0.1	15.1	11.7	0.5	0.5	0.5	0.7	15.0	3.1	2.3	12.0
	CV %		12.94	1.6	1.8		4.6	6.2	5.6	9.3	13.5	11.9	16.1	12.1	10.5	21.0	11.7	10.3	6.8	10.0
	CORRELATION WITH Yd2			-0.22	0.12	0.32	0.04	-0.19	0.18	0.08	0.20	-0.02	0.07	0.31	0.32	0.81	0.24	-0.34	-0.03	-0.27

Table 54. TSCY_99B10. GCA & SCA effects for yield (t/ha) of 13 tropical late yellow lines & three testers.

Poza Rica, Cotaxtla, Tapachula; México, Las Vegas; Guatemala, El Ejido; Panama. 1999 B. Across 5 locations

PEDIGREE LINES	Yd1 t/ha	Yd2 T1	Yd2 T2	Yd2 T3	Yd2 t/ha	GCA	SCA T1	SCA T2	SCA T3	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	RL %	SL %
CL-02410 P24STEC1HC21-3-1-1-#-BBB-#*5-##-BBB	7.23	7.16	9.37	7.62	8.05	0.97	-1.19	0.59	0.60	54	54	0.0	251	143	0.57	3.7	3.5
CL-02456 P24C8HC12-B-2-BBBB-B-B-B	6.69	9.02	8.97	6.08	8.02	0.94	0.70	0.22	-0.92	55	55	-0.4	262	144	0.55	4.5	4.2
CL-02442 P24STEC1HC16-1-3-3-1-2-BBB-1-#*4-BBBBBB	7.14	8.15	8.34	7.25	7.91	0.83	-0.06	-0.31	0.36	57	56	-0.5	259	149	0.58	7.4	2.1
CL-02441 P24STEC2-39-BBBBBBBBBBB-B-B	7.06	7.81	8.44	7.18	7.81	0.73	-0.29	-0.10	0.40	56	55	-1.0	249	139	0.56	7.5	5.1
CL-02444 P24STEC1HC21-3-1-2-1-2-BBB-1-##-BBBBBBBB	6.87	8.36	8.21	6.75	7.77	0.69	0.30	-0.30	0.00	55	55	0.0	251	146	0.58	2.8	5.0
CL-02438 P24STEC1HC17-1-2-1-1-2-BBB-3-##-BBBBBBBBB	6.25	7.17	7.30	7.59	7.36	0.28	-0.48	-0.79	1.26	55	56	0.3	267	150	0.56	3.4	5.0
G26TLYDC25HS239-1-2-BB-2-B	6.04	6.96	7.85	7.10	7.30	0.22	-0.64	-0.19	0.82	55	55	-0.1	251	142	0.57	7.1	7.5
P24STEC2-29-BBBB-#-3-BBBB-B-B-B	6.36	7.24	7.14	6.97	7.12	0.03	-0.17	-0.71	0.88	55	55	-0.5	248	136	0.55	3.9	9.3
CL-02808 P28TSR-33-3-3-B-1-1-BB-f-##-BBB	5.24	7.23	6.05	6.08	6.45	-0.63	0.48	-1.14	0.66	56	56	0.13	255	140	0.55	6.8	11.2
CL-00348 S.AM.TSR-61-3-2-8-2-BBBB-##-BBBBBBBBB	5.61	6.79	7.12	4.89	6.26	-0.82	0.23	0.12	-0.35	56	57	0.42	243	135	0.56	4.2	3.1
CL-00344 SinAmTSR-23-1-2-4-1-BBBB-##-B*8 CML-414	5.36	6.93	8.10	3.50	6.17	-0.91	0.46	1.19	-1.65	57	58	0.33	256	142	0.56	10.2	6.2
CL-SW002 SW 1 (S) C11-14-1-3-3-B	4.78	5.81	7.19	5.05	6.02	-1.07	-0.50	0.44	0.06	55	54	-0.42	255	141	0.55	8.1	8.5
CL-00378 S.AM.TSR-23-2-2-1-2-BBB-B-###-3-BBBBBBB	5.20	7.26	7.52	2.66	5.81	-1.27	1.16	0.97	-2.13	56	57	0.54	251	150	0.60	25.0	9.9
MEAN		7.37	7.81	6.05	7.08												
GCA TESTERS		0.30	0.73	-1.03													

PEDIGREE TESTERS

T1 : CML-226

T2 : CML-287

T3 : CML-413

The superior tropical single cross CLRCW30 x CML254 outyielded the RE: CML247 x CML254 and seed industry checks by 2 tons/ha. RE and seed industry checks presented 17 and 19% of ears damaged by ear rot, reducing yield to 6.5 tons/ha, while in the best hybrids the yield reduction was only 6% giving 9.5 tons/ha of clean yield (Table 55). Best four hybrids will be internationally tested CHTTW in 2001.

Lines CLO23 and CLTHCA001 showed highest estimates of GCA for yield and highest mean cross performance (Table 56). The 8 lines in Table 56 should be used to form synthetic varieties and lines, should be used as male parents in three-way hybrid combinations.

Information at individual locations Tables A164 to A168.

2.34 Evaluation of tropical white late three-way cross hybrids across five locations in the tropical mega-environment - TSCW99B12.

Table 57 shows the best performing TWC hybrids across five locations. Yield response similar to the best seed industry checks (Tables A169 to A175).

2.35 Evaluation of 20 tropical late yellow single crosses across six locations in the tropical mega-environment - SCY99B13.

This experiment includes the evaluation of 16 tropical yellow late single crosses formed by crossing a group of lines Heterotic Group "A" with CML 413 and another group Heterotic Group "B" with CML287. 16 single crosses plus four checks were included in a 4x5 alpha lattice design with 2 replications and tested in six locations, Poza Rica, Cotaxtla, Uxmal in Mexico; Cuyuta, Guatemala; El Ejido, Panama and Turipana, Colombia (Tables A176 to A183).

Table 58 shows the performance of the 8 top yielding entries similar to the reference entry CML287 x CML413 but outyielded the seed industry checks by 1.5 t/ha and resistance to ear rot and root lodging.

2.36 Cross performance and combining ability of tropical yellow late inbred lines with two testers - TSCY99B14.

Twenty-six tropical yellow late inbred lines were test crossed to two testers CML413 and CML287 Heterotic Group "B" and "A" respectively. The 52 advanced test crosses plus two checks were included in an alpha lattice design 6x9 with two replications and tested in seven locations in the tropical mega-environment Poza Rica, Cotaxtla, Uxmal in Mexico; Las Vegas, Guatemala; El Ejido, Panamá; Turipana, Colombia and Suwan Farm, Thailand. The across location analysis was performed with five locations excluding S. Farm and Turipana because of low yield in the testcrosses probably due to DM susceptibility. No score for DM was taken unfortunately. In Turipana low stand was responsible for the low yields.

Table 55. TSCW_99B11. Mean data of top 8 yielding tropical late white single crosses. Across 4 locations

Poza Rica, Cotaxtla, Tapachula; México, Las Vegas; Guatemala. 1999 B.

Ent	PEDIGREE		Yd1	Yd2	Ant	Silk		PH	EH	EH/	E/P	RL	SL	EA	PA	ER	BH	NE	NP	ER	M
			t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	1-5	%	#	#	%	%
39	CL-RCW30	x CML-254	9.49	10.08	59	60	0.4	253	146	0.58	1.02	3.0	1.8	2.2	2.9	1.3	18.6	26	26	5.9	19.8
44	CL-RCW31	x CML-254	8.94	9.27	58	58	-0.1	233	130	0.56	1.00	2.3	1.9	2.2	2.7	1.4	1.7	25	25	3.6	21.4
67	CL-03219	x CML-254	8.68	9.47	59	60	0.7	258	144	0.56	0.99	3.6	2.9	2.4	3.2	1.4	4.0	25	25	8.3	22.7
58	CL-02221	x CML-254	8.64	9.37	57	57	-0.3	239	138	0.58	1.13	8.3	5.8	2.5	3.3	1.6	4.8	28	25	7.8	20.9
45	CL-RCW32	x CML-254	8.58	8.91	58	58	0.1	251	147	0.58	0.99	6.2	4.4	2.2	3.1	1.4	10.4	25	25	3.7	21.5
42	CL-RCW33	x CML-254	8.49	9.07	58	58	0.4	253	140	0.55	1.13	2.4	0.7	2.2	2.8	1.5	2.1	27	24	6.4	22.3
64	CL-03221	x CML-254	8.43	9.38	57	57	-0.3	255	140	0.55	0.96	2.9	0.6	2.0	3.0	1.5	2.5	25	26	10.1	23.6
3	CL-THGA001	x CML-254	8.36	8.85	59	59	-0.1	259	140	0.54	1.03	3.0	8.5	2.3	3.1	1.8	0.6	26	25	5.5	20.5
87	CML-247	x CML-254	6.60	7.93	56	55	-0.6	244	132	0.54	1.06	10.1	6.2	2.9	2.9	2.1	15.3	25	24	16.8	22.4
88	LOCAL CHECK1		6.62	8.16	57	56	-0.3	240	126	0.52	1.00	3.7	1.3	2.8	3.1	2.3	8.0	25	25	18.9	22.6
90	LOCAL CHECK2		6.70	8.05	57	57	-0.2	247	132	0.54	0.95	4.2	4.9	2.9	3.0	2.5	5.5	24	25	16.7	20.7
		LSD 0.05		1.48	1.5	1.7	0.9	12.3	10.4	0.0	0.2	6.0	6.9	0.5	0.6	0.8	15.8	3.8	3.0	12.3	2.1
		CV %		14.83	1.7	2.1		3.9	6.6	6.7	11.9	8.8	8.9	14.3	14.6	23.7	12.5	11.3	9.8	9.8	8.8
		CORRELATION WITH Yd2			0.37	-0.43	0.21	0.56	0.18	0.43	0.40	-0.14	-0.09	0.37	0.28	0.85	0.60	-0.27	-0.45	-0.65	0.03

Table 56. TSCW_99B11. GCA & SCA effects for yield (t/ha) of 9 tropical late white lines & two testers

Poza Rica, Cotaxtla, Tapachula; México, Las Vegas; Guatemala. 1999 B. Across 4 locations.

PEDIGREE LINES	Yd1	Yd2	Yd2	DIFF	Yd2		SCA	SCA	MF	FF	PH	EH	EH/	RL	SL	EA	BH	NE	NP	ER
	t/ha	T1	T2	T1-T2	t/ha	GCA	T1	T2	days	days	cm	cm	PH	%	%	1-5	%	#	#	%
G 23 C27HS 279-3-1-B-2-B-B	7.77	7.92	8.72	-0.8	8.32	1.15	0.34	-0.34	58	58	242	136	0.56	2.1	0.3	2.2	10.3	24	25	6.8
CL-THGA001 (THG-A)C0 MH346-1-1-2#-1-2-B-B-B-B-B	7.41	7.56	8.85	-1.3	8.21	1.04	0.09	-0.09	58	58	251	133	0.53	6.1	11.6	2.5	5.5	24	24	10.1
(CML-269*CL02211)-B-3-B-2-3-3-B	6.66	7.16	9.19	-2.0	8.17	1.00	-0.27	0.27	57	57	244	131	0.53	3.0	2.1	3.0	13.8	24	25	19.9
(CL02821*CML-274)-B-1-B-2-3-2-B	6.12	7.45	8.46	-1.0	7.95	0.78	0.24	-0.24	58	58	250	134	0.54	6.8	7.3	2.8	10.2	23	25	23.7
(POB.22TSR)C3-82-1-1-B-B-B-B-B	6.69	7.06	8.66	-1.6	7.86	0.69	-0.06	0.06	58	57	239	129	0.54	12.6	2.5	3.0	13.3	23	24	15.2
(IBP-2)C0 MH225-1-1-1#-1-2-B-B-B-B-B	6.89	8.04	7.54	0.5	7.79	0.62	0.99	-0.99	57	57	245	134	0.55	4.0	3.2	2.7	9.0	24	25	11.6
(PR90304RPhy-S5*V)-3-B-B-3-2-B	6.21	7.88	6.95	0.9	7.41	0.24	1.20	-1.20	57	57	225	116	0.52	6.2	1.9	3.0	7.5	24	25	15.9
(CML-253*CML-265)-BBB-5-1-1-B-B-B	6.41	6.91	7.86	-1.0	7.38	0.21	0.26	-0.26	56	56	231	123	0.53	3.4	1.2	3.0	12.5	24	25	13.4
(CML-258*CL02212)-B-6-B-1-1-1-B	5.88	7.36	7.14	0.2	7.25	0.08	0.85	-0.85	59	59	249	137	0.55	5.9	2.2	3.2	21.6	23	24	18.7
MEAN		6.43	7.91		7.17															
GCA TESTERS		-0.74	0.74																	

PEDIGREE TESTERS

T1 : CML-247

T2 : CML-254

Table 57. TSCW_99B12. Mean data of top 9 yielding tropical late white three way crosses. Across 5 Locations
Poza Rica, Cotaxtla, Tapachula, Acayucan; México, Las Vegas; Guatemala. 1999 B.

Ent	PEDIGREE		Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	PA	ER	BH	NE	NP	ER
			t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	1-5	%	#	#	%
4	CML-247*CML-254	x CL-04349	6.65	7.13	59	58	0.0	241	124	0.51	0.98	3.6	1.5	2.8	2.6	1.9	6.0	51	52	6.8
3	CML-247*CML-254	x CL-04351	6.63	7.40	58	57	-0.7	241	127	0.52	0.95	3.7	3.2	2.6	2.7	2.1	3.7	48	51	10.4
1	CML-247*CML-254	x CL-02190	6.40	7.31	56	57	-0.2	235	125	0.53	0.89	4.2	1.2	3.0	2.6	2.5	12.0	46	52	12.4
17	CML-247*CML-254	x CL-03215	6.13	6.73	57	57	0.3	239	130	0.55	0.87	8.3	6.7	2.8	3.3	2.2	6.3	44	51	9.0
13	CML-247*CML-254	x CL-G2310	6.13	6.96	56	56	0.4	237	136	0.57	0.88	4.7	4.1	2.7	2.9	2.2	8.8	44	50	12.0
10	CML-247*CML-254	x CL-02305	6.13	6.99	56	57	1.1	239	130	0.54	0.95	6.2	1.9	2.9	2.9	2.5	3.1	48	51	12.3
22	CML-247*CML-254	x CL-02510	6.06	6.89	57	56	-0.5	246	136	0.55	0.91	11.0	2.4	3.0	3.2	2.4	17.6	45	49	12.0
19	CML-247*CML-254	x CL-G2307	5.96	6.67	56	56	-0.1	235	127	0.54	0.90	6.0	5.2	2.7	3.0	2.2	3.3	46	52	10.7
16	CML-247*CML-254	x CL-G2309	5.94	6.68	55	55	0.0	233	128	0.55	0.96	7.2	4.9	2.7	3.1	2.2	7.0	46	48	11.1
53	CML247	x CML254 RE	7.06	7.45	57	57	-0.3	228	124	0.55	0.93	4.3	4.4	2.3	2.8	1.8	3.2	48	52	5.2
41	CL-G2309	x CML-254	6.88	7.60	56	56	-0.5	246	139	0.56	0.98	6.3	4.5	2.4	3.2	2.2	2.8	50	51	9.5
45	CL-03215	x CML-254	6.73	7.15	57	58	0.0	229	130	0.56	0.95	6.4	4.5	2.7	3.3	2.0	2.4	49	52	5.8
51	CL-G2307	x CML-254	6.55	7.32	56	56	-0.2	239	130	0.55	0.94	4.1	4.5	2.6	2.8	2.1	0.9	49	52	10.5
42	CL-G3210	x CML-254	6.52	7.34	57	57	0.8	238	137	0.57	1.06	6.1	4.5	2.8	3.2	2.3	9.4	54	51	11.2
54	LOCAL CHECK 1		5.42	6.75	56	56	0.3	240	121	0.50	0.90	6.3	2.3	2.9	2.8	2.6	5.8	46	51	19.7
55	LOCAL CHECK2		5.27	6.20	56	57	0.7	240	131	0.55	0.82	3.9	2.4	3.0	3.3	2.5	6.6	40	50	15.0
		LSD 0.05		0.79	1.1	1.1	0.9	10.7	11.8	0.1	0.1	5.4	7.5	0.4	0.5	0.6	10.4	4.2	2.3	9.6
		CV %		10.66	1.5	1.4	3.2	5.9	12.7	34.4	10.0	9.7	9.7	13.3	17.6	21.1	9.2	10.4	4.0	8.6
		CORRELATION WITH Yd2			0.4	-0.5	0.12	0.2	0.02	-0.3	0.23	-0.02	0.1	0.08	0.39	0.91	0.08	-0.5	-0.2	-0.6

Table 58. TSCY_99B13. Mean data of top 8 yielding tropical late yellow single crosses. Across 6 Locations
Poza Rica, Cotaxtla, Uxmal; México, Cuyuta; Guatemala; Monteria; Colombia, El Ejido; Panama. 1999 B

Ent	PEDIGREE		Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	PA	BH	NE	NP	ER
			t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	%	#	#	%
11	CL-02450	x CML-413	7.24	7.40	55	56	0.5	239	140	0.58	0.97	3.6	1.5	2.9	2.8	11.4	48	50	2.2
9	CL-02455	x CML-413	7.22	7.45	55	56	0.8	250	142	0.57	0.97	9.7	0.6	2.7	3.1	15.5	49	50	3.1
15	CL-SW003	x CML-287	7.19	7.66	53	53	-0.6	250	146	0.58	0.98	9.7	3.6	2.7	3.0	10.0	48	49	6.1
13	CL-00394	x CML-287	7.15	7.37	55	56	-0.1	261	142	0.54	0.95	5.3	2.9	2.8	3.0	44.5	46	48	3.1
12	CL-02451	x CML-413	7.05	7.21	53	54	0.4	230	139	0.61	0.96	6.2	2.5	2.8	2.9	9.5	48	50	2.2
4	CL-00388	x CML-287	6.99	7.11	55	55	0.2	259	149	0.57	0.96	5.0	1.1	2.5	3.2	1.9	48	50	1.7
16	S.AMTSR-23-3-2-4-1-BBBB-##-1-B-B-B-B-B-B	x CML-287	6.99	7.37	55	56	-0.1	256	139	0.54	0.94	6.9	1.5	2.9	3.1	52.6	46	49	5.2
7	CL-KC001 KC 3001/KC 3002-22-2-2-B-3-B-B-B	x CML-413	6.95	7.22	55	56	0.4	250	140	0.56	0.93	9.3	2.5	2.8	2.9	15.6	47	50	3.7
17	CML-287	x CML-413	7.13	7.36	54	55	0.5	255	145	0.56	0.94	13.8	2.3	2.7	3.1	20.6	46	49	3.1
18	CML285	x CML287	6.75	7.07	53	53	-0.7	253	139	0.55	0.94	6.7	4.3	2.8	3.1	3.0	46	49	4.6
19	LOCAL CHECK 1		5.19	5.71	52	54	1.0	242	131	0.54	0.90	7.2	5.4	3.4	3.5	13.8	42	46	9.2
20	LOCAL CHECK 2		5.46	5.95	53	54	0.6	242	129	0.53	0.86	8.1	2.9	3.3	3.3	19.5	40	46	8.1
		LSD 0.05		0.54	0.8	0.9	0.7	7.9	7.7	0.0	0.0	6.6	2.9	0.4	0.3	15.1	2.6	2.1	3.0
		CV %		8.04	1.3	1.5	3.0	3.5	6.0	5.1	6.4	11.7	6.9	13.1	11.8	9.5	6.6	4.9	6.8
		CORRELATION WITH Yd2			0.3	-0.3	-0.09	0.00	-0.58	-0.34	0.30	0.10	-0.1	-0.1	0.16	0.15	-0.2	-0.2	-0.74

Objectives:

1. Identify new single cross combination tropical x tropical and tropical x subtropical and yield stability.
2. Identify single cross combination within Heterotic Groups AxA and BxB for practical use as female parent in three-way cross combination.
3. Identify four lines with good GCA to be used as Heterotic Group "C" or male parents in three-way cross combinations.
4. Evaluate the heterotic response of testers.

Grain mean yield across five locations was 6.9 t/ha, root lodging 19% and ear rot 11%. Differences in yield and the most important agronomic traits were statistically significant at individual and across locations. Yield responses showed differences in location mean yield from 8.0 t/ha in Cotaxtla, Mexico to 6.2 in Las Vegas, Guatemala. Trial in Turipana, Colombia and Suwan, Thailand averaged 2.0 t/ha and were not considered in across location analysis.

Ear rot and root lodging at individual locations were very important at Las Vegas, Guatemala, Suwan, Thailand, Cotaxtla and Poza Rica, Mexico.

The maximum yield, 10 t/ha was obtained at Cotaxtla and the minimum 2.8 t/ha at Las Vegas. Lower yields were observed at Turipana and Suwan (Tables A184 to A191).

Table 59 shows the performance of the superior 8 crosses that outyielded the seed industry checks across five locations by 1.4 to 2.3 t/ha. Yield potential of yellow hybrids tested in this trial looks very exciting.

Entries 46, 48 and 42 outyielded the RE entry CML287 x CML413 by 12% and seed industry checks Pioneer 3018, HS-8, Pioneer 3031, X-304C and HS-6 by 35% (Table A191).

CLOG2617 x CML287 yielded 8.6 t/ha across locations, 9.8 t/ha at Poza Rica, 9.5 t/ha at Cotaxtla, 7.8 t/ha at Las Vegas, Guatemala, 7.1 t/ha at Yucatan, Mexico and 8.7 t/ha at El Ejido, Panama, ranking 2^{nd}, 3^{rd}, 3^{rd}, 10^{th} and 1^{st} in the same countries.

Good performance across and individual locations (Tables A184 to A191). This performance demonstrates the yield stability built in this germplasm and the suitability for adaptation to tropical environments.

Entries 46, 48 and 42 across locations and the best two entries at individual locations will be tested in CHTTY.

These new hybrids can effectively be used in the tropical environments in Mexico, Central America and South America. R-5 should test them including the inbred parents to enhance maize productivity in Panama, Colombia, Peru, Bolivia, Brazil, Paraguay countries growing yellow corn.

Entries 46, 48 and 18 could be used as female parents in TWC hybrids. Lines 19, 22 and 3 showed the highest GCA estimate (Table 60) and should be used as male parents in TWC hybrids.

Lines 19, 22, 9, 3, 16, 5, 4 and 21 all with positive GCA estimates will form a new synthetic yellow variety.

Table 59. TSCY_99B14. Mean data of top 8 yielding tropical late yellow single crosses. Across 5 locations

Poza Rica, Cotaxtla, Uxmal; México, Las Vegas; Guatemala, El Ejido; Panama. 1999 B

Ent	PEDIGREE		Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	PA	Ru	BH	NE	NP	ER	M
			t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	1-5	%	#	#	%	%
46	CL-G2617	x CML-287	7.90	8.56	56	57	0.5	263	147	0.56	0.99	18.6	7.7	2.7	2.9	2.1	14.1	24	24	7.7	19.6
48	CL-G2620	x CML-287	7.75	8.41	56	55	-1.2	267	141	0.53	0.97	8.8	3.1	2.6	3.0	1.8	11.7	23	24	7.8	19.8
42	CL-RCY005	x CML-287	7.63	8.20	57	57	0.6	258	144	0.56	0.97	20.3	2.9	2.7	2.8	2.1	7.8	24	25	6.9	19.7
40	CL-RCY003	x CML-287	7.59	7.81	55	55	-0.9	259	148	0.58	1.01	14.3	11.5	2.9	2.9	2.2	2.6	24	24	2.8	18.6
44	CL-IBP3001	x CML-287	7.53	8.24	56	57	0.2	274	154	0.56	0.98	26.2	0.7	3.0	3.4	2.2	26.3	25	25	8.5	19.6
18	CL-RCY004	x CML-287	7.40	7.82	57	57	-0.6	278	152	0.54	0.97	28.7	7.2	3.0	3.2	1.8	17.7	24	24	5.5	18.9
7	CL-IBP4001	x CML-287	7.23	7.67	57	57	0.4	269	155	0.58	0.99	19.5	9.5	2.7	3.1	2.2	14.5	25	25	5.7	20.4
35	CL-TCY006	x CML-287	7.14	7.86	54	54	-0.4	272	146	0.54	0.97	24.2	3.5	2.8	3.1	2.2	8.4	23	24	9.1	17.9
52	CML287	x CML-413	7.12	7.72	57	57	0.2	265	149	0.57	0.94	28.7	11.7	3.1	3.0	2.2	18.5	23	25	7.7	18.7
53	LOCAL CHECK1		4.65	5.92	53	55	0.5	253	137	0.54	0.97	4.4	17.0	3.5	3.2	2.5	12.8	22	22	21.5	18.3
54	LOCAL CHECK2		5.27	6.35	55	56	1.5	249	130	0.52	0.94	5.7	9.3	3.5	3.3	2.3	11.3	21	22	17.0	18.2
		LSD 0.05		0.88	1.1	1.4	1.0	9.8	8.1	0.03	0.07	22.8	13.8	0.4	0.5	0.6	14.7	1.9	1.6	7.0	1.7
		CV %		11.35	1.6	1.9	3.3	3.6	5.1	5.51	9.08	13.6	9.9	11.5	8.9	17.4	11.6	8.6	5.9	9.8	7.8
		CORRELATION WITH Yd2			-0.2	0.20	0.34	-0.3	-0.15	-0.47	0.26	0.15	-0.18	-0.3	0.37	0.24	0.14	-0.2	0.25	-0.45	0.12

Table 60. TSCY_99B14. GCA & SCA effects for yield (t/ha) of 13 tropical late yellow lines by two testers

Poza Rica, Cotaxtla, Uxmal; México, Las Vegas; Guatemala, El Ejido; Panama. 1999 B. Across 5 locations.

Lin		Yd1	Yd2	Yd2	DIFF	Yd2		SCA	SCA	MF	FF	PH	EH	EH/	RL	SL	EA	BH	NE	NP	ER
no	PEDIGREE LINES	t/ha	T1	T2	T1-T2	t/ha	GCA	T1	T2	days	days	cm	cm	PH	%	%	1-5	%	#	#	%
19	(CL-02709*v)-B-B-B-1-1-B	7.02	8.20	7.22	0.98	7.71	0.75	0.05	-0.05	57	58	255	144	0.56	19.2	6.5	2.9	6.4	24	25	9.0
22	G26 C26 HS402-1-2-B-3-B-B	6.95	8.41	6.84	1.57	7.62	0.66	0.35	-0.35	57	57	258	142	0.55	11.0	3.1	3.0	11.6	23	24	9.0
9	(CL-02432*CL02821)-B-7-B-5-2-1-B	7.04	7.82	7.14	0.68	7.48	0.52	-0.10	0.10	57	57	269	151	0.56	33.2	12.4	3.1	13.9	23	24	6.0
3	G26 C25HS45-3-4-1-5-B-B-B-B-B-B	6.43	7.06	7.91	-0.85	7.48	0.52	-0.86	0.86	54	55	260	139	0.54	6.9	7.4	3.2	33.6	23	25	14.2
16	(CML-52*CL02821)-B-6-B-1-2-3-B	6.81	7.76	7.03	0.72	7.39	0.43	-0.08	0.08	57	58	254	150	0.59	31.2	4.3	3.1	29.1	23	24	7.8
5	G9B C1 TSR-12P-1P-1P-2-B-1-B-B-B-B-B-B	6.58	7.80	6.83	0.96	7.31	0.35	0.05	-0.05	55	56	257	139	0.54	14.8	7.9	3.1	15.1	23	24	10.0
4	IBP-4 C0 MH348-2-1-2-BB-B-B-B-B-B	6.83	7.67	6.96	0.71	7.31	0.35	-0.08	0.08	58	58	259	152	0.59	19.5	8.6	2.9	8.7	24	25	6.6
21	G26 C26 HS1-2-1-B-1-1-B-B	6.63	8.56	6.01	2.55	7.28	0.32	0.84	-0.84	56	57	259	147	0.57	13.1	4.2	3.2	11.9	23	23	9.2
11	(CL02821*CML-249)-B-1-B-1-1-1-B	6.49	7.45	7.10	0.35	7.27	0.31	-0.26	0.26	56	56	259	148	0.57	25.0	19.9	3.2	21.9	24	25	10.8
20	IBP-3 C1 MH226-1-1-B-1-1-1-B	6.72	8.24	6.26	1.98	7.25	0.28	0.55	-0.55	57	58	268	153	0.57	19.5	3.8	3.2	21.4	25	25	7.1
12	(CL02821*CML-285)-B-8-B-1-B-B	6.42	6.61	7.69	-1.08	7.15	0.18	-0.98	0.98	58	59	263	150	0.57	30.4	6.4	3.0	9.4	21	23	10.2
13	(CL02821*CL02438)-B-1-B-1-2-2-B	6.21	7.50	6.74	0.77	7.12	0.16	-0.05	0.05	54	54	252	138	0.55	17.9	8.4	3.3	54.4	24	25	12.8
10	(CL02821*CL02131)-B-4-B-4-2-1-B	6.35	7.13	6.89	0.24	7.01	0.04	-0.32	0.32	56	57	252	142	0.56	23.6	15.8	3.1	16.8	23	24	9.4
			7.40	6.53		6.96															
	GCA testers		0.32	-0.32																	

TESTERS

T1 : CML-287

T2 : CML-413

Cross L21 x T1 and L3 x T2 showed the highest heterotic responses (SCA = 0.83 and 0.86 respectively). L3 could effectively substitute CML287 as tester (Table 60).

Evaluation of early generation testcrosses among tropical white late lines and two testers - TSCW99B15, TSCW99B16 and TSCW99B17.

Experiment TSCW99B15 includes the evaluation of 224 early generation testcrosses among 112 S_3 tropical white late lines and testers CML247 and CML254. The S_3 lines were derived from different F_2 pedigree breeding populations between Elite x Elite, Heterotic Group "A" and "B" lines.

The 224 testcrosses plus 6 checks were included in an alpha lattice design 10x23 with 2 replications.

Experiment TSCW99B16 includes the evaluation of 120 early generation testcrosses among 120 TLW S_3 lines and CML247. The 120 testcrosses plus 5 checks were included in a 5x25 alpha lattice design with 2 replications.

Experiment TSCW99B17 includes the evaluation of 138 early generation testcrosses among 138, S_3 TLW lines and CML254. The 138 testcrosses plus 6 checks were included in a 12x12 alpha lattice design with 2 replications per location. Plot size for all three experiments was only five meters long rows.

All three experiments were planted in three locations: Poza Rica, Cotaxtla and Uxmal, Mexico.

The 370 S_3 TLW lines included the three experiments were derived from F_2 pedigree population parents in the Elite x Elite population and were selected within and between Heterotic Groups, good GCA and disease resistance.

Objectives:

1. Identify the 20% superior lines with good GCA to move to advanced generation.
2. Separate lines according to their response to Heterotic Groups.
3. Identify superior crosses to follow up to advance generation.

2.37 TSCW99B15

Table 61 shows the best 8 performing (S_3 x Tester) entries 170, 188, 201, 219, 190, 162, 154 and 158 outyielded the CML247 x CML254 and best seed industry check with 13 to 31%.

Entry 170 yielded 9.5 t/ha across locations and 12.0 t/ha at Poza Rica.

The best 20 lines with good GCA estimates are shown in Table 62. Note that the estimates rank from 0.72 to 1.5 t/ha. This confirms our hypothesis that our efforts in breeding against biotic and abiotic constraints is helping us to increase the frequency of good lines in our F_2 population by the effective selection of inbred parents for Elite x Elite combination.

Table 61. TSCW_99B15. Mean data of best 10 tropical late white single crosses. Across 3 Locations

Poza Rica, Cotaxtla, Uxmal; México. 1999 B.

Ent no	PEDIGREE		Yd1 t/ha	Yd2 t/ha	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	BH %	NE #	NP #	ER %
170	(CL-04326*CML-36)-B-8-1	x CML-254	9.15	9.54	59	59	0.1	272	154	0.57	1.8	1.3	2.7	7.3	26	27	4.1
96	P32-SR C1 F2 S1-34-1	x CML-254	9.15	9.35	58	58	-0.1	264	166	0.63	4.8	1.2	2.4	4.0	26	27	2.2
219	(LA POSTA SEQC3-H17-1-2-3-2-1-#-# x LPS Syn)-9-1-2-1	x CML-247	9.07	9.21	60	59	-0.5	243	140	0.57	3.8	0.6	2.8	25.7	25	26	1.6
30	[98(L/LMBR)11-F2-S8B x [CML 9]-1]-21-2-1	x CML-254	8.93	9.10	59	58	-0.5	261	142	0.54	13.7	0.6	2.5	12.5	25	26	1.9
124	(CL-02170*CML-274)-B-15-3	x CML-254	8.79	9.15	58	58	0.2	267	147	0.56	3.1	0.0	2.4	3.2	27	27	3.9
40	[98(L/LMBR)11-F2-S8B x [CML 9]-1]-29-1-2	x CML-254	8.77	9.18	59	58	-0.8	255	146	0.57	1.2	1.3	2.5	15.3	25	26	4.4
188	(SPLC7F183-1-2-1x SPL Syn)-2-1-2-1	x CML-254	8.75	9.69	58	58	-0.1	260	148	0.57	0.0	0.6	3.4	23.0	34	27	9.7
42	[98(L/LMBR)11-F2-S8B x [CML 9]-1]-29-2-3	x CML-254	8.74	9.51	58	58	-0.4	264	151	0.57	1.9	0.6	3.1	4.6	25	26	8.0
72	**[98(L/LMBR)11-F2-S8B x [CML 9]-1]-129-4-1**	**x CML-254**	8.74	9.14	58	57	-0.6	263	146	0.55	5.5	2.4	3.0	22.3	25	27	4.5
202	(SPLC7F52-1-3-1x SPL Syn)-6-1-1-3	x CML-254	8.65	8.74	57	57	0.0	250	143	0.57	4.4	3.1	2.9	8.9	26	26	1.0
225	CML247	x CML-254	7.80	8.05	58	58	0.2	242	140	0.57	3.3	0.6	2.7	6.0	25	26	3.1
227	H 513 (PRONASE)		6.46	6.82	58	58	0.4	255	131	0.51	1.9	0.6	3.3	5.3	20	26	5.2
230	LOCAL CHECK3		7.99	8.34	58	58	0.0	251	144	0.57	8.4	1.9	3.0	4.9	24	26	4.2
		LSD 0.05		1.53	2.0	1.6	1.4	19.4	15.2	0.1	10.1	4.0	0.8	25.6	2.7	1.7	10.2
		CV %		10.76	2.3	1.7		4.3	6.8	9.8	10.9	7.3	14.9	11.5	8.8	6.0	10.4
		CORRELATION WITH Yd2			-0.28	0.19	-0.32	0.07	0.02	-0.03	-0.17	-0.20	0.15	0.61	0.07	-0.10	-0.4

Table 62. TSCW_99B15. GCA & SCA effects for yield (t/ha) of 16 tropical late white lines by two testers

Poza Rica, Cotaxtla, Uxmal; México. 1999 B. Across 3 locations.

Lin no	PEDIGREE LINES	Yd1 t/ha	Yd2 T1	Yd2 T2	DIFF T1-T2	Yd2 t/ha	*GCA*	SCA T1	SCA T2	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	BH %	NE #	ER %
94	(SPLC7F183-1-2-1x SPL Syn)-2-1-2-1	8.51	8.95	9.69	-0.75	9.32	*1.49*	*0.07*	*-0.07*	58	255	146	0.57	1.2	3.2	3.2	28.8	30	8.6
77	(CL-02303*CML-258)-B-19-4	8.34	8.68	9.21	-0.52	8.95	*1.12*	*0.18*	*-0.18*	58	263	151	0.57	4.2	1.9	2.7	17.9	24	6.8
75	(CML-258*CML-273)-B-55-1	7.97	8.65	8.90	-0.26	8.78	*0.95*	*0.31*	*-0.31*	59	263	152	0.58	3.2	0.6	2.9	21.5	24	9.3
110	(LA POSTA SEQC3-H17-1-2-3-2-1-#-# x LPS Syn)-9-1-2-1	8.52	9.21	8.28	0.93	8.75	*0.92*	*0.90*	*-0.90*	59	256	146	0.57	1.9	0.3	2.7	14.1	25	2.7
101	(SPLC7F52-1-3-1x SPL Syn)-6-1-1-3	8.58	8.75	8.74	0.01	8.74	*0.92*	*0.44*	*-0.44*	57	244	138	0.56	5.0	2.5	2.8	9.2	25	1.9
6	SINT.MAZ.LARGAC2S1-32-2-3-1	8.49	8.71	8.77	-0.06	8.74	*0.92*	*0.41*	*-0.41*	59	264	152	0.58	1.9	0.3	2.7	5.0	24	2.8
95	(SPLC7F183-1-2-1x SPL Syn)-2-1-4-6	8.27	8.35	9.08	-0.72	8.72	*0.89*	*0.08*	*-0.08*	58	253	138	0.55	5.6	1.6	2.9	13.2	26	5.0
85	(CL-04326*CML-36)-B-8-1	8.19	7.89	9.54	-1.64	8.71	*0.89*	*-0.38*	*0.38*	60	267	152	0.57	9.8	2.5	2.8	10.9	25	6.2
91	(CML-264*CL-02510)-B-33-4	8.39	8.61	8.75	-0.14	8.68	*0.85*	*0.37*	*-0.37*	59	268	148	0.55	5.7	0.3	2.9	8.6	25	3.3
111	(LA POSTA SEQC3-H17-1-2-3-2-1-#-# x LPS Syn)-9-1-2-3	8.20	9.08	8.25	0.83	8.67	*0.84*	*0.85*	*-0.85*	59	262	146	0.55	3.8	0.3	2.7	9.9	26	5.3
106	(LA POSTA SEQC3-H17-1-2-3-1-4-#-# x LPS Syn)-6-1-3-3	8.28	8.64	8.66	-0.03	8.65	*0.83*	*0.43*	*-0.43*	59	258	147	0.57	2.2	1.6	3.0	10.5	26	4.3
21	[98(L/LMBR)11-F2-S8B x [CML 9]-1]-29-2-3	7.91	7.77	9.51	-1.74	8.64	*0.81*	*-0.43*	*0.43*	58	257	144	0.56	6.6	0.3	3.3	7.7	25	8.5
62	(CL-02170*CML-274)-B-15-3	7.78	8.10	9.15	-1.05	8.63	*0.80*	*-0.09*	*0.09*	58	264	147	0.56	14.4	0.9	3.0	16.3	26	10.2
64	(CL-02170*CML-274)-B-24-1	7.59	8.17	8.99	-0.82	8.58	*0.76*	*0.03*	*-0.03*	58	257	147	0.57	0.6	0.7	3.2	27.5	26	11.7
20	[98(L/LMBR)11-F2-S8B x [CML 9]-1]-29-1-2	7.94	7.93	9.18	-1.25	8.55	*0.73*	*-0.18*	*0.18*	57	249	140	0.56	5.1	0.6	2.9	17.0	25	7.4
48	P32-SR C1 F2 S1-34-1	8.29	7.73	9.35	-1.62	8.54	*0.72*	*-0.37*	*0.37*	58	252	155	0.62	3.2	3.0	2.7	8.1	24	3.0
	MEAN		7.39	8.26		7.82													
	GCA testers		-0.44	0.44															

TESTERS

T1 : CML-247

T2 : CML-254

These 20 lines will be advanced to S_6 for advanced generation testing. Lines 94, 77, 85, 95, 81, 83 are aligned to Heterotic Group "B" lines 107, 91 to Heterotic Group "A" and 75, 80 have good general combining ability (Table 63).

Entries 170, 188, 201, 219, 190 and 162 will be recorded in advanced generation to confirm the effectiveness of early generation testing and to develop new hybrids. Seed will be increased to test in second stage trials (Tables A192 to A195).

2.38 TSCW99B16

The majority of F_2 populations were the lines derived from Heterotic Group "A", therefore we used only CML247 as tester.

Superior entries in these experiments are 76, 38, 79, 23, 37, 99, 81, 82, 71 and 92 that yielded 9.74 t/ha to 8.7 t/ha (Table 63).

(CML254* CML271)-B-12-2 x CML247 and (CML277 x CML36)-B-13-2 x CML242 yielded 9.7 and 9.5 t/ha respectively and outyielded the RE: CML247 x CML254 and the seed industry D.9820.

The best 15 lines Heterotic Group "A" that combined well with CML247 will be advanced to S_6 for advanced test crosses and hybrid formation. Tables (A196 to A199), present the information at individual locations.

2.39 TSCW99B17

This trial included S_3 lines derived from F_2 populations Heterotic Group "B", therefore only CML254 was used as tester.

Table 64 shows the best 10 entries in this experiment across locations 135, 116, 103, 88, 112, 105, 92, 93, 95 and 86. Yield from 10.5 to 9.29 t/ha outyielded RE: CML247 x CML254 and the best seed industry check D.9820 yielded 15% to 33%. Superior hybrids also showed root lodging and ear rot resistance.

Entries 135, 116 and 103 topped the trial across locations at individual locations yielding 12.4, 11.7 and 11.6 t/ha respectively at Poza Rica. 10.0, 8.96 and 10.2 t/ha respectively at Cotaxtla and 9.5, 8.7 and 7.8 t/ha respectively at Uxmal (Tables A200 to A203). This performance shows again the yield stability and the increased frequency of good lines derived from recycling F_2 pedigree populations.

Yield performance and combining ability of early generation testcrosses among tropical late yellow S_3 lines and testers.

These experiments include the evaluation of the following projects:

TSCY99B18

35 S_3 tropical yellow late lines, derived from recycling F_2 Elite x Elite yellow lines selected within and between Heterotic Groups were test crossed to tester CML 287

Table 63. TSCW_99B16. Mean data of top 10 yielding tropical late white lines by one tester. Across 3 locations
Poza Rica, Cotaxtla, Uxmal; México. 1999 B.

Ent	PEDIGREE		Yd1	Yd		MF	FF		PH	EH	EH/	E/P	RL	SL	EA	ER	BH	NE	NP	ER	M
			t/ha	t/ha	GCA	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	%	#	#	%	%
76	(CML-254*CML-271)-B-12-2	x CML-247	9.28	9.74	1.78	59	60	-0.1	254	153	0.60	0.93	1.2	1.3	2.3	1.4	8.3	24	26	4.7	21.3
38	(CML-277*CML-36)-B-13-2	x CML-247	9.22	9.50	1.55	56	56	-0.2	268	152	0.57	0.96	0.7	2.0	2.6	1.5	11.3	24	25	2.9	21.4
79	(CML-254*CML-271)-B-22-3	x CML-247	9.00	9.27	1.32	59	60	0.3	245	143	0.59	0.96	5.6	1.9	2.7	1.7	19.7	25	26	2.9	23.1
23	(CML-271*CML-254)-B-14-2	x CML-247	8.96	9.35	1.40	58	58	-0.4	244	138	0.56	0.98	0.0	0.7	2.4	1.5	17.8	25	26	4.1	21.7
37	(CML-277*CML-36)-B-13-1	x CML-247	8.95	9.21	1.26	57	57	0.1	252	141	0.55	0.94	2.5	1.9	2.6	1.6	9.5	25	26	2.9	20.3
99	(CML-264*CL-02510)-B-33-1	x CML-247	8.81	9.07	1.12	57	57	0.1	259	137	0.53	0.95	9.0	0.0	3.2	2.0	33.6	25	26	2.9	21.8
81	(CML-254*CML-271)-B-31-2	x CML-247	8.55	9.04	1.08	59	59	-0.3	245	135	0.56	0.92	1.9	1.9	2.7	1.9	40.0	24	26	5.4	23.0
82	(CML-254*CML-271)-B-33-2	x CML-247	8.53	8.72	0.76	59	58	-0.8	245	147	0.60	0.90	15.2	1.9	2.8	1.8	21.3	24	27	2.2	21.5
71	(CL-03208*CL-02131)-B-11-1	x CML-247	8.47	9.39	1.43	59	59	0.6	262	151	0.58	0.93	5.7	0.0	2.8	1.8	42.7	24	26	9.8	19.5
92	(CL-04326*CML-36)-B-22-2	x CML-247	8.44	8.75	0.80	57	57	-0.2	262	154	0.59	0.94	1.9	0.6	2.7	1.7	9.7	24	26	3.5	20.8
121	CML247	x CML-254	8.77	9.06		58	58	-0.3	243	141	0.58	0.95	4.4	0.0	2.5	1.4	13.9	25	26	3.1	22.8
122	(CML247 x CML254)	x P73R1-#B	8.01	8.45		56	56	-0.5	262	139	0.53	0.96	5.1	4.5	3.3	2.0	30.0	25	26	5.2	20.9
125	LOCAL CHECK EXP9820 (DEKALB)		7.71	8.50		57	57	0.3	253	139	0.55	0.92	6.0	3.9	3.0	2.2	16.0	24	26	9.3	18.7
		LSD 0.05		1.40		1.2	1.4	1.1	12.2	12.7	0.0	0.1	11.6	3.7	0.6	0.7	20.4	2.8	1.7	10.6	2.2
		CV %		10.76		1.5	1.9	3.4	3.6	6.8	6.2	8.1	14.7	7.3	11.4	18.4	10.0	8.2	4.7	11.0	6.7
		CORRELATION WITH Yd2				0.22	0.09	0.29	0.11	0.19	-0.17	-0.02	0.20	0.02	-0.4	0.27	0.68	-0.2	-0.1	0.69	0.18

Table 64. TSCW_99B17. Mean data of top 10 yielding tropical late white lines by one tester. Across 3 locations
Poza Rica, Cotaxtla, Uxmal; México. 1999 B.

Ent	PEDIGREE		Yd1	Yd2	MF	FF	PH	EH	EH/	E/P	RL	SL	EA	BH	ER	M
			t/ha	t/ha	days	days	cm	cm	PH		%	%	1-5	%	%	%
135	(LA POSTA SEQC3-H17-1-2-3-2-1-##x LPS Syn)-29-3--1	x CML-254	10.06	10.54	59	58	288	171	0.59	1.10	1.2	2.5	2.6	5.7	4.5	22.3
116	(SPLC7F210-2-3-1x SPL Syn)-4-2-1-2	x CML-254	9.52	9.77	60	59	265	150	0.56	1.26	0.7	0.6	3.0	8.6	2.5	21.0
103	(CLG2409*CML-247)-B-16-1	x CML-254	9.47	9.87	59	59	275	164	0.59	0.96	3.7	2.5	2.8	8.2	4.0	20.4
88	(CL-02303*CML-258)-B-40-2	x CML-254	9.41	9.73	59	58	268	150	0.56	1.01	0.0	0.0	2.4	3.2	3.3	23.1
112	(CL-02182*CML-247)-B-10-4	x CML-254	9.32	9.68	59	58	263	144	0.55	0.98	0.6	0.6	2.8	23.3	3.6	21.5
105	(CLG2409*CML-247)-B-19-1	x CML-254	9.26	9.25	58	58	263	164	0.63	1.01	1.2	1.3	2.5	2.6	-0.1	22.1
92	(CL-02303*CL-02131)-B-1-1	x CML-254	9.20	9.44	58	58	272	161	0.59	1.01	0.0	0.7	2.7	6.0	2.5	22.1
93	(CL-02303*CL-02131)-B-8-3	x CML-254	9.20	9.74	58	58	271	164	0.60	0.96	0.6	1.9	2.4	11.0	5.5	21.9
95	(CL-02303*CL-02131)-B-30-2	x CML-254	9.16	9.54	60	60	279	157	0.56	0.97	0.0	0.6	3.0	7.4	3.9	21.7
86	(CL-02303*CML-258)-B-19-1	x CML-254	9.07	9.29	59	59	274	161	0.58	0.92	10.4	0.0	2.6	9.7	2.4	22.8
139	CML247	CML-254	8.01	8.08	59	58	248	141	0.57	1.00	4.6	1.3	2.8	10.6	0.9	23.3
140	(CML247 x CML254)	P73R1-#B	6.51	7.11	56	56	261	146	0.56	0.93	13.5	11.1	3.8	23.8	8.4	20.4
141	H 513 (PRONASE)		6.33	6.95	57	58	260	126	0.48	0.90	1.6	1.3	3.4	4.6	8.9	22.5
144	LOCAL CHECK EXP9820 (DEKALB)		7.15	7.90	58	57	260	150	0.58	0.95	2.6	7.1	3.8	11.3	9.5	19.7
		LSD 0.05		1.27	1.6	1.1	12.2	11.4	0.0	0.0	7.2	4.7	0.6	14.1	5.5	1.9
		CV %		10.81	2.2	1.5	3.7	6.3	5.7	5.6	10.0	8.6	15.3	13.0	12.7	6.7
		CORRELATION WITH Yd2			-0.4	-0.46	-0.3	-0.10	-0.12	0.31	0.09	0.15	-0.21	0.05	0.18	-0.16

(Heterotic Group "A") and tester CML413 (Heterotic Group "B"). The 70 early generation of testcrosses were included in an 8x9 alpha lattice design with 2 replications.

TSCY99B19

41 S_3 tropical yellow late lines, derived from recycling F_2 populations were testcrossed to CML 287. The 41 S_3 x tester testcrossed plus 4 checks were included in a 5x9 alpha lattice design with 2 replications.

TSCY99B20

70 S_3 tropical yellow late lines, derived from recycling F_2, Elite x Elite pedigree populations were testcrossed to CML413. The 70 plus two checks, S_3 x Tester early generation testcrosses were included in an 8x9 alpha lattice design with two replications, plot size was 1 row 5m long.

All three experiments were tested in Cotaxtla, Poza Rica and Uxmal, Mexico.

Objectives:

1. Identify the 20% superior lines with good GCA to move to advanced generation.
2. Separate lines according to their response to Heterotic Groups.
3. Identify superior crosses to follow up to advance generation.

2.40 TSCY99B18

Table 65 shows the performance of the best entries across three locations, entries 11, 27, 3, 33, 31, 29, 2 and 3 yielded: 8.0 to 9.6 t/ha: (CML285* CLO2410)-5-4-1 x CML287 and (CL2410 x CL2808)-B-39-1 x CML287 yielded 9.6 and 9.1 t/ha respectively, both testcrosses outyielded the RE CML287 x CML413 by 27 and 12% respectively.

The eight superior testcrosses outyielded Pioneer P3018, with yields from 33 to 60%. New testcrosses also showed resistance to ear rot while the check presented 16% rotten ears.

Yield stability was demonstrated by the performance across and at individual sites, entries 11, 27 and 33 ranked 1st, 2nd and 3rd across locations, 1st, 2nd and 3rd at Uxmal; 2nd, 3rd and 1st, at Cotaxtla and 4th and 2nd at Poza Rica, respectively.

The best entry (47) at Poza Rica, yielded 10.1 t/ha, at Cotaxtla (33) 9.7 t/ha and at Uxmal (11) = 10.0 t/ha (Tables 204 to 207).

S_3 lines 6, 16, 12, 2, 9, 5, 14, 3, showed high and positive GCA effects (1.39 to 0.38). They will be used for synthetic formation.

The best 15 lines with good GCA will be advanced to S_6-S_8 and tested under: ear rot, B. maydis, drought and low N - testcross (CML285* CML283)-B-39-3 x CML287 (AxA) showed the highest SCA = 0.94 estimate. (CML285* CML283)-B-15-1 x CML413, (AxB); (CML285 x CL2410)-B-4-1 x CML287 (AxA) also presented high and positive SCA=0.60 estimate, we will follow up their performance in hybrid combination in advance generations (Table 66).

Table 65. TSCY_99B18. Mean data of top 8 yielding tropical late yellow single crosses. Across 3 Locations

Poza Rica, Cotaxtla, Uxmal; México. 1999 B

Ent	PEDIGREE			Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	ER	BH	NE	NP	ER
				t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	%	#	#	%
11	(CML-285*CL-02410)-B-4-1	x	CML-287	8.89	9.62	58	57	-1.5	262	161	0.63	0.95	7.4	3.3	2.4	1.8	15.9	24	25	7.6
27	(CML-285*CML-283)-B-39-1	x	CML-287	8.76	9.03	57	57	-0.3	284	156	0.55	0.99	7.4	5.0	2.4	1.6	5.8	26	26	2.9
3	IBP-3(TYD)C2S1-49-1-4-1	x	CML-287	8.21	8.41	57	56	-0.7	280	159	0.57	0.92	11.5	3.2	2.7	1.5	14.3	23	25	2.4
33	(CML 226 x CML 295)-62-2-1	x	CML-287	8.06	8.44	56	55	-1.1	284	160	0.56	0.96	32.8	3.1	2.6	1.7	14.5	25	26	4.5
31	(CL-2410*CL-2808)-B-17-2	x	CML-287	8.05	8.73	56	56	0.0	278	153	0.54	0.97	6.0	2.6	2.9	1.9	37.7	26	27	7.8
24	(CML-285*CML-283)-B-15-1	x	CML-413	7.80	8.19	56	56	0.7	261	146	0.56	0.91	3.7	0.0	3.0	1.8	19.4	24	26	4.7
2	(CL-02142*CL-02821)-B-6-1-1-4-1	x	CML-413	7.75	8.13	57	58	1.1	267	150	0.56	0.97	4.3	1.9	3.0	1.8	13.4	25	26	4.7
63	(G26 Seq.C3-83-2-1-1-1 x G26SEQ. Syn)-16-1-1-1	x	CML-287	7.60	8.05	55	55	-0.7	266	156	0.58	1.01	6.9	3.4	3.1	1.8	33.2	25	25	5.6
71	CML-287	x	CML-413	7.31	7.58	57	56	-0.6	277	159	0.57	0.94	26.7	6.9	2.9	1.8	43.5	23	24	3.6
72	LOCAL CHECK-1 P3018 (PIONEER)			5.02	5.92	54	55	0.7	268	146	0.55	0.87	8.1	7.3	3.6	2.9	12.7	19	22	15.3
	LSD 0.05				1.94	1.2	1.6	1.4	20.0	13.2	0.0	0.1	24.3	10.5	0.6	0.6	21.9	5.0	4.6	8.1
	CV %				14.33	1.9	2.2	3.9	5.6	6.8	7.2	8.8	16.5	11.0	14.1	23.2	13.9	10.5	6.5	11.8
	CORRELATION WITH Yd2					0.05	0.32	0.03	-0.40	-0.49	-0.33	0.02	0.32	-0.19	0.15	0.66	0.10	-0.41	0.11	-0.25

Table 66. TSCY_99B18. GCA & SCA effects for yield (t/ha) of top 8 tropical late yellow Lines. Across 3 Locations

Poza Rica, Cotaxtla, Uxmal; México. 1999 B

Lin		Yd	Yd2	Yd2	DIFF	Yd2		SCA	SCA	MF	FF	PH	EH	EH/	RL	SL	BH	NE	NP	ER
no	PEDIGREE LINES	t/ha	T1	T2	T1-T2	t/ha	GCA	T1	*T2*	days	days	cm	cm	PH	%	%	%	#	#	%
6	(CML-285*CL-02410)-B-4-1	7.82	9.62	7.52	2.10	8.57	1.39	0.60	-0.60	58	57	264	158	0.61	9.3	5.2	16.5	24	25	8.9
16	(CL-2410*CL-2808)-B-17-2	7.49	8.73	7.76	0.97	8.25	1.06	0.04	-0.04	56	57	268	150	0.56	6.6	1.3	36.8	25	26	9.3
12	(CML-285*CML-283)-B-15-1	7.52	7.87	8.19	-0.32	8.03	0.84	-0.61	0.61	56	56	267	148	0.55	5.6	0.6	29.8	24	26	6.4
2	IBP-3(TYD)C2S1-49-1-4-1	7.65	8.41	7.28	1.14	7.84	0.66	0.12	-0.12	57	57	270	154	0.57	11.6	3.5	14.4	23	25	2.5
9	(CML-285*CML-27)-B-8-1	7.24	7.85	7.64	0.20	7.74	0.56	-0.35	0.35	57	57	267	152	0.57	5.8	6.2	9.0	25	26	6.5
5	(CL-02410*CL-00356)-B-7-1	7.10	8.01	7.34	0.67	7.68	0.49	-0.11	0.11	57	56	268	154	0.57	3.0	3.5	17.9	25	26	7.5
14	(CML-285*CML-283)-B-39-1	7.18	9.03	6.26	2.77	7.65	0.46	0.94	-0.94	58	58	267	148	0.56	7.1	5.8	4.2	24	26	6.7
3	IBP-4(TYF)C2S1-53-3-3-1	7.00	7.86	7.28	0.58	7.57	0.38	-0.16	0.16	58	58	271	162	0.61	26.0	0.6	19.1	23	25	7.6
24	(AC8328BNC5-35-2-2-1-1 x AC8328BN Syn)-7-3-1-2	6.90	8.42	6.68	1.74	7.55	0.37	0.42	-0.42	57	56	265	144	0.55	2.5	13.0	20.1	24	25	8.4
25	(AC8328BNC5-35-2-2-1-1 x AC8328BN Syn)-8-1-2-3	7.01	7.76	7.33	0.43	7.54	0.36	-0.23	0.23	56	56	263	149	0.57	3.8	7.1	8.8	24	26	7.0
27	(AC8328BNC5-35-2-2-1-1 x AC8328BN Syn)-15-3-1-4	7.08	7.40	7.58	-0.17	7.49	0.31	-0.53	0.53	56	56	276	150	0.54	2.8	4.1	28.4	24	26	5.5
13	(CML-285*CML-283)-B-15-2	6.68	7.49	7.23	0.26	7.36	0.17	-0.32	0.32	57	57	267	146	0.55	3.2	2.1	10.5	24	25	9.1
1	(CL-02142*CL-02821)-B-6-1-1-4-1	6.77	6.52	8.13	-1.61	7.32	0.14	-1.25	1.25	57	58	273	148	0.54	14.0	2.3	12.9	25	26	7.9
23	(AC8328BNC5-35-2-2-1-1 x AC8328BN Syn)-7-3-1-1	6.73	7.92	6.71	1.21	7.32	0.13	0.16	-0.16	56	56	272	143	0.53	1.3	7.7	15.8	24	25	8.1
15	(CML-285*CML-283)-B-51-1	6.93	7.49	6.96	0.53	7.22	0.04	-0.18	0.18	57	57	265	150	0.57	17.4	3.0	14.4	23	25	4.2
26	(AC8328BNC5-35-2-2-1-1 x AC8328BN Syn)-15-3-1-1	6.81	7.47	6.93	0.54	7.20	0.01	-0.18	0.18	56	57	275	151	0.55	2.5	7.5	28.9	24	26	5.4
	MEAN		7.63	6.74		7.18														
	GCA testers		0.45	-0.45																

TESTERS

T1 : CML-287
T2 : CML-413

2.41 TSCY99B19

Table 67 shows the mean hybrids and agronomic traits of the superior 8 entries across locations. Entries 9, 7, 40 yielded 8.6 t/ha and outyielded RE: CML287 x CML413 and Pioneer 3018 by 18% and 46% yield respectively. Entries 9 and 7 ranked 1st and 2nd across locations, 4th and 3rd at Poza Rica; 2nd and 6th at Cotaxtla and 2nd, 3rd at Uxmal. Entry 38 yielded 8.3 t/ha at Uxmal. Entry14 yielded 9.6 t/ha at Cotaxtla and Entry 27 yielded 10.4 t/ha at Poza Rica (Tables A208 to A211).

The best 15 lines Heterotic Group A and A showing the best SCA with CML286 will be advanced to S_6-S_8 for advanced testcrosses and hybrid combination.

2.42 TSCY99B20

Table 68 presents the mean yields and agronomic traits of the best 8 entries: 64, 68, 31, 8, 32, 22, 41, 65 (CLO2410* CML287)-B-6-3 x CML413 (AxB); (CLO2410* CML287)-B-18-2 x CML413) (AxB); (CML226 x CML295)-73-3-3 x 413 (BxB) and (CLO2410* CML287)-B-9-1 x CML413 yielded similar to CML287 x CML413 and outyielded Pioneer 3018 by 41% to 48% yield. New superior testcrosses also presented good resistance to RL, SL and ER while hybrid check showed 22% ear rot damage, reducing the clean yield to 4.3 t/ha (Table 68).

Some entries showed good yield stability across locations and individual sites (Tables 212 to 215).

Best 14 lines Heterotic Group "A" showing good SCA estimates with CML413 will be advanced to S_6 for advanced testcrosses with new testers and selection of superior hybrid combinations.

2.43 Evaluation of early generation testcrosses among tropical white early maturity S_3 lines and one tester - TSCW99B21.

33 S_3 lines derived by recycling F_2 (AxB) Elite x Elite early maturing tropical white inbred lines were test crossed to CLO4935. The 33 S_3 x Tester progenies plus 3 checks were evaluated under alpha lattice design 6x6 with 2 replications, preliminary information from two locations, Poza Rica and Cotaxtla is presented here (Tables A216 to A218).

Table 69 shows the performance of the best entries: 10, 6, 8, 11, 4, 5, 7 and 3 testcrosses S_3 x CML04935.

The mean yield of this experiment was 8.05 t/ha and days to flower 51 days. The best entries showed from 8 to 9.3 t/ha and days to silk 51 to 53. A good yield potential considering days to maturity. New S_3 x Tester combination outyielded the RE: (CL51615* G1504)-B-12-1 x CLO4935 and (CLO4923* CL1504)-B-21-4 x CLO4935 yielded 9.3 and 8.8 t/ha respectively, 51 days to flower and resistance to ear rot.

Table 67. TSCY_99B19. Mean data of top 8 yielding tropical late yellow lines by one tester. Across 3 Locations
Poza Rica, Cotaxtla, Uxmal; México. 1999 B

Ent	PEDIGREE	Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	ER	BH	NE	NP	ER	M
		t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	%	#	#	%	%
9	(CL-03616*CL-00331)-B-15-1 x CML-287	8.20	8.61	57	56	-1.0	293	171	0.59	0.99	7.7	8.2	2.8	1.8	4.5	26	26	4.7	19.6
7	(CL-03616*CL-00331)-B-7-1 x CML-287	8.10	8.40	56	56	0.0	274	158	0.58	1.00	3.8	12.2	3.0	1.7	16.2	26	26	3.5	19.3
40	(CL-03616*CL-00331)-B-24-5 x CML-287	7.87	8.40	56	55	-0.8	283	173	0.61	0.97	3.8	10.7	3.1	1.9	21.8	24	25	6.3	19.8
38	(CL-03616*CL-00331)-B-24-1 x CML-287	7.76	8.23	57	56	-0.5	292	171	0.58	0.97	10.6	6.8	3.0	1.8	28.4	25	26	5.8	19.3
14	(CML-297*CL-2410)-B-26-1 x CML-287	7.73	8.27	56	55	-1.2	262	156	0.59	0.97	8.7	3.4	2.7	1.7	9.9	25	25	6.6	19.8
13	(CML-297*CL-2410)-B-22-1 x CML-287	7.65	7.82	57	57	-0.1	272	152	0.55	0.97	7.5	8.4	2.9	1.8	10.9	25	26	2.1	22.1
32	(CL-03616*CL-00331)-B-2-1 x CML-287	7.56	7.89	57	56	-0.8	291	164	0.56	0.92	9.1	2.2	2.9	1.6	39.6	22	25	4.2	18.2
36	(CL-03616*CL-00331)-B-21-2 x CML-287	7.49	7.95	57	56	-0.3	278	159	0.57	0.97	7.3	7.3	3.5	2.4	13.6	25	26	5.7	19.9
42	CML-287 x CML-413	6.92	7.25	58	58	0.2	280	170	0.60	0.93	20.2	7.0	3.2	1.7	14.4	24	26	4.4	20.0
43	CML285 x CML-287	6.58	7.00	56	56	-0.8	280	150	0.54	0.94	13.0	11.2	3.4	2.1	6.7	24	26	6.1	20.1
44	LOCAL CHECK 1	5.22	5.89	55	56	0.5	270	146	0.55	0.86	6.0	6.6	3.6	2.3	33.3	20	23	11.4	19.2
	LSD 0.05		1.40	1.2	1.4	1.0	18.4	18.1	0.1	0.1	13.9	12.2	0.6	0.5	21.1	3.1	1.9	7.2	1.8
	CV %		16.94	1.5	1.9		4.6	8.9	9.3	8.2	12.9	11.6	16.3	22.1	16.7	9.4	6.0	9.6	6.9
	CORRELATION WITH Yd2			-0.08	-0.37	0.42	0.19	0.01	-0.21	0.03	0.20	-0.29	-0.46	0.06	0.43	-0.37	-0.13	0.28	0.23

Table 68. TSCY_99B20. Mean data of top 8 yielding tropical late yellow lines by one tester. Across 3 Locations
Poza Rica, Cotaxtla, Uxmal; México. 1999 B

Ent	PEDIGREE	Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	PA	ER	BH	NE	NP	ER	M
		t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	1-5	%	#	#	%	%
64	(CL-02410*CML-287)-B-6-3 x CML-413	8.63	8.91	56	57	0.3	267	158	0.59	0.98	1.3	0.8	2.3	2.6	1.8	44.6	24	25	3.1	20.3
68	(CL-02410*CML-287)-B-18-2 x CML-413	8.33	8.57	56	56	0.3	251	149	0.59	0.92	0.0	0.0	2.6	2.5	1.7	29.7	23	25	2.8	21.5
31	(CML 226 x CML 295)-73-3-3 x CML-413	8.19	8.47	57	57	-0.2	256	148	0.58	0.93	0.9	0.9	3.0	2.6	2.1	46.7	22	24	3.3	19.3
8	(CL-02410*CML-287)-B-9-1 x CML-413	8.10	8.71	56	57	0.9	259	158	0.61	1.00	2.7	1.3	2.6	2.8	1.8	47.4	25	25	7.0	23.2
32	(CML 226 x CML 295)-73-3-4 x CML-413	7.94	8.45	56	57	0.5	245	148	0.60	0.97	2.7	5.7	2.8	2.6	1.8	24.8	25	26	6.1	19.5
22	(CL-2410*CL-2808)-B-2-1 x CML-413	7.79	8.25	56	57	1.0	259	159	0.61	1.15	1.9	6.1	5.8	2.9	1.8	32.1	28	25	5.6	19.9
41	(CML 226 x CML 295)-83-1-3 x CML-413	7.70	8.25	55	55	0.2	248	145	0.58	0.98	1.4	3.3	2.5	2.5	2.0	13.2	24	24	6.6	20.8
65	(CL-02410*CML-287)-B-8-1 x CML-413	7.69	7.91	57	57	0.2	254	153	0.60	0.89	2.6	6.1	2.4	2.5	1.6	19.3	22	25	2.8	21.5
70	CML-287 x CML-413	7.97	8.47	57	56	-0.3	272	162	0.59	0.93	7.4	9.2	2.5	3.1	1.8	42.8	23	25	6.0	20.4
71	LOCAL CHECK 1	4.67	6.01	54	55	0.7	258	131	0.51	0.88	0.0	3.2	3.3	2.8	2.6	18.8	20	23	22.3	20.0
72	LOCAL CHECK 2	4.30	5.55	55	56	0.8	247	134	0.54	0.82	1.6	4.6	3.8	2.6	2.6	20.2	19	23	22.6	21.5
	LSD 0.05		1.21	0.9	1.1	1.0	11.4	10.6	0.0	0.1	14.3	11.7	1.1	0.6	0.4	17.2	3.1	3.0	6.8	2.2
	CV %		13.5	1.3	1.4	3.0	3.6	5.9	5.8	8.1	12.6	14.2	33.6	13.0	19.2	9.7	11.4	9.5	11.2	7.6
	CORRELATION WITH Yd2			0.33	0.09	0.28	0.30	0.09	-0.22	0.13	0.19	0.38	0.34	0.07	0.04	0.21	-0.26	-0.26	0.09	0.02

Table 69. TSCW_99B21. Mean data of top 8 yielding tropical early white lines by one tester. Across 2 Locations
Poza Rica, Cotaxtla; México. 1999 B

Ent	PEDIGREE	Yd1	Yd2	Ant	Silk		PH	EH	EH/	E/P	RL	SL	EA	ER	BH	NE	NP	ER	M
		t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	%	#	#	%	%
10	(CL-G1615*CL-G1504)-B-12-1 x CL-04935	8.78	9.29	51	51	0.0	227	116	0.51	1.03	0.0	1.8	2.5	1.6	28.3	27	27	5.4	25.0
6	(CL-04923*CL-G1504)-B-21-4 x CL-04935	8.19	8.77	52	52	-0.3	223	111	0.49	0.99	0.0	0.0	3.1	2.1	19.6	26	26	6.7	24.4
8	(CL-04923*CL-G1504)-B-46-2 x CL-04935	8.18	8.34	52	52	0.0	240	100	0.42	0.94	10.6	0.0	2.8	1.6	6.4	25	27	1.9	23.5
11	(CL-G1615*CL-G1504)-B-21-2 x CL-04935	8.09	8.42	51	51	0.2	205	93	0.46	0.99	0.0	0.0	3.3	2.1	39.7	26	26	3.9	23.3
4	(CL-04923*CL-G1504)-B-21-2 x CL-04935	7.94	8.67	52	52	0.0	222	106	0.49	0.91	0.0	0.0	2.8	1.6	18.2	24	26	8.5	23.7
5	(CL-04923*CL-G1504)-B-21-3 x CL-04935	7.92	9.04	52	52	0.0	220	101	0.46	0.93	0.0	0.0	2.9	2.0	37.2	24	26	12.3	22.3
7	(CL-04923*CL-G1504)-B-24-1 x CL-04935	7.81	8.72	53	53	0.0	223	104	0.46	0.97	0.0	1.9	2.9	1.9	33.4	26	27	10.4	21.4
3	(CL-04923*CL-G1504)-B-10-1 x CL-04935	7.60	8.05	52	51	-0.5	222	111	0.50	0.93	0.0	2.9	3.0	1.9	9.9	25	27	5.6	22.7
34	CL-04935 x CML-419 RE	7.41	8.62	50	50	-0.5	223	113	0.51	1.02	3.0	1.0	3.4	2.6	63.1	26	26	14.0	21.6
35	LOCAL CHECK-1 CL-04933 x CML-420	8.27	8.88	52	52	-0.2	233	140	0.60	1.07	0.0	0.9	2.4	1.8	17.4	28	27	6.9	23.6
36	LOCAL CHECK-2 CL-04933 x CML-419	9.04	9.42	51	51	-0.8	234	126	0.52	1.07	20.8	1.9	3.0	1.9	22.4	29	27	4.1	23.8
	LSD 0.05		1.56	1.4	1.6	0.8	37.8	22.7	0.2	0.1	14.1	4.0	0.6	0.7	22.8	3.0	1.9	12.3	4.5
	CV %		9.39	2.3	2.5		10.1	10.3	24.7	11.0	13.0	7.3	12.6	21.7	9.2	8.6	4.9	11.5	8.8
	CORRELATION WITH Yd2			0.32	0.01	0.37	-0.16	-0.19	-0.36	0.06	0.12	0.06	-0.3	-0.1	0.54	-0.32	0.24	0.59	-0.1

The S_3 lines with good SCA estimate with CLO4935 will be advanced to S_6-S_8, the advanced testcrosses with new testers and new hybrid formation.

2.44 Evaluation of early generation tropical yellow testcrosses among tropical early yellow S_3 lines and one tester (TSCY99B22).

32 S_3 tropical early maturing yellow lines derived by recycling F_2 pedigree population between Elite x Elite Heterotic Groups A&B, early maturity yellow inbred lines were testcrossed to tester CML423 and CML422. The 32 testcrosses and 4 checks were evaluated under a 6x6 alpha lattice design with 2 replications in two locations.

Table 70 summarizes the performance of the best performing testcrosses entries 2, 3, 11, 1, 20, 67, 19 (CLG21102* CLO3105)-B-6-3 x CML323 and (CL-621102* CL3105) -B-24-1 x CML323 (AxB) yielded 9.5 t/ha superior to CML423 x CML422 by 30% yield and they also showed resistance to root and stalk lodging and ear rot. Days to silk 50. Tables A219 to A221 show the performance of all crosses at individual and across locations. These hybrids could be harvested in 90 to 100 days making the use of the land cost effective for farmers planting maize in relay with other crops such as wheat in India or rice in Vietnam.

Early yellow lines will be advanced to S_4 and make hybrid combination with other lines of the opposite heterotic group. The two entries mentioned above will be used as female parents in TWC combination to enhance the possibilities of adoption by farmers reducing the cost of seed.

Conclusions and Recommendations

For the first time in the LL tropics the process of recycling in pedigree breeding has been very well documented from early generation to advanced generation and will help breeders in regional programs R2-R5 and NARS to use effectively the germplasm derived from these activities.

It's highly recommended that colleagues in the regional programs ARMP, SAM and PRM take the superior 10% of lines at S_3 level, evaluate in their conditions and cross in advanced generations with their origin tester and NARS in order to build on the adaptation to local conditions. This advantage will help to produce superior hybrids and to yield stability.

For the last two years the advanced testcross has demonstrated superiority to the RE entries CML247 x CML254 and CML287 x CML413 and seed industry hybrid checks.

It is recommended that colleagues in ARMP, SAM and PRM to effectively use the best performing hybrid and lines that showed good yield potential under their conditions: in Thailand, Colombia and Guatemala and across locations, examples of the good use are clearly moving in Venezuela, Colombia and Central America.

The TLL subprogram would like to express our appreciation to our colleagues in the ARMP, SAM and PRM for their continued support and conducting our trials in their region and extend this to NAR's in Thailand, Colombia and Guatemala.

Table 70. TSCY_99B22. Mean data of top 8 yielding tropical early single crosses yellow. Across 2 Locations

Poza Rica, Cotaxtla; México. 1999 B

Ent	PEDIGREE	Yd1	Yd2	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	ER	BH	NE	NP	ER	M
		t/ha	t/ha	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	%	#	#	%	%
2	(CL-G2102*CL-03105)-B-6-3 x CML-423	8.81	9.46	50	51	0.8	238	131	0.55	0.90	0.0	5.4	2.6	1.6	54.8	25	27	6.8	26.7
3	(CL-G2102*CL-03105)-B-24-1 x CML-423	8.62	9.41	50	50	0.3	244	132	0.54	1.00	1.0	3.7	2.3	1.7	60.2	26	26	8.3	26.2
11	(CL-TEYP001*CL-G1801)-B-12-1 x CML-422	8.18	8.89	49	51	1.8	244	118	0.48	0.93	0.0	0.9	2.6	1.7	30.8	25	27	7.9	26.3
1	(CL-G2102*CL-03105)-B-1-1 x CML-423	7.99	8.66	50	50	0.5	247	114	0.46	0.94	0.0	0.0	2.7	1.7	14.3	24	26	7.7	29.3
20	(CL-G1804*CL-G1801)-B-7-1 x CML-422	8.36	8.62	49	50	0.8	230	107	0.47	1.02	0.0	0.9	2.3	1.6	9.7	27	27	2.9	26.4
6	(CL-G2102*CL-03105)-B-31-4 x CML-423	8.11	8.57	49	51	1.5	242	121	0.50	0.93	0.0	0.9	3.0	1.7	35.1	24	26	5.4	23.9
7	(CL-G2102*CL-03105)-B-35-1 x CML-422	8.09	8.55	50	50	0.0	229	111	0.48	0.96	0.0	1.0	2.9	1.8	46.6	25	26	5.4	25.5
19	(CL-G1804*CL-G1801)-B-1-2 x CML-422	7.73	8.44	48	49	0.0	224	105	0.47	0.95	0.0	0.0	3.0	2.1	20.0	26	27	8.5	24.2
33	CML-422 x CML-424 RE	6.67	7.77	48	48	-0.5	239	115	0.48	0.94	0.9	5.7	4.4	3.6	76.3	25	26	14.2	25.9
34	CML-423 x CML-422 RE	6.93	7.36	48	49	0.8	226	104	0.46	1.07	1.0	3.8	3.4	2.1	30.6	28	26	5.8	26.9
35	LOCAL CHECK CML-423 x CML-421	7.90	8.59	48	48	0.3	256	127	0.50	0.98	0.0	1.0	2.6	2.1	63.8	26	27	8.1	27.6
	LSD 0.05		1.33	1.0	1.6	1.4	13.5	20.6	0.1	0.1	1.9	4.6	0.8	0.8	26.8	2.6	1.5	10.3	4.5
	CV %		5.87	1.5	1.5	3.1	3.2	13.7	13.2	8.1	5.4	9.6	10.5	19.5	5.9	7.7	2.9	10.2	4.8
	CORRELATION WITH Yd2			0.52	-0.34	0.17	0.21	-0.26	0.33	-0.11	-0.01	0.32	0.29	0.81	0.54	-0.13	-0.07	-0.14	0.09

3. Quality Protein Maize Project (QPM)

3.1. QPM – Germplasm development.

Twenty-four F_2 (13 white and 11 yellow) and 123 F_1 (21 QPM-white x QPM-white, 41 QPM-white x NORMAL-white, 9 QPM-yellow x QPM-white, 52 QPM-white x NORMAL-yellow) QPM populations with low ear placement were grown at Poza Rica 1999 A and B, respectively with the purpose of developing new QPM white and yellow germplasm with low ear placement and to enhance the frequency of extracting new lines with favorable alleles for grain yield and quality protein.

3.2. QPM – Pedigree breeding.

In the continued procces of developing and recycling new QPM lines, 700 (S_1 - S_2) and 1318 (S_2 - S_3) early generation lines white and yellow were planted at Poza Rica station during 1999 A and B season, respectively.

3.3. Conversion of normal lines to QPM genetic background.

Two tropical white normal endosperm inbred lines (CML264 and CML273) were chosen to convert QPM genetic background, using CML176 subtropical QPM as donor line. In 1999 A, 810 five meters rows were planted with the backcross BC_1 F_1 for advanced BC_1 F_2. Meanwhile in 1999 B, the BC_1F_2 was planted and BC_2F_1.completed.

3.4. QPM Inbred line development and hybrid research.

Development of inbred lines with superior agronomic characteristics continues as an important activity in the lowland QPM project. 1010 and 549 five meters rows of CML's and advanced inbred lines white and yellow, were grown at Poza Rica station during 1999 A and B season, respectively. Hybrid research also is another important activity in the QPM project, therefore 4948 (Poza Rica) and 1664 (Cotaxtla) five meter rows were planted in isolation blocks with the objective to form several QPM hybrids and produce seed foundation to accelarate the use of this type of germplasm. In 1999 B, 246 rows were planted to increase seed of the best QPM hybrids, however we lost these cross formations due to excessive rains that caused severe flooding.

3.5. Announcement of QPM maize inbred lines.

Seven tropical white QPM elite inbred lines were identified from combining ability data trials for their potential to use in new hybrids and for their future release as parents of superior hybrid combinations. These inbred lines are in seed increase process plot to obtain seed to distibute to the cooperators.

3.6. QPM - Combining ability trials.

During 1998 B and 1999 A, several advanced inbred lines derived from various CIMMYT QPM maize populations were crossed at Tlaltizapan and Poza Rica stations with the principal objective of evaluating combining ability and identifying superior hybrids simultaneously.

At Tlaltizapan, 8 white flint and dent QPM lines from populations 62 and 63 were crossed in a diallel mating system; other 11 white flint QPM lines from population 62 (heterotic group B) and 6 white dent QPM lines from population 63 (heterotic group A) were crossed in a design-II mating system. At Poza Rica, 24 white flint and dent QPM lines were crossed with two testers; 9 yellow flint and dent QPM lines were crossed with three and four testers; and 10 yellow flint and dent QPM lines were crossed in a diallel mating system. Also various elite CML's white and yellow QPM inbred lines were crosses for seed increase of superior hybrids. The crosses developed were grouped in different trials depending upon whether a line was crossed. The results of several hybrids trials conducted during 1999 A and B are discussed below.

3.7. Evaluation of tropical late white endosperm QPM single crosses - TSCWQ-9901.

Germplasm: 8 white flint and dent advanced QPM lines from population 62, 63 and pool G24 were crossed in a diallel mating system.

Experimental design: 4x8 Alpha Lattice; 2 reps; two 5-m row.

Planting density: 66,667 plts/ha.

Locations: Poza Rica 99A, Cotaxtla 99A, Tlaltizapan 99A, El Salvador 99A, Poza Rica 99B, Cotaxtla 99B, Cardel 99B, Cuyuta 99B (Guatemala), Turipana 99B (Colombia) and Suwan Farm 99B (Thailand).

Tables: 75 to 77 and A222 to A232.

Parent Line			Parent Line		
P1 P62 C3 HC163-3-1-3-1--B-1-3-BB-3-BB		Flint	P5 P63 C2 HC23-1-2-1-B-1-BB		Dent
P2 P62 C5 HC182 2-1-2-BB-3-1-##	CML144	Flint	P6 P63 C2 HC5 1-3-1-B-2-1-1-B-#	CML159	Dent
P3 CLQ-63-6701	CML176	Flint	P7 P63 C2 HC161-1-3-B-B-2-BB		Dent
P4 AC8563 MH35 3-1-B-2-1-BB-1-BB-#	CML146	Dent	P8 G24Q MH169-2-1-B-3-1-1-BBBB		Dent

The average grain yield across locations in A and B plantings seasons was 7.73 t/ha and 5.65 t/ha, respectively. While the rank of grain yield was 6.08 t/ha to 10.44 t/ha in A season and 3.93 t/ha to 8.57 t/ha in B season. The average ear rot across locations in A and B seasons was 3.8 % and 7.3 %, respectively. The rank of ear rot in A season was 0.7 % to 8.0 % and 2.6 % to 12.4 % in B season (Fig. 1). Cotaxtla registered the lowest and highest ear rot value in both season. Three QPM hybrids were the top yielding hybrids across locations similar in yield to (CML247xCML254) which is the best reference entry with normal endosperm (Table 75 and A232). Entries 9, 18, 10 and 8 yielded more than (CML144xCML159) QPM hybrid used as reference entry. The best QPM hybrids in each location and across locations yielded 0.5 to 1.5 t/ha more than the best seed industry normal endosperm check and showed up to 4% protein and double amount of tryptophan than the normal checks (Table 75). These hybrids also showed less ear rot and low ear placement, which is more attractive to the

farmers (Fig. 2). P2 and P3 were the only parents with positive and significative GCA values in each of the eight locations (Table 76), the cross between P2xP3 had good yield and ranked fifth across locations and performed well in each location. The cross P1xP4 had the highest SCA effect (0.665 t/ha) and ranked ten for grain yield. While the reference entry P2xP6 had (0.477 t/ha) for SCA effect and ranked sixth for grain yield (Table 77).

Fig. 1 Means of grain yield and ear rot

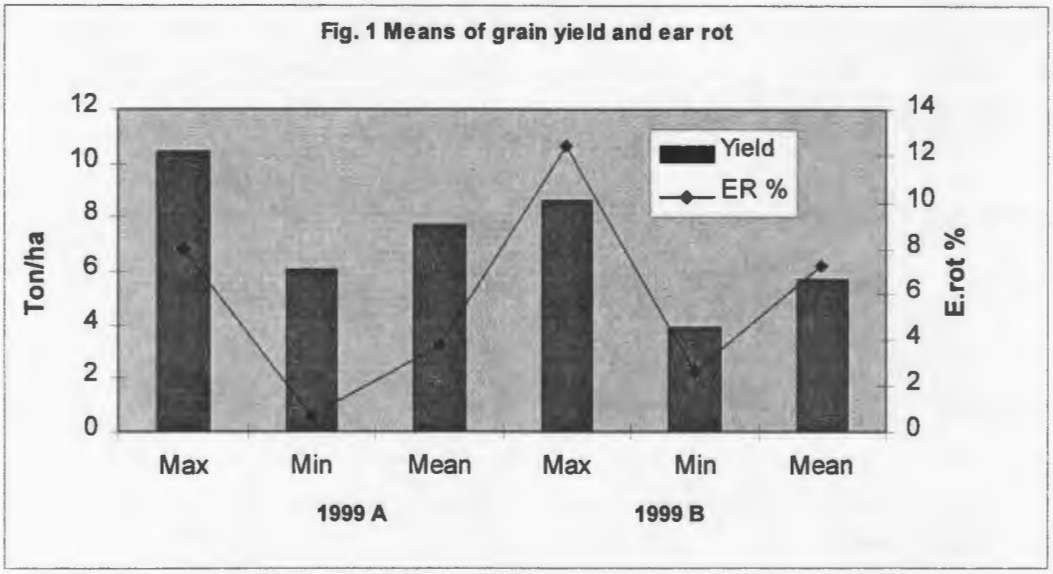


Table 75. TSCWQ-9901. Mean data of the top 10 yielding white single crosses across eight locations. 1999.

Ent no.	PEDIGREE	Yd1 t/ha	Yd2 t/ha	Rk	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	PA 1-5	HE 1-5	BH %	ER %	M %	Try %	Prot %
9	P2 x P4	8.09	8.49	(2)	66	65	0.8	238	117	0.49	4.8	4.3	2.9	2.7	2.2	2.1	4.7	17.6	0.096	10.29
18	P3 x P8	7.98	8.42	(3)	64	63	0.5	241	120	0.50	21.5	1.2	2.9	2.7	2.4	3.5	5.1	19.0	0.095	10.36
10	P2 x P5	7.97	8.34	(4)	66	65	0.8	238	128	0.54	8.3	13.8	2.9	2.8	2.2	9.0	4.5	18.2	0.101	10.79
8	P2 x P3	7.92	8.20	(5)	66	65	0.0	249	128	0.52	19.7	8.8	2.6	2.5	1.5	1.0	3.4	18.7	0.103	10.92
11	P2 x P6 (RE)	7.85	8.12	(6)	66	65	0.3	244	120	0.49	19.1	3.8	3.0	2.6	1.8	4.9	3.3	18.8	0.100	11.12
14	P3 x P4	7.69	8.14	(7)	65	64	1.2	241	116	0.47	16.8	4.7	2.7	2.5	2.2	0.8	5.5	17.3	0.098	10.30
17	P3 x P7	7.66	7.99	(8)	66	66	1.3	240	116	0.49	13.5	4.5	2.7	2.9	2.0	2.4	4.1	19.2	0.100	9.95
3	P1 x P4	7.39	7.59	(10)	64	64	1.5	219	103	0.47	5.1	5.0	3.2	2.6	2.2	1.7	2.6	19.9	0.096	9.12
12	P2 x P7	7.39	7.59	(11)	68	67	0.6	249	125	0.51	3.3	2.9	3.0	2.8	2.0	0.2	2.7	19.4	0.100	11.17
15	P3 x P5	7.34	7.94	(12)	65	65	1.2	237	123	0.52	17.8	6.1	3.3	3.0	1.9	30.5	7.5	18.0	0.103	10.74
29	CML247xCML254 (RE)	8.10	8.31	(1)	68	67	0.2	222	121	0.54	7.5	0.8	2.3	2.5	1.7	4.5	2.5	24.3	0.050	9.0
30	H515	6.30	6.77	(25)	65	65	0.9	205	109	0.52	17.0	10.8	3.3	3.3	2.3	7.3	7.0	19.8		
31	P3086	6.01	6.23	(28)	67	66	1.3	238	138	0.58	10.0	4.8	3.3	3.0	2.1	6.9	3.5	19.9		
32	Local check*	7.42	7.81	(9)	66	64	0.0	239	128	0.54	12.3	3.8	3.0	3.0	2.2	7.9	5.0	20.3		
	CHECKS MEAN	6.96	7.28		67	66	0.6	226	124	0.55	11.7	5.1	3.0	2.9	2.1	6.6	4.5	21.1		
	GRAND MEAN	6.96	7.37		66	65	0.8	230	115	0.50	12.9	5.1	3.2	2.8	2.3	8.6	5.6	19.3		
	LSD 0.05		0.87		1.3	1.3	0.8	11.5	9.3	0.0	12.9	6.2	0.5	0.6	0.4	8.8	4.3	1.4		
	CV %		10.19		1.2	1.3	2.6	5.2	7.6	7.5	9.9	6.6	15.7	11.2	15.0	9.8	7.4	6.3		
	F Value		1.37		2.50	2.53	1.17	0.82	1.19	0.83	2.03	2.18	1.00	1.56	1.76	1.65	1.33	1.42		
	P(F>f)		0.02		0.00	0.00	0.18	0.88	0.13	0.88	0.00	0.00	0.50	0.03	0.00	0.00	0.04	0.01		
	NUMBER OF LOC.		8		7	8	7	7	8	7	7	7	8	4	8	8	8	8		

*Check:CML145xCML144, H513, CML145xCML144, H59, (CML247xCML254)xR1, (CML247xCML254)xR1, Narro1, CB35 x 6B41

Prot = Protein %; Try = Tryptophan % in the whole grain

Fig. 2 Yield performance of best QPM hybrids

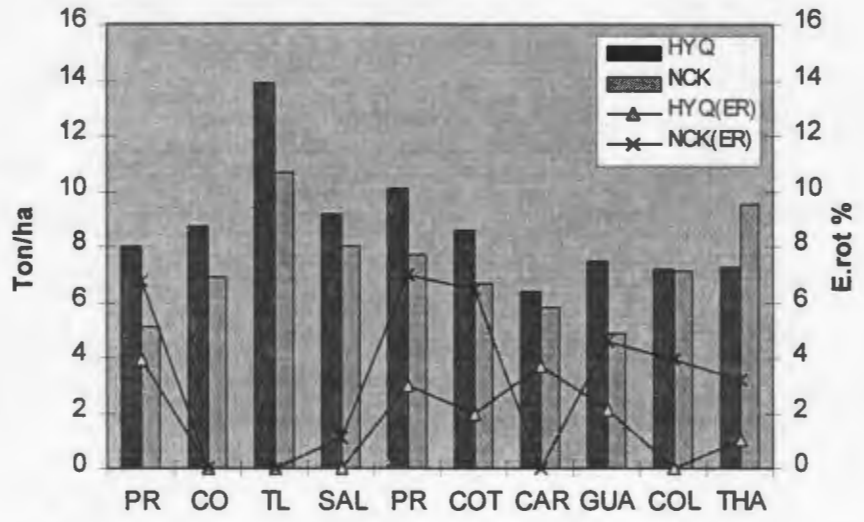


Table 76. TSCWQ-9901. Grain yield (t/ha) and GCA effects of the 8 white lines across eight locations. 1999.

Line	GCA/Loc								GCA Across	Mean
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8		
P1	-0.566	-0.475	0.301	-0.024	-0.684	-0.370	-0.012	-0.722	**-0.351**	7.08
P2	0.004	1.194	0.403	0.551	1.715	-0.047	0.151	0.773	**0.614**	7.91
P3	0.811	0.074	0.747	1.746	0.752	0.303	0.206	0.343	**0.637**	7.93
P4	0.571	-0.511	-0.309	-1.139	0.429	-0.250	-0.088	0.613	**-0.108**	7.29
P5	0.207	-0.533	0.071	-0.493	0.236	0.027	0.230	-0.017	**-0.028**	7.36
P6	-0.452	0.005	-0.264	0.163	-0.491	0.143	-0.745	-1.087	**-0.355**	7.08
P7	-0.229	-0.023	-0.965	-0.563	-0.291	-0.003	-0.087	-0.055	**-0.253**	7.17
P8	-0.347	0.289	0.017	-0.241	-1.666	0.205	0.345	0.150	**-0.156**	7.25

Table 77. TSCWQ-9901. SCA and GCA effects (t/ha) of the 8 white lines across eight locations. 1999.

Line	P1	P2	P3	P4	P5	P6	P7	P8	GCA
P1									-0.351
P2	-0.416								0.614
P3	-0.390	-0.435							0.637
P4	0.665	0.600	0.227						-0.108
P5	0.105	0.370	-0.053	-0.758					-0.028
P6	0.652	0.477	-0.126	-0.921	-0.031				-0.355
P7	-0.290	-0.155	0.222	-0.013	0.027	0.244			-0.253
P8	-0.326	-0.441	0.555	0.200	0.340	-0.293	-0.035		-0.156

3.8. Combining ability and cross performance of tropical late white QPM lines-TSCWQ-9902.

Germplasm: 11 white flint advanced lines from population 62 (heterotic group B) and 6 white dent inbred lines from population 63 (heterotic group A), were crossed in a design-II mating design.

Experimental design: 7x10 Alpha Lattice; 2 reps; two 5-m row.

Planting density: 66,667 plts/ha.

Locations: Poza Rica 99A, Cotaxtla 99A, Tlaltizapan 99A, El Salvador 99A, Poza Rica 99B, Cotaxtla 99B, Cardel 99B, Cuyuta 99B (Guatemala), Turipana 9B (Colombia) and Suwan Farm 99B (Thailand).

Tables: 78 to 80 and A233 to A243.

The average grain yield across locations in A and B planting season was 7.00 t/ha and 5.00 t/ha, respectively. While the rank of grain yield was 5.63 t/ha to 9.17 t/ha in season A and 3.98 t/ha to 7.07 t/ha in season B. The average ear rot across locations in A and B seasons was 6.7 % and 10.9 %, respectively. The rank of ear rot in A season was 1.7 % to 11.5 % and 1.8 % to 18.9 % in B season (Fig. 3). Cotaxtla registered the lowest and highest ear rot value in both seasons. P11 x P14, P11 x P16, P1 x P12 and P1 x P16 and the normal RE (CML247xCML254) were the top yielders across locations (Table 78 and A243). Entries 63, 65, 1, 5, 66, 61 and 64 yielded more than entry 2, (CML144 x CML159) QPM hybrid used as reference entry.

The best QPM hybrids in each location and across locations yielded 0.5 to 1.5 t/ha more than the best commercial normal endosperm check, protein and tryptophan content in the best QPM hybrids was greater than normal checks, 3 to 4% more protein and twice tryptophan content (Table 78). These hybrids also showed less ear rot and low ear placement (Fig. 4). Line P1, P5, P8 and P11 had positive GCA values in the heterotic group B. Line P12, P13 and P17 had positive GCA values in the heterotic group A (Table 79). The cross (P11xP13) which involves the best GCA line from heterotic group B and A ranked ten for grain yield in their cross. The cross (P3xP16) had the highest SCA effect (0.76 t/ha) and ranked sixteen for grain yield. While the reference entry (P1xP13) had negative value for SCA effect and was ninth for grain yield (Table 80).

Flint Parent Lines (Heterotic Group B)	Dent Parent Lines (Heterotic Group A)
P1 P62 C5 HC182 (S7) CML144	P12 P63 C2 HC5-1-3-1-B-1-BB
P2 P62 C1 HC24-5-3-1-1-B-1-BB	P13 P63 C2 HC5 (S8) CML159
P3 P62 C3 HC163-3-1-3-1--B-1-3-BB-3-BB	P14 P63 C2 HC161-1-3-BB-2-BB
P4 P62 C5 HC24-5-3-2-1-BBBB	P15 AC8363 MH44-1-1-BBBBB
P5 P62 C6 HC13-1-3-BBB-10-BB	P16 P63 C0 HC124-1-3-1-####-1-BBBBB
P6 P62 C5 HC2-1-2-2-1-B-5-BB	P17 G24 MH169-2-1-B-3-1-1-BBBB
P7 S8662Q-7-2-BBBB	
P8 P62 C5 HC117-2-1-1-2-1-BBBB	
P9 P62 C1 HC24-5-3-2-1-B-7-1-##-B	
P10 P62 C3 HC163-3-3-3-#-1-1-B-2-BBBB	
P11 CLQ-63-6701	

Fig. 3 Means of grain yield and ear rot

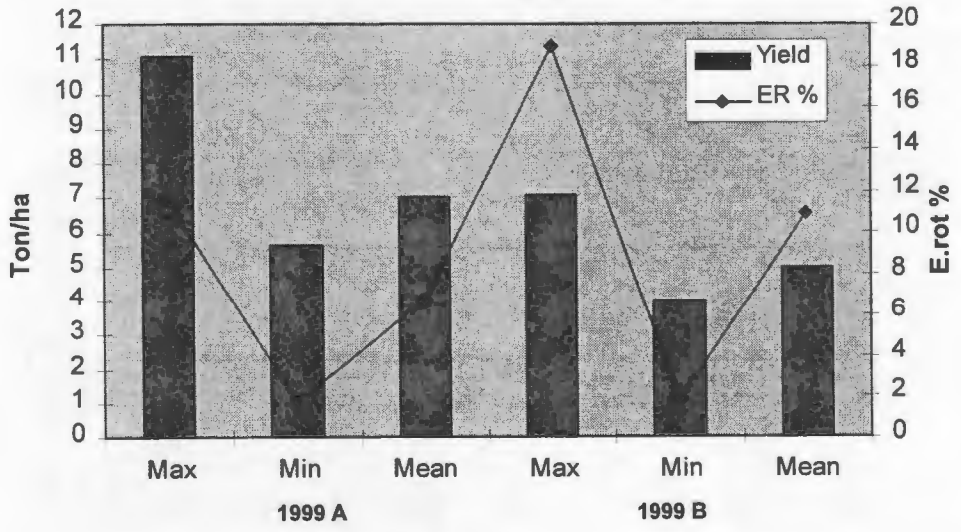


Table 78. TSCWQ-9902. Mean data of the top 10 yielding white single crosses across eight locations. 1999.

Ent no.	PEDIGREE	Yd1 t/ha	Yd2 t/ha	Rk	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	PA 1-5	HE 1-5	BH %	ER %	Try %	Prot %
53	P11 x P14	7.69	7.96	(2)	66	66	246	115	0.46	19.0	3.5	2.6	2.7	2.0	2.4	3.4	0.094	10.65
65	P11 x P16	7.59	8.01	(3)	64	63	248	131	0.54	30.7	4.0	2.8	3.0	1.7	8.8	5.3	0.100	10.48
1	P1 x P12	7.56	7.85	(4)	67	67	239	121	0.51	19.3	5.8	2.7	2.8	1.9	0.4	3.7	0.092	11.65
5	P1 x P16	7.52	8.02	(5)	65	64	253	137	0.55	16.9	12.9	2.7	2.9	1.8	7.9	6.1	0.091	11.08
66	P11 x P17	7.50	7.87	(6)	64	63	240	118	0.49	22.4	1.5	2.7	2.5	2.1	9.5	4.6	0.106	10.93
61	P11 x P12	7.43	7.95	(7)	65	66	246	125	0.51	27.1	1.9	2.8	2.5	2.1	7.9	6.5	0.103	11.02
64	P11 x P15	7.29	7.63	(8)	63	63	234	115	0.49	23.7	4.0	2.9	3.2	1.9	8.5	4.4	0.102	10.89
2	P1 x P13 (RE)	7.27	7.56	(9)	67	65	239	124	0.52	18.7	7.7	2.8	2.9	1.9	3.5	3.8	0.095	11.20
62	P11 x P13	7.22	7.88	(10)	64	64	240	119	0.50	21.6	3.9	3.0	2.8	2.0	5.1	8.4	0.097	10.66
45	P8 x P14	7.13	7.36	(12)	66	65	233	121	0.52	14.3	3.0	2.8	2.7	1.8	6.9	3.2	0.113	13.63
67	CML247xCML254 (RE)	8.28	8.34	(1)	68	67	223	122	0.55	3.8	1.4	2.0	2.2	1.7	6.0	0.8	0.055	8.7
68	H515	5.96	6.46	(48)	65	64	208	108	0.51	17.2	16.3	3.4	3.0	2.0	10.7	7.7		
69	P3086	5.35	5.60	(61)	67	67	236	133	0.56	12.2	5.7	3.0	2.9	1.9	7.9	4.4		
70	LOCAL CHECK*	7.14	7.53	(11)	66	65	238	130	0.55	14.3	3.5	3.1	2.9	2.1	5.8	5.1		
	CHECKS MEAN	6.68	6.98		66	66	227	123	0.54	11.9	6.7	2.9	2.7	1.9	7.6	4.5		
	GRAND MEAN	6.19	6.86		65	64	231	120	0.52	17.4	6.3	3.1	3.1	2.1	20.3	9.8		
	LSD 0.05		0.96		1.3	1.4	10.9	8.6	0.0	12.0	7.8	0.5	0.6	0.4	12.6	9.1		
	HSD 0.05 Tukey		2.17		2.9	3.1	24.5	19.3	0.1	27.0	17.7	1.2	1.3	0.8	28.3	20.5		
	CV %		14.25		1.9	2.2	4.5	7.3	6.9	9.5	9.6	16.9	13.2	17.5	11.1	10.3		
	F Value		1.52		2.01	1.96	0.94	0.83	0.90	1.23	2.07	1.49	1.07	1.24	1.71	2.21		
	P(F>f)		0.00		0.00	0.00	0.73	0.98	0.84	0.02	0.00	0.00	0.31	0.01	0.00	0.00		
	NUMBER OF LOC.		8		7	8	7	8	7	7	7	8	4	8	8	8		

*Check:CML145xCML144, H513, CML145xCML144, H59, (CML247xCML254)xR1, (CML247xCML254)xR1, Narro-1, HB-83.

Prot = Protein %; Try = Tryptophan % in the whole grain

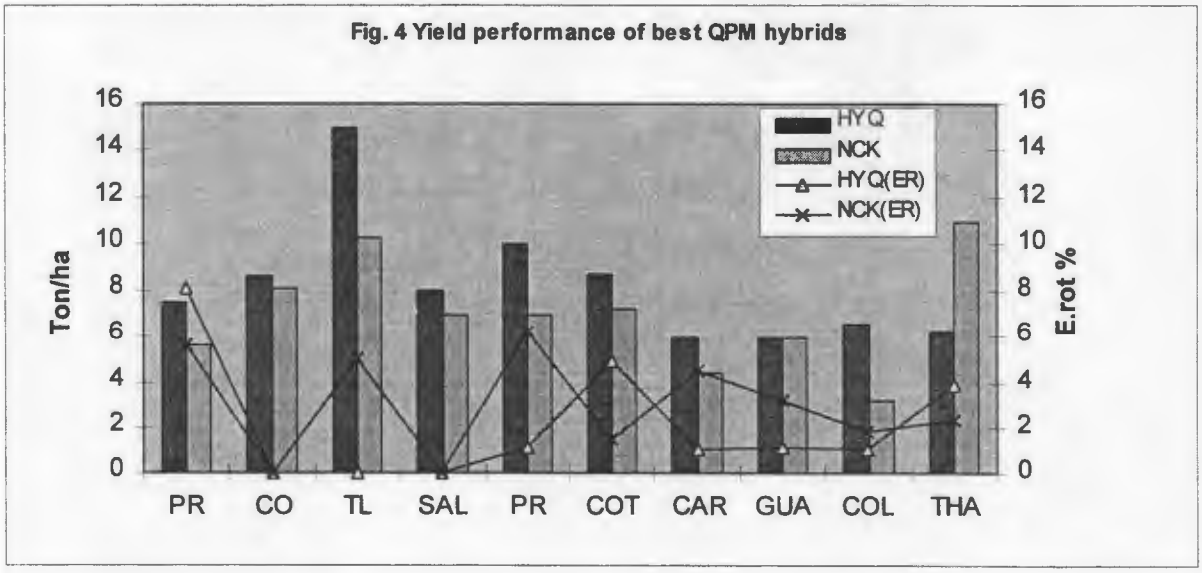


Table 79. TSCWQ-9902. Grain yield (t/ha) and GCA effects of 17 white lines by locations. 1999.

Line	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	GCA	Mean
P1	-0.05	0.70	2.94	0.25	0.81	0.81	-0.09	0.65	**0.75**	7.61
P2	-0.49	-0.73	-2.41	-0.32	-0.60	0.46	0.50	0.16	**-0.43**	6.42
P3	-0.40	0.16	-0.42	0.15	-0.48	-0.50	-0.15	0.58	**-0.13**	6.72
P4	-0.18	-0.30	-0.83	-0.67	0.39	0.79	0.07	-0.14	**-0.11**	6.75
P5	1.05	0.88	-1.28	-0.07	0.77	-0.32	0.47	-0.25	**0.15**	7.01
P6	-0.09	0.27	-0.86	-0.31	-1.23	-0.99	-0.29	-0.40	**-0.49**	6.37
P7	0.08	-0.77	0.35	0.00	-0.41	-0.59	-0.08	-0.23	**-0.21**	6.65
P8	0.36	-0.52	1.24	0.00	0.02	-0.13	0.28	-0.33	**0.11**	6.97
P9	-0.64	-0.53	-1.12	-0.24	0.01	0.00	-0..32	-0.78	**-0.45**	6.40
P10	-0.44	0.17	0.38	0.02	-0.35	-1.02	-0.48	0.31	**-0.18**	6.68
P11	0.80	0.67	2.01	1.19	1.06	1.48	0.09	0.43	**0.97**	7.82
P12	0.35	0.23	0.11	-0.29	-0.09	-0.13	0.23	-0.16	**0.031**	6.88
P13	0.08	0.30	0.18	0.008	-0.20	0.34	0.01	0.09	**0.101**	6.95
P14	0.05	0.01	0.70	-0.081	0.05	-0.26	-0.78	0.24	**-0.010**	6.84
P15	-1.07	-0.62	-0.09	0.54	0.24	0.53	0.05	0.12	**-0.036**	6.82
P16	0.43	-0..34	0.05	-0.454	0.00	-0.30	0.13	-0.24	**-0.090**	6.76
P17	0.15	0.43	-0.95	0.278	-0.01	-0.18	0..36	-0.05	**0.004**	6.86

Table 80. TSCWQ-9902. GCA and SCA effects (t/ha) of 17 white lines across eight locations. 1999.

Line	P12	P13	P14	P15	P16	P17	GCA
P1	0.22	-0.10	-0.28	-0.12	0.45	-0.17	0.75
P2	0.00	-0.66	0.41	-0.16	-0.16	0.56	-0.43
P3	-0.52	0.35	-0.07	0.00	0.76	-0.51	-0.13
P4	0.22	0.28	-0.17	-0.05	-0.65	0.36	-0.11
P5	0.07	-0.70	-0.08	0.40	0.35	-0.04	0.15
P6	0.15	0.02	0.21	0.16	-0.15	-0.38	-0.49
P7	-0.07	0.65	-0.02	0.20	-0.72	-0.04	-0.21
P8	-0.04	-0.32	0.39	-0.21	-0.08	0.27	0.11
P9	-0.04	0.39	-0.05	-0.22	-0.49	0.42	-0.45
P10	0.06	0.23	-0.47	0.15	0.48	-0.44	-0.18
P11	-0.03	-0.14	0.12	-0.13	0.21	-0.02	0.97
GCA	0.031	0.101	-0.010	-0.036	-0.090	0.004	

3.9 Top cross evaluation of tropical late white endosperm QPM lines - . TSCWQ-9903.

Germplasm: 25 white flint and dent advanced lines from population 62 and 63 were crossed with two testers.

Testers: T1: CML144 (P62C5HC182-2-1-2-BB-3-1-##-BB)

T2: CML159 (P63C2HC5-1-3-1-B-2-1-1-B-#-BBB)

Experimental design: 7x7 Alpha Lattice; 2 reps; one 5-m row.

Planting density: 66,667 plts/ha.

Locations: Poza Rica 99B, Cotaxtla 99B, Cuyuta 99B (Guatemala), Turipana 99B (Colombia)

Tables: 81, 82 and A244 to A248.

Parent Line	Parent Line
L1 P62C1HC24-5-3-2-1-B-1-B-B	L14 P63c0HC181-2-1-#4-1-1-1-B-B
L2 P62C3HC163-3-1-3-1-B-1-2-BBBBB	L15 P68c0HC179-4-2-2-#b-#b-2-#b-4-3-7-B-B
L3 P62C3HC163-3-3-3-#2-1-1-B-2-BBB-B	L16 [2301Q/2403Q]-xb-1-xb-2-3-B-B
L4 P62C5HC2-1-2-2-1-1-B-3-B-B	L17 [2301Q/2403Q]-xb-1-xb-5-1-B-B
L5 P62C5HC24-5-3-2-1-BBB-2-B-B	L18 (6304Q/6303Q)-xb-6-1-2-3-B-B
L6 P62C5HC93-5-6-1-3-2-B-2-B-B	L19 (6304Q/6303Q)-xb-6-1-3-4-B-B
L7 P62C5HC182-2-1-2-BBB-1-2-B	L20 P63Qc2HC161-1-3-xb-xb-2-xb-xb-2-4-B-B
L8 P63C2HC23-1-2-1-B-2-B-B	L21 P63Qc2HC161-1-3-xb-xb-2-xb-xb-5-1-B-B
L9 P63C2HC53-1-1-B-B-7-B-B	L22 P62Qc6HC13-1-3-xb-xb-xb-6-xb-7-6-B-B
L10 P63C2HC161-1-3-B-B-2-B-B	L23 6203Q-6-xb-5-2-B-B
L11 (2301Q/G23C5MH276-1-1-1-1-B)-#-B-5-1-B-B	L24 6207Q-3-1-3-7-B
L12 G24QC3-#-182-1-1-3-B-B-B-BB	L25 P63Qc2HC53-1-1-xb-xb-7-1-xb-7-B-B
L13 THOH-C57-4-2-B-3-B-B	

The average grain yield and ear rot across locations was 6.40 t/ha and 12.7 %, respectively. The highest and lowest grain yield mean were observed in Poza Rica (8.11 t/ha) and Colombia (1.93 t/ha), respectively. While, the highest and lowest ear rot values were observed in Cotaxtla (17.5%) and Colombia (9.3 %), respectively (Fig. 5). Table 81 shows the performance of the top 10 yielding entries across locations L7xCML159, L14xCML144 and L8xCML144 yielded from 8.5 to 8.9 t/ha similar to the normal RE check CML247xCML254 and CML144xCML159 QPM RE. In seven of the best ten top yielding hybrids involved tester 1 (CML144) as one comon parent (Table 82 and A248).

The best QPM hybrids in each location and across locations yielded 1.5 t/ha more than the best commercial normal endosperm check, these hybrids also showed less ear rot. Only one cross (L7xT2) yielded 160 kg/ha more than the cross between testers T1xT2. The mean cross performance of inbred lines with Tester 1 (CML144) yielded 1.4 t/ha more than the crosses of Tester 2 (CML159), also the Tester 1 crosses showed (11.7 %) less ear rot than the Tester 2 crosses (Fig. 7). Sixteen of twenty-five lines had positive GCA effect values. Tester T1 showed positive GCA effect and tester T2 negative GCA (Table 82). Line L7 had the highest

GCA effect (1.46 t/ha) followed by lines L8, L21 and L22. Lines L7 and L8 showed also the highest yielding in crosses with tester T2 and T1, respectively. These two lines L7 and L8 should be crossed to get a superior hybrid because these lines belonged to two different heterotic patterns, also lines L20 and L22 belonged to different heterotic groups and should be crossed The highest SCA effect was registered by cross L14xT1 (1.60 t/ha) and ranked third for grain yield, while the cross T1xT2 had (1.17 t/ha) for SCA effect and ranked first for grain yield (Table 82). The best performing hybrid yielded 9.5 t/ha and showed resistance to ear rot at Cotaxtla, while the check yielded 6.2 t/ha, showing 14% rotten ears; at Turipana, Colombia, the check also showed susceptibility to ear rot (Fig. 6).

Table 81. TSCWQ-9903. Mean data of the top 10 yielding white top crosses across three locations. 1999.

Ent no.	PEDIGREE			Yd1 t/ha	Yd2 t/ha	Rk	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	PA 1-5	HE 1-5	BH %	ER %	M %
12	L7	x	CML-159	8.60	8.88	(2)	55	55	-0.1	255	124	0.49	5.6	4.1	2.8	2.0	2.2	1.6	3.2	19.1
25	L14	x	CML-144	8.17	8.75	(3)	55	55	0.0	256	131	0.51	23.3	5.8	2.6	2.5	2.0	9.3	6.5	20.9
13	L8	x	CML-144	7.95	8.51	(4)	54	54	-0.3	249	144	0.57	10.1	17.7	2.6	2.6	1.7	3.3	6.6	18.5
44	L25	x	CML-144	7.36	8.32	(6)	55	56	1.2	254	131	0.51	4.9	6.6	2.9	2.8	1.9	10.4	11.5	20.8
38	L21	x	CML-144	7.89	8.28	(7)	53	54	0.2	251	148	0.59	24.1	12.5	2.4	2.9	1.7	4.0	4.8	20.6
39	L22	x	CML-159	7.58	8.28	(8)	55	55	0.0	256	136	0.53	36.7	2.7	3.2	3.1	2.7	10.9	8.4	20.5
31	L17	x	CML-144	7.82	8.25	(9)	54	54	-0.2	244	128	0.52	8.3	2.5	2.9	2.6	2.1	4.3	5.3	20.9
29	L16	x	CML-144	7.61	8.22	(10)	54	53	-0.3	243	128	0.53	19.9	7.6	3.0	2.9	2.3	7.2	7.4	22.0
1	L1	x	CML-144	7.82	8.19	(11)	55	55	0.1	248	134	0.54	11.5	15.3	2.8	2.9	1.7	4.4	4.6	20.7
4	L2	x	CML-159	7.42	8.12	(12)	55	55	0.1	244	126	0.52	29.2	6.8	3.4	2.8	3.1	14.6	8.7	20.8
46	CML144 x CML159 RE			8.44	8.94	(1)	55	55	0.3	256	126	0.49	20.0	7.1	2.8	2.0	2.1	4.5	5.7	21.0
47	CML247 x CML254 RE			8.11	8.41	(5)	56	56	-0.2	234	128	0.55	10.6	3.0	2.2	2.3	2.1	3.3	3.6	25.1
48	LOCAL CHECK-1			5.56	6.38	(40)	57	57	0.1	255	134	0.53	18.6	7.5	3.2	3.3	2.6	7.2	12.9	22.5
49	LOCAL CHECK-2			6.70	7.52	(29)	56	56	0.3	252	132	0.52	15.6	2.1	3.3	2.5	2.4	5.8	11.0	22.8
	Lines (22) x CML144			7.03	7.57		55	55	0.3	246	128	0.52	12.2	10.0	2.9	2.8	2.0	5.5	7.1	20.2
	Lines (23) x CML159			5.66	6.86		56	56	0.3	253	124	0.49	22.4	4.8	3.5	3.0	2.5	26.9	18.8	21.0
			CHECKS MEAN	7.20	7.81		56	56	0.1	249	130	0.52	16.2	4.9	2.9	2.5	2.3	5.2	8.3	22.9
			GRAND MEAN	6.40	7.26		55	55	0.3	250	126	0.50	17.3	7.2	3.2	2.9	2.3	15.5	12.7	20.8
			LSD 0.05		1.57		1.2	1.3	0.8	16.6	13.0	0.0	21.8	11.9	0.7	1.1	0.5	20.9	14.0	2.7
			CV %		14.35		1.1	1.2	2.2	3.3	6.9	5.8	11.8	10.5	14.8	13.0	17.6	12.4	12.6	8.9
			NUMBER OF LOC.		3		3	3	3	3	3	3	3	3	3	2	3	3	3	3

Check-1: P30F94, P30F94, CB-35 x 6B-41; Check-2: H-513, H-513, HB-83.

Fig. 5 Means of grain yield and ear rot

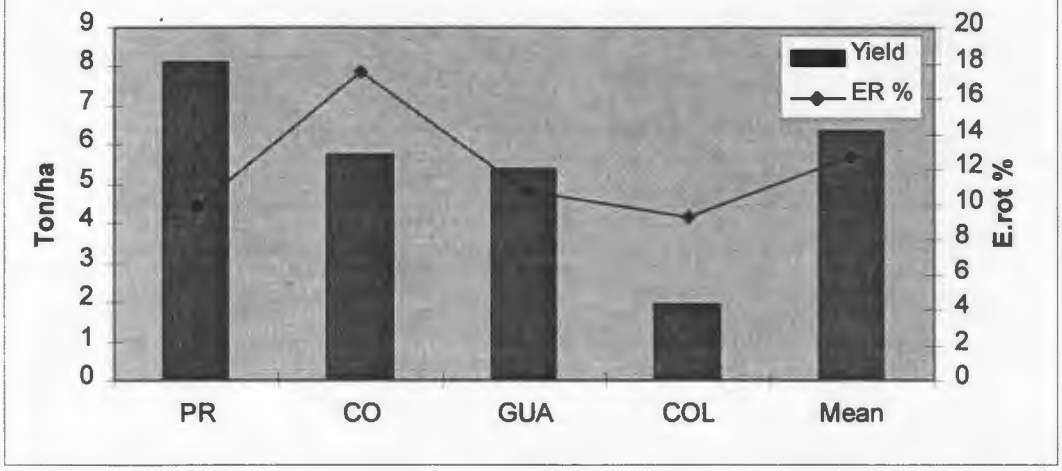
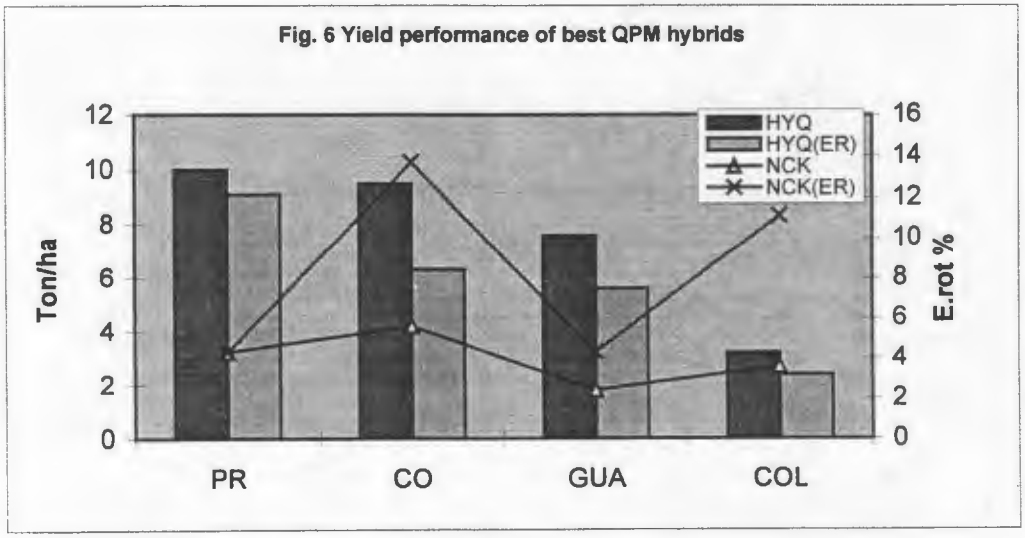


Fig. 6 Yield performance of best QPM hybrids



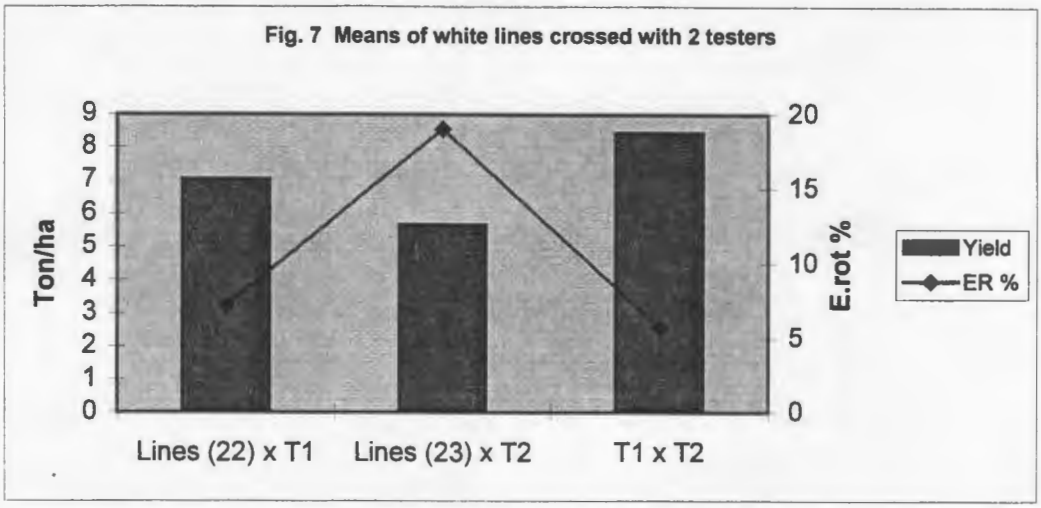


Table 82. TSCWQ-9903. GCA and SCA effects of the top 10 yielding white lines across two testers and three locations. 1999.

	T1	T2	Mean	Rank	GCA	SCAxT1	SCAxT2	GCA/Loc		
	T/ha	T/ha	T/ha		T/ha	T/ha	T/ha	Loc1	Loc2	Loc3
L7	8.21	8.79	8.50	1	1.23	-0.69	0.69	0..55	2.47	0.67.
L8	8.51	7.83	8.17	2	0.90	-0.06	0.06	-0.02	1.68	1.05
L22	7.98	8.33	8.15	3	0.89	-0.57	0.57	0.69	1.67	0.29
L21	8.58	7.69	8.14	4	0.87	0.04	-0.04	0.97	1.57	0.07
L5	7.86	7.88	7.87	5	0.60	-0.41	0.41	0.50	0.72	0.59
L17	8.24	7.30	7.77	6	0.50	0.07	-0.07	0.61	0.44	0.45
L4	7.99	7.40	7.69	7	0.42	-0.11	0.11	0.75	-0.25	0.77
L6	7.67	7.62	7.64	8	0.37	-0.38	0.38	0.52	0.48	0.12
L18	7.61	7.59	7.60	9	0.33	-0.39	0.39	0.67	0.22	0.10
L25	8.23	6.94	7.59	10	0.32	0.24	-0.24	0.76	0.70	-0.50
GCA	0.40	-0.40					1.17			
Mean	7.67	6.87								

3.10. Top cross evaluation of tropical late yellow endosperm QPM lines - TSCWQ-9904.

Germplasm: 9 yellow flint and dent advanced lines from population 65 and 66 were crossed with three and four testers.

Testers: T1: CML161 (P62C5HC182-2-1-2-BB-3-1-##-BB)

T2: CML165 (P63C2HC5-1-3-1-B-2-1-1-B-#-BBB)

T3: CML169 (G26C22MH7-1-1-1-1-BB)

T4: CML172 (G25QS4B MH35-2-B-1-1-2-B-4-BBBB)

Experimental design: 5x6 Alpha Lattice; 2 reps; one 5-m row.

Planting density: 66,667 plts/ha.

Locations: Poza Rica 99B, Cotaxtla 99B, Guatemala 99B, Republica Dominicana 99B.

Tables: 83, 84 and A249 to A254.

Parent Line	
L1 P65C2HC193-2-7-2#-1-B-1-2-1-B-3-BB	Flint
L2 P66C1HC144-3-1-1-B-B-4-BB	Dent
L3 G25 S4 B-MH13-5-B-1-1-2-BBB	Flint
L4 G25 S4 B MH35-2-B-1-1-2-B-9-BB	Flint
L5 G25C1HC25-1-1-2-BB-1-1-BB	Flint
L6 G25C18MH520-1-1#-1-2#-5-3-B-1-BB-3-BBB	Flint
L7 G25QC1 (STE)-18-8-1-2-BBBB	Flint
L8 G26MH31-2-2-#-2-2-1-B-3-BB	Dent
L9 G26C1HC2-3-3-3-1-B-2-B-BB	Dent

The average grain yield and ear rot across locations was 5.49 t/ha and 12.0 %, respectively. The highest and lowest grain yield mean were observed in Poza Rica (7.54 t/ha) and Colombia (2.82 t/ha), respectively. While, the highest and lowest ear rot values were observed in R. Dominicana (15.7%) and Colombia (1.9 %), respectively (Fig. 8). The highest yielding hybrid was entry 21 that yielded more than the cross between T1xT2 and T3xT4. Tester T1(CML161) and T4(CML172), were involved as one common parent in five and four times of the top yielding hybrids, respectively (Table 83 and A254). Entry 21 had better yield than the entries 28 and 27 which were used as best reference entry check with QPM and normal endosperm. The best QPM hybrids in each location and across locations

yielded 1.3 t/ha more than the best commercial normal endosperm check, these hybrids also showed 7% less ear rot (Fig. 9). The cross (L8 x T1) yielded 1.50 t/ha more than the cross between testers T1xT2 which was used as reference entry and ten hybrids yielded more than the cross between testers T3xT4. The crosses of inbred lines with Tester 1 (CML161) yielded 1.0 t/ha more than the crosses with Tester 2 (CML165), and Tester 1 crosses showed (2.7%) less ear rot than Tester 2 crosses. Crosses of inbred lines with Tester 3 (CML169) yielded 0.450 t/ha more than the crosses with Tester 4 (CML172), but Tester 3 crosses showed (2.3 %) more ear rot than Tester 4 crosses (Fig. 10). Five of nine lines had positive GCA effect values. In case of the testers, only testers T1 and T3 had positive GCA effect (Table 84). Line L8 had the highest GCA effect (1.20 t/ha) followed by lines L6, L2 and L4. Lines L8 and L6 showed also the highest yield in crosses with testers T1 and T2, respectively. Lines L6 and L8 should be crossed to get a superior hybrid because they belong to two different heterotic patterns. The highest SCA effect was registered by cross L3xT1 (1.12 t/ha) and ranked fourth for grain yield, while the cross T1xT2 had (0.74 t/ha) for SCA effect and ranked third for grain yield (Table 84).

Fig. 8 Means of grain yield and ear rot

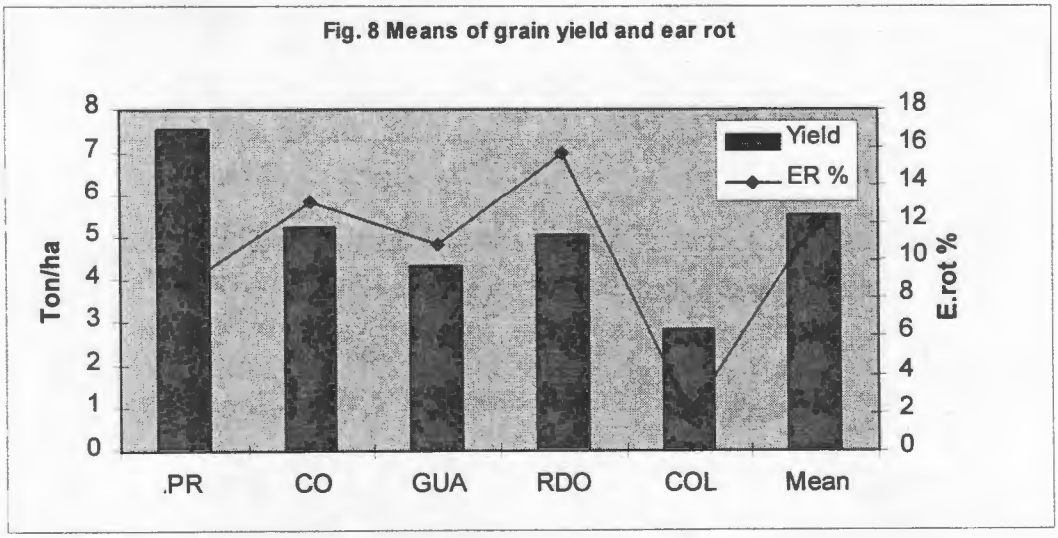


Table 83. TSCYQ-9904. Mean data of the top 10 yielding yellow top crosses across four locations. 1999.

Ent no.	PEDIGREE	Yd1 t/ha	Yd2 t/ha	Rk	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	E/P #	RL %	SL %	EA 1-5	PA 1-5	HE 1-5	BH %	ER %	M %
21	L8 x CML-161	8.23	2.94	(1)	54	55	0.9	244	133	0.54	1.00	2.2	1.4	2.6	2.8	2.1	10.1	6.5	20.1
6	L3 x CML-161	6.49	7.03	(4)	54	53	0.3	245	139	0.57	0.94	11.7	4.1	3.2	3.0	1.6	23.1	7.6	21.1
15	L6 x CML-165	6.48	7.26	(5)	54	55	0.9	245	134	0.55	1.00	11.6	1.4	3.4	3.0	1.9	31.2	10.7	20.6
10	L4 x CML-161	6.38	7.37	(6)	54	54	1.0	253	137	0.54	0.95	9.1	1.7	3.2	3.3	2.2	52.8	13.4	20.2
24	L9 x CML-161	5.89	6.36	(8)	54	54	0.2	226	127	0.57	0.95	3.0	3.3	3.0	2.9	1.8	2.8	7.3	21.2
20	L7 x CML-172	5.88	6.28	(9)	54	54	0.5	236	140	0.59	0.90	6.4	0.8	3.2	3.2	1.5	20.2	6.3	20.8
4	L2 x CML-161	5.74	6.79	(10)	54	54	0.6	231	129	0.55	1.07	6.1	3.7	3.6	2.7	1.7	14.6	15.4	20.0
23	L8 x CML-172	5.66	6.57	(11)	54	55	1.3	255	134	0.53	0.87	2.2	3.3	3.7	3.2	2.6	74.2	13.8	20.1
26	L9 x CML-172	5.65	6.13	(12)	54	54	0.7	220	125	0.56	0.87	19.3	6.6	3.2	2.8	2.4	4.7	7.8	20.4
14	L5 x CML-172	5.63	6.46	(13)	54	54	0.2	244	136	0.55	0.91	15.9	3.6	3.3	3.0	1.7	18.9	12.9	19.2
27	CML-161 x CML-165 (RE)	6.70	7.40	(3)	54	54	0.7	225	123	0.55	1.01	4.0	2.3	3.1	2.7	1.7	12.8	9.4	21.2
28	CML-287 x CML-413 (RE)	7.49	8.07	(2)	55	56	0.1	252	145	0.57	0.99	10.9	3.0	2.4	3.0	1.9	21.4	7.2	21.2
29	LOCAL CHECK 1	4.98	5.73	(13)	54	54	0.6	238	119	0.50	0.92	7.2	6.1	3.3	3.0	1.8	10.5	13.0	19.6
30	LOCAL CHECK 2	4.26	5.14	(14)	55	55	0.4	241	129	0.54	0.96	9.7	2.2	3.1	3.7	1.9	12.9	17.1	21.5
	Lines (7) x CML161	6.22	6.16		54	54	0.5	238	133	0.56	0.98	6.5	5.1	3.2	3.0	2.0	19.6	11.3	20.1
	Lines (6) x CML165	5.20	6.03		54	54	0.4	233	126	0.54	0.95	3.2	5.2	3.5	3.1	2.2	31.2	13.7	21.2
	Lines (5) x CML169	5.42	6.25		54	55	0.7	250	137	0.55	0.92	9.3	4.0	3.4	3.1	2.4	20.6	13.2	21.1
	Lines (8) x CML172	4.97	5.56		54	55	0.7	241	132	0.55	0.87	6.7	3.7	3.6	3.2	2.0	32.5	10.9	20.8
	CHECKS MEAN	5.86	6.58		54	54	0.5	239	129	0.54	0.97	8.0	3.4	3.0	3.1	1.8	14.4	11.7	20.9
	GRAND MEAN	5.49	6.24		54	54	0.5	240	131	0.55	0.93	7.1	4.3	3.4	3.1	2.1	24.8	12.0	20.8
	LSD 0.05		1.50		0.9	1.2	0.8	12.2	10.7	0.0	0.1	13.9	7.2	0.6	0.4	0.5	19.9	11.1	3.2
	CV %		12.43		1.2	1.8	2.4	3.6	6.6	6.2	10.1	10.1	10.7	13.6	11.0	18.0	10.3	11.7	7.5
	F Value (Loc*Entry)		1.89		0.74	0.71	1.31	0.98	0.77	0.69	1.14	1.17	0.93	0.78	0.58	0.95	1.46	0.95	2.11
	P(F>f)		0.00		0.88	0.94	0.16	0.53	0.88	0.95	0.28	0.24	0.63	0.87	0.98	0.59	0.05	0.60	0.00
	NUMBER OF LOC.		4		3	4	3	4	4	4	4	4	4	4	3	4	4	4	4

Check-1: P30F94, 930F94, CB-35 x 6B-41, CESDA-88; Check-2: H-513, H-513, HB83, RD-662.

Fig. 9 Means of grain yield and ear rot

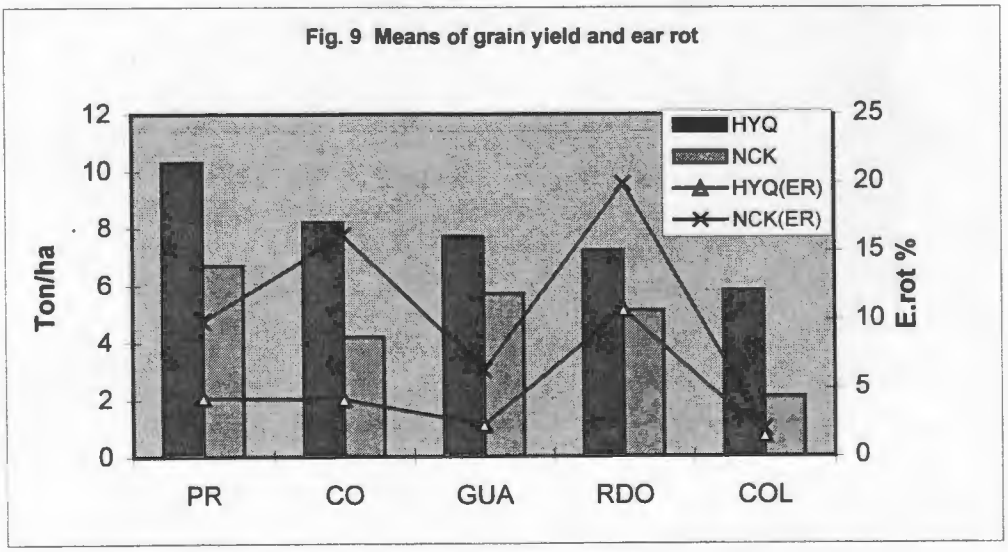
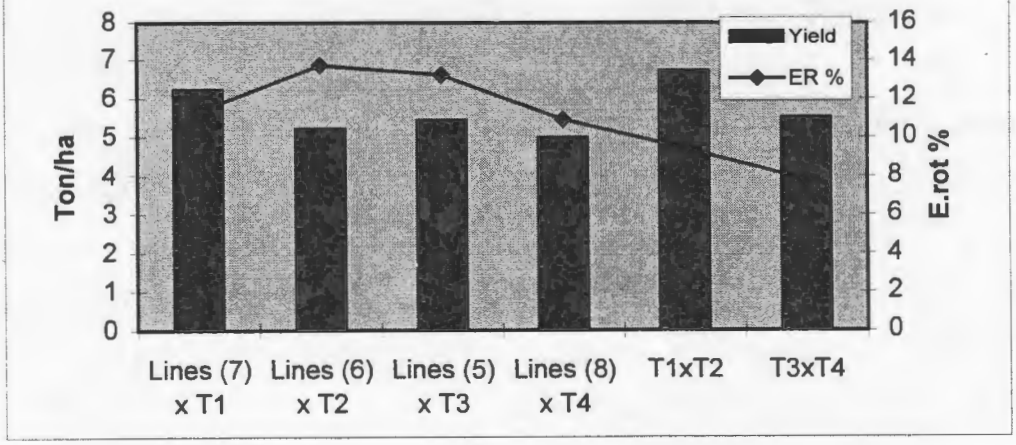


Table 84. TSCYQ-9904. GCA and SCA effects of the top 10 yielding white lines across two testers and two locations. 1999.

	T1	T2	T3	T4	Mean	Rk	GCA	SCAxT1	SCAxT2	SCAxT3	SCAxT4		GCA		
	T/ha	T/ha	T/ha	T/ha	T/ha		T/ha	T/ha	T/ha	T/ha	T/ha	Loc1	Loc2	Loc3	Loc4
L8	8.74	6.85		6.48	7..36	1	1.20	0.54	-0.29		-0.28	1.75	1.68	1.00	0.36
L6		7.14	6.86	6.41	6.80	2	0.64		0.55	0.03	0.20	1.48	0.27	-0.37	1.17
L2	6.88			6.08	6.47	3	0.31	-0.44			0.18	0.32	0.01	0.92	0.00
L4	7.39	5.77	6.15		6.43	4	0.27	0.10	-0.45	-0.30		0.32	0.27	-0.25	0.76
L7	6.42		6.01	6.21	6.21	5	0.05	-0.64		-0.23	0.59	-0.59	0.11	0.53	0.16
L5			5.91	6.39	6.15	6	-0.01			-0.26	0.83	0.71	-0.61	0.00	-0.15
L9	6.49	5.19		5.96	5.88	7	-0.29	-0.24	-0.47		0.67	-0.85	-0.75	0.40	0.06
L1	6.21	5.22		5.61	5.68	8	-0.48	-0.31	-0.24		0.52	-0.92	0.10	-0.85	-0.27
L3	6.93	5.50	5.99	1.45	4.97	9	-1.19	1.12	0.75	1.00	-2.93	-1.41	-0.96	-0.80	-1.60
GCA	0.85	-0.22	0.02	-0.59					0.74						
Mean	7.01	5.94	6.18	5.57											

Fig. 10 Means of yellow lines crossed with 4 testers



3.11. Top cross evaluation of tropical late yellow endosperm QPM lines - TSCWQ-9905.

Germplasm: 10 yellow flint and dent advanced lines from populations 65 and 66 were crossed in a diallel mating system.

Experimental design: 6x7 Alpha Lattice; 2 reps; two 5-m row.

Planting density: 66,667 plts/ha.

Locations: Poza Rica 99B, Cotaxtla 99B, Cuyuta 99B (Guatemala), Turipana (Colombia).

Tables: 85 to 87 and A255 to A259.

Line		Line	
P1 G26MH31-2-2-#-2-2-1-B-4-BB		P6 P66C1HC144-3-1-1-BB-4-BB	
P2 G26MH31-2-2-1-B-4-BBB		P7 G26C1HC2-3-3-3-1-B-2-BBB	
P3 G26QC22MH7-1-1-1-1-B*7 CML169		P8 G25QS4BMH13-5-B-1-1-2-BBB	
P4 G25S4BMH35-2-B-1-1-2-B-9-BB		P9 G25C1HC25-1-1-2-BB-1-1-BB	
P5 P65C2HC193-2-7-2#-1-B-1-2-1-B-3-1-B*6 CML164		P10 G25QC1(STE)-18-8-1-2-BBBB	

The average grain yield and ear rot across locations was 5.87 t/ha and 12.4 %, respectively. The highest and lowest grain yield mean were observed in Poza Rica (6.84 t/ha) and Colombia (4.63 t/ha), respectively. While, the highest and lowest ear rot values were observed in Cuyuta (Guatemala) (16.8%) and Colombia (1.3 %), respectively (Fig. 11). The normal endosperm RE (entry 41) was the highest yielding hybrid, across locations. Only two hybrids had better yield than entry 40 which was used as reference entry check with QPM endosperm (Table 85). The best QPM hybrids in each location and across locations yielded more than the best commercial normal seed industry endosperm check, these hybrids also showed less ear rot (Fig. 12). Four of ten lines had positive GCA effect values. Lines L6 and L8 had the highest GCA effect (Table 87) The highest SCA effect was registered by cross P1xP10 (1.925 t/ha) and ranked first for grain yield.

Table 85. TSCWQ-9905. Mean data of the top 10 yielding white single crosses across three locations. 1999.

Ent no.	PEDIGREE	Yd1 t/ha	Yd2 t/ha	Rk	MF days	FF days	PH cm	EH cm	EH/ PH	RL %	SL %	EA 1-5	PA 1-5	ER 1-5	HE 1-5	BH %	ER %	M %
7	P1 x P10	8.23	8.32	(2)	53	54	247	135	0.54	3.6	5.2	2.8	2.9	2.1	1.7	13.6	1.2	21.0
32	CML-172 x CLQ-6601	7.79	8.31	(3)	53	53	263	131	0.50	20.9	1.7	2.5	2.9	1.5	1.8	4.9	6.2	22.4
1	CML-172 x CLQ-6601	7.51	7.80	(5)	52	53	258	132	0.52	29.4	0.7	2.5	3.3	1.3	1.7	9.1	3.7	23.9
31	P6 x P8	7.38	7.91	(6)	54	53	229	134	0.58	9.1	5.4	2.8	3.3	2.1	1.4	13.0	6.7	23.1
30	P6 x P7	7.35	7.75	(7)	52	51	216	118	0.54	8.8	6.1	2.8	3.3	1.7	1.5	1.7	5.1	22.4
12	P2 x P8	7.34	8.45	(8)	53	54	250	132	0.52	11.5	0.3	3.2	3.1	2.5	2.4	50.8	13.2	22.7
20	CML-172 x CLQ-6601	7.16	7.86	(9)	53	54	254	134	0.53	21.4	0.6	2.9	3.1	1.7	1.7	5.1	8.9	24.0
37	P8 x P9	7.00	7.47	(11)	54	53	248	134	0.54	9.8	4.8	3.0	3.3	2.4	1.3	10.8	6.3	21.8
24	P4 x P9	6.93	8.30	(12)	53	53	237	135	0.57	18.0	4.3	2.9	3.2	2.1	1.4	14.5	16.5	20.2
9	P2 x P4	6.89	8.31	(13)	53	54	252	138	0.54	18.5	5.8	3.3	3.5	2.8	2.2	50.6	17.1	20.8
40	CML-161 x CML-165 (RE)	7.56	8.42	(4)	54	54	243	140	0.57	5.6	5.5	2.6	3.1	2.1	1.6	11.6	10.2	21.9
41	CML-287 x CML-413 (RE)	8.82	9.44	(1)	56	56	250	147	0.59	9.0	4.8	2.3	2.9	1.7	1.6	19.7	6.6	22.8
42	LOCAL CHECK	7.08	7.92	(10)	53	54	241	132	0.55	12.4	5.3	3.1	3.1	2.8	1.7	13.6	10.6	20.8
	CHECKS MEAN	7.82	8.59		54	55	245	140	0.57	9.0	5.2	2.7	3.0	2.2	1.7	15.0	9.1	21.9
	GRAND MEAN	5.87	6.70		53	53	238	131	0.55	16.3	4.7	3.1	3.4	2.4	1.8	20.0	12.4	21.9
	LSD 0.05		1.87		3	3	14	13	0.04	22.3	10.5	0.5	0.8	0.8	0.5	20.4	14.2	3.4
	CV %		12.95		2	3	4	8	6.29	9.4	12.4	11.4	11.9	14.5	15.2	10.0	9.0	8.8
	F Value		1.75		2.63	0.80	1.07	0.57	0.49	1.22	0.91	0.85	1.53	1.24	0.75	1.92	1.70	1.21
	P(F>f)		0.01		0.00	0.84	0.38	1.00	1.00	0.18	0.68	0.77	0.03	0.23	0.84	0.00	0.01	0.19
	NUMBER OF LOC		3		2	3	3	3	3	3	3	3	3	2	2	3	3	3

Check : P3018, P3018, HA-48

Table 86. TSCWQ-9905. Yield t/ha of the ten white lines across three locations. 1999.

Line	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Mean
P1											6.23
P2	4.74										6.27
P3	5.85	6.56									6.10
P4	6.43	8.31	6.14								6.28
P5	7.03	4.20	5.10	5.89							6.26
P6	6.42	7.93	4.72	6.09	6.00						6.63
P7	4.81	3.61	5.43	6.82	6.44	7.75					5.44
P8	6.71	8.45	7.08	2.26	7.30	7.91	5.69				6.65
P9	5.74	6.30	6.66	8.30	6.89	6.90	4.63	7.47			6.46
P10	8.32	6.37	7.32	6.32	7.48	5.97	3.80	7.01	5.28		6.43
Grand Mean											6.28

Table 87. TSCWQ-9905. GCA and SCA effects (t/ha) of ten yellow lines across three locations. 1999 B.

Line	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	GCA
P1											-0.054
P2	-1.479										-0.00
P3	-0.169	0.489									-0.203
P4	0.199	2.028	0.058								-0.009
P5	0.828	-2.058	-0.950	-0.379							-0.020
P6	-0.202	1.256	-1.754	-0.596	-0.658						0.401
P7	-0.474	-1.725	0.295	1.473	1.122	2.011					-0.938
P8	0.064	1.752	0.582	-4.450	0.620	0.809	-0.073				0.425
P9	-0.692	-0.186	0.376	1.805	0.424	0.013	-0.919	0.560			0.211
P10	1.925	-0.077	1.073	-0.138	1.051	-0.880	-1.711	0.236	-1.380		0.173

Fig. 11 Means of grain yield and ear rot

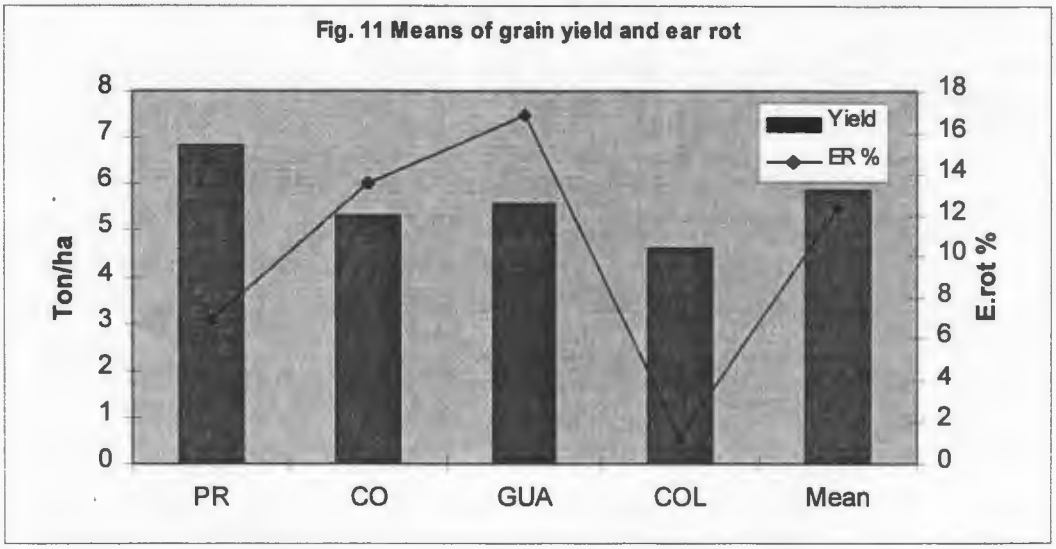
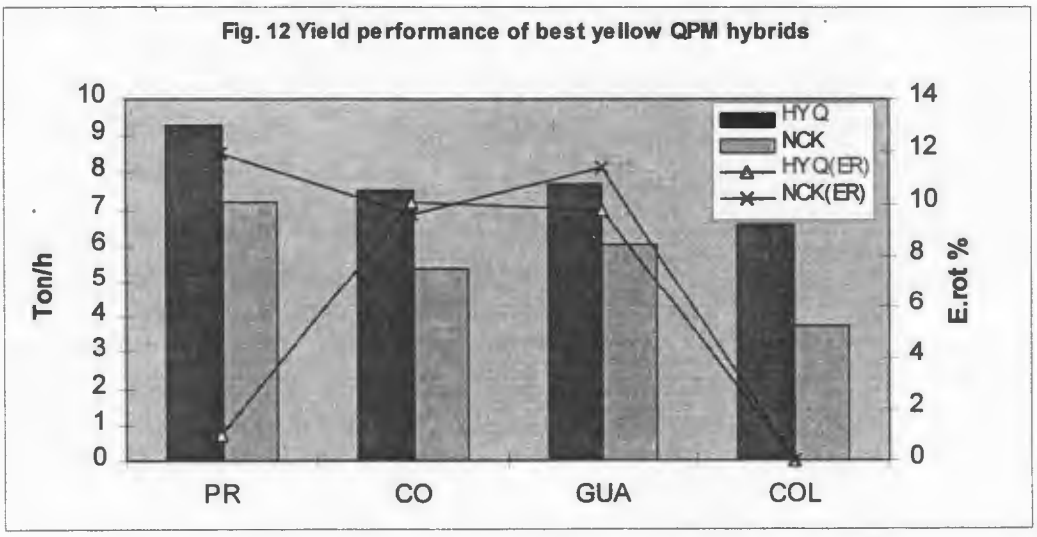


Fig. 12 Yield performance of best yellow QPM hybrids



3.12 International QPM Hybrid Maize Trials 1999.

During 1999A and B, one international QPM hybrids trial was distributed by the lowland tropical maize subprogram. The trial was CHTTWQ99 B. The results are summarized in Tables 88 and 89 respectively.

CHTTWQ-99B. CIMMYT Hybrid Trial Tropical White QPM.

Germplasm: 23 white tropical QPM hybrids and varieties.

Experimental design: 5x5 Alpha Lattice; 3 reps; two 5-m row.

Planting density: 66,667 plts/ha.

Checks: Two 2 commercial hybrids.

Locations: 28 : Mexico (8), Colombia (1), Costa Rica (1), Ecuador (1), Guatemala (2), Haiti (1), Honduras (1), Nicaragua (1), Venezuela (1), India (5), Philippines (2), Thailand (2), Vietnam (2).

Tables: 88 and 89.

This trial was sent out to several locations in the world, data from 28 locations is presented. The top five yielding hybrids across locations were CMSQ983013 (CML141 x CML144), CMTQ983049 (CML141 x CML144) x CML142, CMSQ983015 (CML150 x CML142), CMSQ983011 (CML146 x CML142), CMTQ983051 (CML141 x CML144) x CML176. The best single cross hybrid (CML141 x CML144) showed that in three–way combinations also has high yielding. Nine new QPM hybrids were better than the best QPM reference entry (Table 88).

CML141 x CML144 and (CML141 x CML144) CML142 yielded 6.0 tons/ha across 28 locations while the best normal checks yielded 5.88 tons/ha and showed more susceptibility to ear rot (Fig. 13). The potential of this hybrid for seed production is an advantage since the female parent is CML141 x CML144.

Table 88. CHTTWQ-99. Mean data of the top 7 yielding yellow single crosses by locations. 1999.

Ent.	Pedigree	Yd t/ha	ER (%)	FF days	MF days	PH cm	EH cm	SL (%)	RL (%)	EH/PH (ratio)	M (%)	HC (%)	EA (1-5)	PA (1-5)	Curv (1-5)	Stunt (%)	Hm (1-5)	Pp (1-5)	HE (1-5)	Dm (%)	Curv (1-5)	Virus (%)	Borer (%)	GLS (1-5)
11	CMSQ 983013 (CML141 x CML144)	6.04	5.8	57	56	212	120	11.6	14.6	0.56	21.6	3.0	2.6	2.9	2.5	1.0	1.5	2.7	1.5	14.4	2.0	0.2	5.4	2.3
9	CMTQ 983049 (CML141 x CML144) x CML142	6.03	7.4	57	56	224	128	5.3	14.3	0.57	22.1	5.5	2.7	2.8	2.6	1.3	1.0	2.4	1.7	9.1	2.7	0.2	5.6	1.7
2	CMSQ 983015 (CML150 x CML142)	6.02	6.4	56	55	215	105	3.1	12.3	0.49	22.3	5.4	2.7	2.5	2.8	0.9	1.3	2.6	2.1	6.5	1.3	0.5	7.3	1.7
5	CMSQ 983011 (CML146 x CML142)	6.00	7.8	57	55	221	111	5.9	13.4	0.50	20.5	3.4	2.6	2.6	2.8	1.7	1.5	3.0	2.3	5.5	1.3	0.8	2.7	2.7
10	CMTQ 983051 (CML141 x CML144) x CML176	5.94	7.7	56	55	218	114	9.2	20.3	0.52	21.6	7.1	2.8	2.9	2.8	1.6	1.0	2.7	1.8	13.7	1.7	0.0	5.9	1.7
18	CMSQ 983037 (CML142 x CML144)	5.93	4.8	58	57	219	120	5.3	14.0	0.55	21.7	2.6	2.6	2.6	2.7	1.0	1.5	2.5	1.6	78.6	1.7	0.0	7.4	2.7
13	CMSQ 983007 RE (CML144 x CML159) RE	5.60	6.0	58	57	215	105	6.5	18.5	0.49	22.3	4.1	2.6	2.6	2.4	2.4	1.2	2.2	2.0	9.4	2.0	0.5	5.9	3.0
21	PR8763 TLWD	4.73	13.3	57	55	210	102	9.3	16.9	0.49	22.2	10.8	3.1	3.1	2.8	3.9	1.5	2.6	2.5	80.0	2.0	0.8	6.7	3.0
23	S89 TLWQ (F/D)	4.39	12.5	57	55	208	108	9.7	19.5	0.52	22.3	15.5	3.2	3.1	2.7	5.5	1.7	2.8	2.4	25.9	2.0	0.7	7.7	2.3
22	AC8763 TLWF	4.27	15.1	56	55	198	103	8.5	17.0	0.52	21.2	7.9	3.4	3.0	2.8	8.8	1.2	3.0	2.1	50.7	2.0	1.8	5.3	3.0
24	LOCAL-CHECK-1	5.51	8.4	57	55	214	111	8.9	17.0	0.52	22.1	10.4	2.9	2.8	2.8	1.1	1.5	2.6	2.3	13.1	2.0	0.0	8.2	2.3
25	LOCAL-CHECK-2	5.88	8.1	57	55	213	113	6.8	16.5	0.53	23.5	11.4	2.6	2.6	2.4	1.6	1.5	2.3	1.9	10.6	2.3	0.0	0.0	2.3
	Means	5.47	9.8	56.4	54.9	211.7	105.8	7.3	15.4		21.6	10.6	2.9	2.7	2.7	2.5	1.4	2.8	2.1	25.5	1.8	0.7	6.1	2.4
	No.Locations	28	24	25	23	26	27	21	22	25	25	11	23	20	2	2	2	5	8	1	1	2	1	1
	Effect of genotype	**		**	**	**	**				**													
	Genotype X Location interaction	**		**	**	NS	NS				NS													
	5 % LSD	439.73		0.7197	0.7928	5.298	4.083				0.778													
	C.V. (%)	12.3		1.9	2.0	5.4	8.6				8.0													

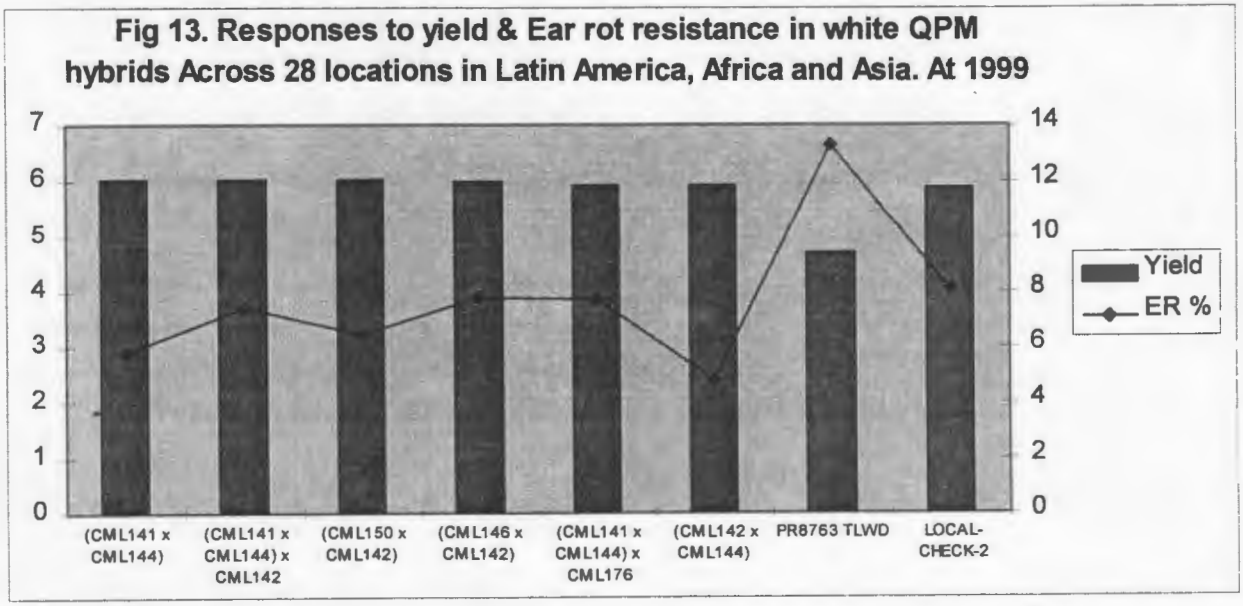


Table 89. Mean grain yield (t/ha) by locations and overall means

(Rendimiento medio de grano (t/ha) por localidad y medias generales)

CIMMYT Hybrid Trial Tropical White QPM (CHTTWQ) **Year: 1999** **No. Locations: 28**

Ensayo de hibridos tropicales de grano blanco QPM del CIMMYT (CHTTWQ) Año: 1999 No. Localidades: 28

Ent. No.	Entry Name / Entradas	South America			Central, North America and Caribbean													Asia											Overall means / Medias generales		
																													Grain yield (t/ha) Rendimiento grano (t/ha)	Days to silk Días a flor	Plant ht (cm) Altura de planta (cm)
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28			
11	CMSQ 983013	4.1	6.9	6.1	8.9	7.5	7.2	6.8	10.8	5.4	9.9	2.1	9.6	9.0	1.1	5.7	5.6	6.6	4.0	4.6	5.3	4.6	0.6	4.7	10.2	4.9	5.1	6.0	5.5	6.0	57	212
9	CMTQ 983049	4.9	7.3	6.5	8.4	7.6	7.0	5.1	10.2	5.2	9.4	4.1	9.5	9.3	0.9	6.1	6.4	6.5	4.5	4.5	5.0	5.8	1.5	5.3	8.8	5.1	5.3	3.8	5.0	6.0	57	224
2	CMSQ 983015	4.3	6.6	6.1	10.1	6.9	7.3	5.8	9.5	5.4	9.9	5.8	8.7	8.7	2.1	6.2	5.3	6.5	4.6	4.7	6.1	6.1	2.2	4.5	7.8	5.0	4.4	3.6	4.2	6.0	56	215
5	CMSQ 983011	5.2	7.1	4.4	10.0	7.7	7.8	4.5	9.1	5.6	9.2	4.8	9.1	8.4	0.6	7.4	5.9	6.1	6.6	3.3	5.9	6.8	1.2	4.0	7.8	5.5	3.9	4.9	5.4	6.0	57	221
10	CMTQ 983051	4.8	6.4	6.2	8.5	6.7	7.6	5.3	8.4	5.2	9.1	3.9	8.7	9.7	1.3	6.6	5.9	7.1	5.5	4.1	5.7	4.7	1.2	4.9	8.7	4.6	5.0	5.0	5.3	5.9	56	218
18	CMSQ 983037	4.5	7.3	5.3	8.5	7.8	7.2	4.7	9.7	5.8	9.3	4.6	10.2	8.7	1.1	5.8	5.5	7.1	4.4	4.3	4.8	5.7	1.0	3.7	8.8	6.0	5.2	4.2	5.0	5.9	58	219
1	CMTQ 983023	5.6	6.1	6.4	8.6	6.9	7.4	6.4	8.1	5.0	8.5	4.7	9.2	9.8	1.0	6.2	5.1	6.7	4.9	4.2	6.2	4.6	2.0	3.8	7.0	4.5	3.9	4.5	4.8	5.8	56	214
4	CMTQ 983055	4.5	7.6	4.3	7.8	7.3	7.3	5.2	8.8	6.3	10.0	3.8	10.3	7.8	0.6	7.6	6.3	6.3	5.5	4.0	5.3	4.8	0.7	4.9	6.6	6.0	3.9	4.5	4.2	5.8	58	219
17	CMSQ 983035	5.6	5.7	6.2	9.1	6.4	6.6	5.5	7.2	5.5	7.8	4.7	9.5	6.6	2.0	6.4	5.4	6.9	4.1	3.7	5.9	4.1	1.7	4.8	6.9	4.5	3.9	5.2	5.3	5.6	56	196
13	CMSQ 983007	4.8	7.9	4.2	7.9	7.3	7.5	4.8	8.9	4.7	9.8	3.8	9.7	9.0	0.6	6.8	6.6	6.3	3.2	4.3	4.7	4.5	0.3	5.0	5.4	5.7	4.2	4.4	4.4	5.6	58	215
14	CMTQ 983053	4.9	5.6	5.5	7.9	6.6	6.9	6.3	7.9	5.4	7.9	3.8	9.4	8.1	1.7	6.1	6.8	5.6	4.6	4.4	5.8	5.1	2.0	3.1	6.9	5.2	4.4	3.6	3.9	5.6	54	212
19	CMSQ 983005	4.6	5.7	5.0	6.8	7.0	7.0	6.9	6.7	5.1	8.7	3.2	10.3	7.3	1.6	5.9	5.5	5.7	4.4	3.1	5.9	6.7	0.4	4.4	5.7	5.2	4.8	5.1	4.4	5.5	57	211
8	CMTQ 983047	5.1	5.2	5.5	7.4	6.9	6.5	5.8	7.4	4.2	8.2	3.2	9.9	8.1	2.1	6.1	6.4	4.8	3.2	4.7	5.3	5.0	1.6	4.0	6.7	4.5	4.6	4.9	4.7	5.4	54	215
3	CMTQ 983043	4.6	7.0	5.7	7.5	7.2	6.3	3.9	7.6	5.2	8.1	3.8	10.4	8.4	1.4	5.7	6.8	4.9	4.2	5.1	5.2	6.8	1.0	2.3	4.7	5.3	3.9	4.8	3.9	5.4	54	213
7	CMSQ 983025	4.3	5.4	5.6	7.8	6.5	7.6	6.7	7.1	4.8	7.3	3.1	7.9	7.5	2.0	6.0	5.4	5.6	4.5	5.4	5.2	5.3	2.7	3.8	6.4	4.7	4.2	3.8	4.4	5.4	54	204
6	CMTQ 983045	4.9	6.3	5.7	8.0	6.8	6.3	6.6	6.8	5.3	7.6	3.7	10.0	7.8	2.3	5.7	6.1	4.6	4.1	5.2	5.0	6.0	1.5	2.7	5.5	4.7	3.4	4.6	3.1	5.4	53	205
15	CMSQ 983031	3.8	6.3	4.5	8.7	6.8	7.7	6.4	8.6	5.2	8.7	4.3	9.3	6.9	0.7	5.9	4.8	5.5	4.5	4.3	5.1	5.3	0.5	3.6	5.5	4.5	2.6	4.8	5.1	5.4	58	206
12	CMTQ 983057	4.5	6.5	4.6	7.0	7.2	7.7	4.6	5.6	5.0	8.2	4.9	9.2	8.3	0.5	5.7	5.2	6.2	4.5	3.8	5.3	4.6	1.3	5.0	4.5	4.2	4.0	4.6	3.9	5.2	58	222
16	CMSQ 983033	4.2	5.3	3.0	6.2	6.0	6.1	5.3	7.2	4.2	7.6	4.3	9.5	7.2	1.5	7.0	7.4	5.4	5.3	4.5	5.9	6.0	1.0	3.0	3.1	4.6	3.3	4.2	4.4	5.1	55	203
20	CMSQ 983059	4.4	5.1	4.8	6.9	6.4	6.0	6.2	5.7	4.0	8.7	3.1	9.5	7.0	1.9	6.1	5.6	4.5	3.5	2.1	5.1	4.6	0.9	3.3	5.8	4.0	4.3	5.7	4.8	5.0	57	204
21	POZA RICA 8763 TLWD	4.1	5.6	3.4	6.5	5.8	6.2	5.9	7.0	2.7	7.1	2.1	9.2	6.3	0.7	6.5	4.9	4.9	3.8	4.3	5.9	4.2	1.1	2.5	4.8	5.8	4.0	3.7	3.3	4.7	57	210
23	S89 TLWQ (F/D)	3.4	5.1	3.3	4.8	5.5	5.5	3.8	6.6	3.5	7.8	3.1	7.9	6.1	0.5	5.3	4.5	5.4	3.6	4.1	4.8	3.9	1.0	3.4	5.1	4.4	3.6	3.4	3.7	4.4	57	208
22	ACROSS 8763 TLWF	3.5	4.8	3.2	5.9	5.4	5.5	4.2	6.3	3.1	6.4	2.0	8.4	5.5	1.1	5.9	3.7	4.3	3.3	3.8	5.0	5.4	0.5	3.0	4.6	4.0	3.3	3.4	3.9	4.3	56	198
24	LOCAL CHECK-1 (QPM)	3.8	4.6	3.3	8.6	6.5	7.5	5.3	8.0	3.8	8.7	4.6	12.8	7.5	1.9	6.5	5.2	5.7	2.8	5.2	4.6	5.4	0.8	3.5	5.5	7.3	9.3	2.8	2.6	5.5		
25	LOCAL CHECK-2 (NORMAL)	3.9	4.8	4.8	6.7	6.9	8.5	4.7	8.3	4.5	9.4	7.2	11.5	8.1	2.0	6.1	4.4	7.0	4.4	4.9	6.2	4.4	2.4	2.7	0.0	10.6	7.4	4.4	2.6	5.7		
Means		4.6	6.2	5.0	7.8	6.8	6.9	5.5	7.9	4.9	8.5	3.8	9.4	7.9	1.3	6.2	5.7	5.8	4.4	4.2	5.4	5.2	1.2	3.9	6.4	4.9	4.1	4.5	4.5	5.5		
CV		11.4	9.8	13.9	12.1	5.6	5.6	15.4	6.5	10.0	4.5	14.9	6.9	7.1	23.5	10.1	12.0	9.5	8.2	10.9	13.9	7.0	28.3	16.7	15.0	7.9	7.9	10.7	8.7			

No.	Country / País	Location / Localidad	No.	Country / País	Location / Localidad	No.	Country / País	Location / Localidad
1	Colombia	Monteria	11	Mexico	Puerto Vallarta	21	India	Udaipur
2	Ecuador	Pichilingue	12	Mexico	Roque, Gto	22	India	New Delhi
3	Venezuela	Guarico	13	Mexico	Cotaxtla	23	Philippines	San Felipe, Ilagan,Isabela
4	Costa Rica	Cañas, Guanacaste	14	Mexico	Valle De Yaqui	24	Philippines	Baybay, Leyte
5	Guatemala	Jutiapa	15	Mexico	Nextipac	25	Thailand	Farm Suwan
6	Guatemala	Tiquisate, Finca las Vegas	16	exico	Nextipac(2)	26	Thiland	Takfa
7	Guatemala	Damien	17	aragua	Santa Rosa, Managua	27	Vietnam	Dan Phuong
8	Honduras	Comayagua	18	India	Dholi	28	Vietnam	Binh Chanh District, HCM
9	Mexico	Campeche	19	India	Hyderabad			
10	Mexico	Poza Rica	20	India	Ludhiana			

CIMMYT Hybrid Trial Tropical Yellow QPM - HTTYQ-99B.

Germplasm: 14 yellow tropical QPM hybrids and varieties.

Experimental design: 4x4 Alpha Lattice; 3 reps; two 5-m row.

Planting density: 66,667 plts/ha.

Checks: Two commercial hybrids.

Locations: Poza Rica 99B, Cotaxtla 99B, Monteria (Colombia), La Maquina (Guatemala), El Ejido (Panama) and Suwan Farm (Thailand).

Table: 90

The average grain yield and ear rot in across locations was 5.52 t/ha and 7.5 %, respectively. The highest grain yield mean (7.51 t/ha) was recorded in Poza Rica, while the lowest yield (3.17 t/ha) was registered in Guatemala. The lowest and highest ear rot value was recorded in Panama and Cotaxtla, respectively. Seven top yellow hybrids yielded more than the local checks, these new QPM hybrids had also less ear rot. Entry 5 was the superior hybrid and yielded more than the best QPM reference entry (CML161xCML165) and more than best normal endosperm local check (Table 90). In each location the best QPM hybrids yielded more than the local check except in Thailand, and in some cases had less ear rot (Fig. 14).

CLO-6601 x CML172 yielded 7.2 tons/ha and the normal seed industry checks 6.1 tons/ha, and showed more ear rot and root lodging damage (Table 90).

All hybrids and lines selected in this project will be internationally and regionally tested in the different regional programs around the world in the tropical mega-environment.

The lines selected with good GCA will be used to form new F2 pedigree populations and hybrid or synthetic formation to enhance QPM breeding activities.

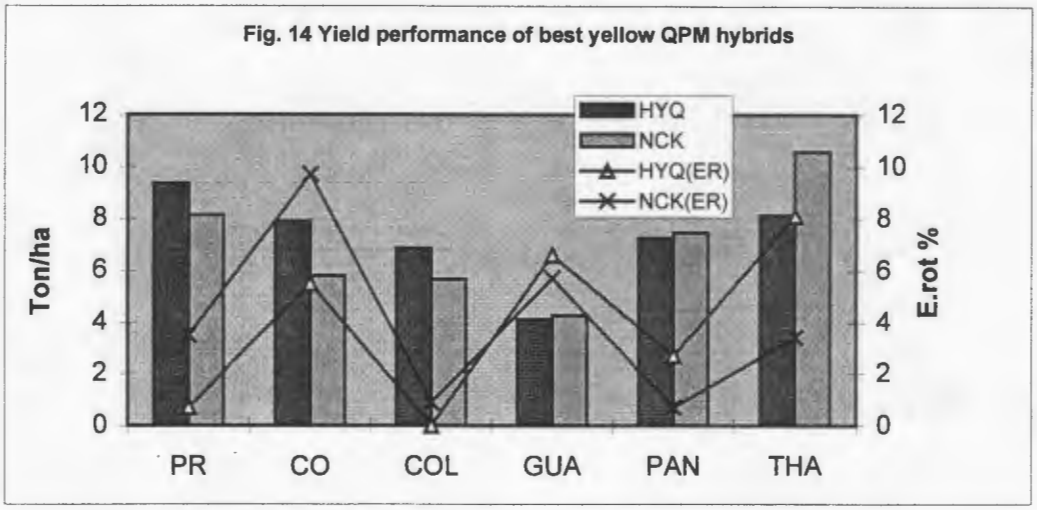


Table 90. HTTYQ-99. Mean data of the top 7 yielding yellow single crosses across six locations. 1999.

Ent no.	PEDIGREE	Yd1 t/ha	Yd2 t/ha	Rk	MF days	FF days	ASI	PH cm	EH cm	EH/ PH	E/P #	RL %	SL %	EA 1-5	PA 1-5	Ru 1-5	BH %	ER %	M %
5	CLQ-6601xCML-172	6.97	7.24	(1)	52	54	0.9	268	131	0.49	0.98	19.8	2.5	2.6	2.9	2.0	4.1	3.8	21.8
6	CLQ-6601xCLQ-6502	6.59	6.89	(2)	49	51	0.6	247	124	0.50	1.01	14.9	1.0	2.9	2.9	1.5	2.4	4.4	22.2
3	CML-168xCML-172	6.23	6.47	(3)	53	55	0.8	273	147	0.53	0.92	24.2	6.4	3.0	3.7	1.5	21.1	3.7	20.3
1	CML-164xCML-172	6.13	6.37	(4)	51	53	1.2	247	135	0.55	1.03	17.3	2.6	3.1	3.1	2.2	13.4	3.8	21.8
11	CML-164xCML-161	6.04	6.39	(5)	51	53	1.2	237	135	0.58	0.96	23.4	2.6	2.9	3.0	1.5	14.1	5.6	20.3
9	CML-165xCML-161 (RE)	5.99	6.41	(6)	53	54	1.0	240	124	0.51	0.95	13.4	7.4	2.9	2.9	1.8	13.3	6.5	20.7
10	CML-170xCML-161	5.86	6.23	(7)	52	53	0.1	225	126	0.56	0.96	12.6	6.1	2.9	2.9	1.8	7.5	6.0	19.8
15	LOCAL CHECK1	5.75	6.11	(8)	54	55	0.5	244	130	0.53	0.94	9.7	5.0	2.9	3.0	1.7	9.9	5.9	22.7
16	LOCAL CHECK2	5.61	5.95	(9)	53	54	0.7	242	120	0.49	0.92	12.3	5.4	2.9	2.9	1.7	8.6	5.6	20.2
	CHECKS MEAN	5.68	6.03		53	55	0.6	243	125	0.51	0.93	11.0	5.2	2.9	3.0	1.7	9.3	5.8	21.5
	GRAND MEAN	5.52	5.94		52	54	1.0	246	130	0.53	0.94	17.9	4.9	3.1	3.2	1.8	14.5	7.5	21.0
	LSD 0.05		0.9		0.9	1.0	0.7	9.2	8.5	0.0	0.1	15.1	6.2	0.4	0.4	.	17.8	6.0	1.8
	HSD 0.05		2.0		1.9	2.1	1.6	20.1	18.6	0.1	0.2	32.9	13.6	1.0	0.8	.	38.8	13.2	3.9
	CV %		10.3		1.3	1.4	2.6	3.6	7.2	6.7	8.5	7.3	10.6	10.8	12.2	14.2	8.2	8.1	6.5
	F Value		1.45		0.55	0.95	0.45	0.65	0.52	0.40	0.69	1.36	0.57	1.06	0.59	.	2.60	0.87	1.05
	P(F>f)		0.05		0.96	0.58	0.99	0.96	1.00	1.00	0.94	0.11	0.98	0.40	0.99	.	0.00	0.72	0.40
	NUMBER OF LOCATIONS		5		3	5	3	5	5	5	5	4	4	5	5	1	4	5	5

Check-1: P3031, P3031, V-109, HA-48, P9490; Check-2: P3018, P3018, G5423, HA-48, X-304C

4.0 Screening and Evaluation of Lines under Biotic and Abiotic Stress.

These trials were evaluated under four stresses: Drought, Low-N, Fall armyworm and Foliar diseases. LET(EW)9901, LET(EY)9902, LET(LW)9903 and LET(LY)9904.

4.1 Evaluation of tropical early and intermediate maturity white endosperm inbred lines under biotic and abiotic stresses. LET(EW)9901.

Germplasm: 49 S6 to S10 inbred lines from G15, G16, G19, P102, P30 and P49
Experimental design: 7 x 7 alpha lattice; 2 reps; one 2.5-m row
Planting density: 82,666 plts/ha
Location: Poza Rica (Mexico)
Tables: 91 to 94.

The mean grain yield under Low N was 1.09 t/ha, but there was no signifficant differences between lines. Mean DTA was 61 days after sowing. Thirty lines out of the 49 entries performed better than the two checks. The best yielding line was entry 15 (2.48 t/ha), followed by entries 42 and 32, these lines also showed good values to lodging and ear rot resistant.

The ranking mean of FAW and SCM were 5.8 and 8.1, respectively. Four lines showed good values for FAW than the resistant check. The best entries with low values for FAW were entry 27 and 46. However, all lines in this trial were afected for SCB, while the resistant check was the best resistant line.

The average mean of B.m and P.p were 2.4 and 1.9, respectively. The two reference entries 46 and 47 showed more suceptibility to diseases than most of the lines evaluated here. Sixteen lines were more resistant to diseases than the best inbred lines as check. The best resistant line was entry 5, followed by entries 22 and 33.

The best performing lines that showed differential responses under different stresses were: Entries 14, 15, 26, 32 and 46. The early white inbred lines were on the top yielding 10 yielding lines under low N and drought, entries 15, 17 and 46 also coincide with good response to drought, low N, FAW and SCW. Line 20 concide in both FAW and drought. Lines 44 and 37 showed good response under foliar diseases and low-N, 10 lines outyielded the checks under low-N and drought and showed resistance to foliar diseases and tolerance to FAW (Tables 91 to 94).

4.2 Evaluation of tropical early maturity yellow endosperm inbred lines under biotic and abiotic stresses. LET(EY) 9902.

Germplasm: 50 S6 to S10 inbred lines from G17, G18, G21, G22 and P31
Experimental design: 5 x 10 alpha lattice; 2 reps; one 2.5-m row
Planting density: 82,666 plts/ha
Location: Poza Rica (Mexico)

Table 91. LET(EW) 9901. Mean data of the best lines under drought at Tlaltizapan. 2000 A.

Ent no	PEDIGREE	Yd t/ha	Rk	MF days	ASI	EH/ PH	SEN1 1-10	SEN2 1-10	LR 1-5	SPAD1 %	SPAD2 %	RL %	E/P	EA 1-5	ER %
17	G16C23MH-B78-2-2-B-1-1-BB	2.93	*1*	91	-1.0	0.43	2.3	6.1	3.0	37.9	13.2	11.1	1.7	2.6	20.0
13	G16C23MH122-1-1-B-2-1-BB	2.57	*2*	88	0.0	0.46	2.9	3.4	2.4	39.7	12.8	0.0	1.4	2.5	10.0
15	G16C23MH173-1-2-B-3-2-BB	2.29	*3*	93	-2.0	0.51	2.8	3.7	1.5	45.5	18.4	5.6	1.0	2.5	10.0
14	G16C23MH159-1-2-B-1-2-BB	2.13	*4*	92	0.0	0.44	1.9	3.2	2.1	37.7	18.0	26.7	1.0	2.2	10.0
46	(PR8549-1-1*P23C2-1-1)-5-1-3-BBB RE	2.12	*5*	98	1.0	0.42	2.9	3.6	2.3	44.2	19.3	11.1	1.1	2.5	10.0
26	G19C3MH426-3-2-B-1-3-BB	2.07	*6*	96	1.5	0.50	1.5	3.1	1.8	40.6	24.3	26.1	1.2	2.8	10.0
18	G19C3MH19-1-1-B-2-2-BB	1.95	*8*	95	-1.0	0.40	1.0	4.7	2.5	35.6	10.6	11.8	1.0	2.5	10.0
32	SPEC6F74-1-4-1-1-1-BBBBB	1.94	*9*	100	-3.5	0.44	2.1	3.4	2.5	37.0	10.4	66.7	2.0	3.5	20.0
11	G16C23MH30-2-2-B-2-3-BB	1.92	*10*	93	-1.5	0.39	1.1	5.9	2.4	46.0	9.4	16.7	1.2	2.5	15.0
47	G16C19MH219-5-1-1-3-2-B#-BBBB RE	1.24	*11*	92	-1.5	0.48	1.8	5.9	2.1	42.6	12.6	29.2	1.6	4.3	25.0
48	P30C6HC93-B-2-BBBBBB	1.22	*12*	94	2.0	0.52	3.5	5.3	2.8	37.2	13.7	27.8	1.0	3.0	15.0
49	CML-418	2.00	*7*	96	-6.0	0.54	2.1	6.5	2.3	38.4	8.1	33.3	1.0	2.5	10.0
	GRAND MEAN	1.21		96	0.7	0.47	2.6	4.7	2.4	35.8	15.1	41.7	1.1	3.6	22.1

Table 92. LET(EW) 9901. Mean data of the best lines under low-N at Poza Rica. 1999 B.

Ent	PEDIGREE	Yd t/ha	Rk	MF days	ASI days	PH cm	EH cm	SEN1 (1-10)	SEN2 (1-10	Hm (1-5)	RL %	SL %	EPP #	EROT %	EA (1-3)
15	G16C23MH173-1-2-B-3-2-BB	2.48	1	58	0.4	113	44	3.6	7.0	1.0	0.8	8.2	1.2	0.5	0.6
26	G19C3MH426-3-2-B-1-3-BB	1.56	2	61	0.5	102	33	2.7	6.5	0.9	-0.4	-0.1	1.7	1.7	1.3
42	(P49-SR(BC6S3)-HS#-HS#-120-3-#1-B1-B1	2.10	3	62	1.0	117	51	3.3	6.0	1.0	0.1	-0.3	1.1	3.2	1.5
32	SPEC6F74-1-4-1-1-1-BBBBB	2.00	4	62	-1.6	83	43	1.6	7.5	1.0	0.2	6.3	1.3	2.3	1.5
46	(PR8549-1-1*P23C2-1-1)-5-1-3-BBB-RE	1.89	5	63	-0.5	78	20	1.5	6.5	1.1	7.4	-0.1	1.0	1.7	1.8
14	G16C23MH159-1-2-B-1-2-BB	1.60	6	60	0.5	112	52	1.6	6.5	1.1	6.6	-0.4	1.1	2.8	1.6
44	(P49-SR(BC6S3)-HS#-HS#-120-6-#1-B1-B2	1.76	7	63	-1.5	90	41	2.3	6.0	1.6	16.3	0.2	0.8	2.5	1.8
37	SPEC7F152-1-3-2-1-1-B-B	1.13	8	62	-0.4	87	43	2.8	6.0	2.0	0.1	0.3	1.4	4.9	2.2
20	G19C3MH104-3-1-B-2-3-BB	1.42	9	62	0.0	104	53	3.5	6.5	1.8	0.6	8.6	1.1	3.1	1.6
48	P30-C6-HC-93-B-2-B*6 (CHECK-1)	0.92	31	63	2.5	103	38	3.2	5.5	2.0	-0.5	0.1	0.8	7.8	2.9
49	CML 418 (CHECK-2)	0.78	46	57	1.5	83	36	4.7	10.0	5.0	1.2	0.3	0.9	4.3	2.0
	Grand Mean	1.09		61	1.0	98.7	38.5	2.9	7.2	2.1	4.1	3.9	1.0	4.5	2.2

Table 93. LET(EW) 9901. Mean data of the best lines under FAW and SCB. 1999 B.

Ent no	PEDIGREE	FAW rep 1	FAW rep 2	Mean	SCB rep 1	SCB rep 2	Mean
27	G16BNSEQC0F81-2-1-1-2	5.5	5.0	5.3	8.5	9.0	8.8
46	(PR8549-1-1*P23C2-1-1)-5-1-3-BBB RE	5.0	5.5	5.3	9.0	9.5	9.3
20	G 19 C3MH104-3-1-B-2-3-BB	5.5	5.5	5.5	7.5	9.0	8.3
36	SPEC7F124-2-1-2-1-1-B-B	5.5	5.5	5.5	9.0	6.5	7.8
12	G 16 C23MH176-2-2-B-1-1-BB	5.5	6.0	5.8	8.0	9.0	8.5
13	G16 C23MH122-1-1-B-2-1-BB	6.5	5.0	5.8	8.5	9.0	8.8
7	P102 C6 S2(B)-165-2-BB	7.0	5.0	6.0	8.5	8.0	8.3
15	G 16 C23MH173-1-2-B-3-2-BB	5.5	6.5	6.0	9.0	8.5	8.8
17	G 16 C23MH378-2-2-B-1-1-BB	5.5	6.5	6.0	9.0	8.5	8.8
48	P30 C6 HC93-B-2-BBBBBB	6.0	6.0	6.0	9.0	8.5	8.8
49	CML-418	6.5	5.5	6.0	8.5	9.0	8.8
	Resistant check			7.0			4.0
	Susceptible check			5.8			6.5
	GRAND MEAN			5.8			8.1

Table 94. LET(EW) 9901. Mean data of the best lines under B.m and P.p. 1999 B.

Ent	PEDIGREE	B.m (1-5) Rep 1	B.m (1-5) Rep 2	P.p (1-5) Rep 1	P.p (1-5) Rep 2	Avg. B.m.	Avg. P.p.	Avg. B.m/P.p	Rk	PA (1-5)
5	P102 C6 S2(B)-97-3-BB	2.0	1.5	1.0	1.5	1.8	1.3	1.5	1	3.5
22	G 19 C3MH185-1-2-B-1-1-B	2.0	2.0	1.5	1.5	2.0	1.5	1.8	2	4.0
33	SPEC6F295-1-1-1-1-1-BBBB	2.0	2.5	1.0	1.5	2.3	1.3	1.8	3	4.0
31	G16BNSEQC0F118-1-4-3-1-BBB	2.0	1.5	2.0	2.0	1.8	2.0	1.9	4	3.5
28	G16BNSEQC0F118-1-1-4-2	2.5	1.5	1.5	2.0	2.0	1.8	1.9	5	3.5
41	SPE-C6-2-1-4-B	2.0	2.0	1.5	2.0	2.0	1.8	1.9	6	3.5
43	(P49-SR(BC6S3) HS#HS#-120-4-#1-B1-B1	2.5	1.5	1.5	2.0	2.0	1.8	1.9	7	3.5
44	(P49-SR(BC6S3) HS#HS#-120-6-#1-B1-B2	1.5	2.5	1.5	2.0	2.0	1.8	1.9	8	3.5
37	SPEC7F152-1-3-2-1-1-B-B	2.5	2.0	1.5	1.5	2.3	1.5	1.9	9	3.0
23	G 19 C3MH260-1-1-B-3-2-BB	2.0	1.5	2.5	2.0	1.8	2.3	2.0	10	3.0
46	(PR8549-1-1*P23C2-1-1)-5-1-3-BBB RE	3.0	2.0	1.5	2.5	2.5	2.0	2.3	35	3.0
47	G16C19MH219-5-1-1-3-2-B-#-BBBB RE	3.5	2.5	1.5	2.0	3.0	1.8	2.4	42	3.5
48	CHECK 1 = P30C6HC 93-B-2-B*6	2.0	2.5	1.5	2.0	2.3	1.8	2.0	17	3.5
49	CHECK 2= CML 418	2.5	2.0	2.0	2.5	2.3	2.3	2.3	31	3.0
	Grand mean	2.4		1.9						

Table 95. LET(EY) 9902. Mean data of the best lines under drought at Tlaltizapan. 2000 A.

Ent		Yd	Rk	MF	ASI	EH/	SEN1	SEN2	LR	SPAD1	Lodg	EA	PA	E/P	ER
no	PEDIGREE	t/ha		days		PH	1-10	1-10	1-5	%	%	1-5	1-5		%
39	G18SeqC3F155-2-1-3-1-1-B	2.72	1	95	1.0	0.53	1.0	3.3	1.0	43.1	46.6	2.5	2.7	1.85	15.0
1	G17C29MH22-2-1-B-4-1-BB	2.40	2	88	-1.5	0.49	1.5	5.6	2.3	30.5	3.1	2.8	3.3	1.28	10.0
18	P31C4S5B-41-##-7-BBB	2.40	2	88	1.4	0.46	2.0	5.0	1.0	42.1	12.1	2.5	2.5	0.94	10.0
31	G18SeqC1-124-2-2-1-1-4-BBBB	2.27	4	95	-0.5	0.38	1.0	3.2	1.0	42.4	28.3	2.5	2.2	1.00	10.0
45	G18C19MH100#-4-1-1-BBBBBB	2.16	5	89	0.5	0.53	1.5	5.2	2.2	33.7	7.8	2.6	2.8	1.00	10.0
40	G18SeqC3F245-2-2-2-1-1-BB	2.15	6	94	-0.3	0.39	1.5	5.6	1.2	47.3	49.8	2.5	2.8	1.09	10.0
22	P31C4S5B-85-##-10-BBB	2.13	7	86	1.6	0.49	1.5	4.6	1.0	40.8	0.7	2.7	3.1	1.01	10.0
20	P31C4S5B-B-6-##-2-BBB	2.05	8	91	0.5	0.47	1.5	4.9	1.2	41.1	14.2	2.8	3.3	0.98	10.0
19	P31C4S5B-B-6-##-1-2-BB	2.02	9	89	2.0	0.52	1.5	4.5	1.2	42.8	4.5	2.6	3.3	0.96	10.0
16	G21MH586-1-B-3-1-B-3-5-BB	2.00	10	95	0.5	0.51	1.0	4.0	2.0	35.9	1.9	2.7	2.7	1.01	15.0
47	G21C22MH169#-1-2-1-1-BBBBB RE	1.37	12	93	-1.1	0.57	2.5	7.0	1.3	26.3	64.3	4.3	3.0	1.22	35.0
48	P31DMR#1-55-2-3-2-1-BBBBB RE	1.01	14	92	2.6	0.42	1.0	5.3	2.0	37.6	0.4	3.7	3.7	0.93	10.0
49	G18SEQC3-74-1-3-1-1-BBBB	1.85	11	97	0.6	0.20	1.0	2.8	1.3	33.7	99.6	3.2	2.8	1.99	15.0
50	DTP1Y-C6F234-2-#-2-2-3-2-BBBB	1.02	13	99	1.4	0.39	1.0	2.7	1.5	40.2	86.1	5.0	3.7	1.57	30.0
	GRAND MEAN	1.58		93	1.0	0.48	1.6	5.0	1.4	36.9	36.7	3.4	3.2	1.09	19.2

Table 96. LET(EY) 9902. Mean data of the bets lines under low-N at Poza Rica. 1999 B.

Ent	PEDIGREE	Yd		MF	ASI	PH	EH	SEN1	SEN2	Hm	RL	SL	EPP	ER	EA
		t/ha		days	days	cm	cm	(1-10)	(1-10	(1-5)	%	%	#	%	(1-3)
11	G21C4MH182-1-B-1-1-B-3-2-B	1.82	1	61	-0.2	104	42	1.8	6.3	2.0	0.0	6.3	2.3	1.7	1.1
32	G18SeqC2F119-2-1-1-#-1-1-BB	2.05	2	59	1.0	113	47	2.4	6.6	2.5	-0.1	0.0	1.2	5.9	0.7
39	G18SeqC3F155-2-1-3-1-1-B	1.54	3	58	2.3	103	50	3.8	5.7	1.5	7.1	0.0	1.5	9.3	2.1
45	G18C19MH100#-4-1-1-BBBBBB	2.47	5	56	0.5	109	52	2.8	9.2	1.5	0.0	21.4	1.1	8.1	1.4
1	G17C29MH22-2-1-B-4-1-BB	1.87	6	53	0.1	116	50	2.1	9.0	1.5	6.4	6.3	0.9	1.0	0.9
48	P31DMR#1-55-2-3-2-1-BBBBB RE	1.35	7	58	1.0	130	55	1.7	7.7	2.0	0.0	6.3	1.1	4.2	2.3
6	G18C25MH276-2-1-B-2-1-BB	1.45	8	57	-0.5	116	58	3.3	7.0	1.5	56.3	0.0	1.1	6.7	2.4
41	EY-DMR-GC5-S2-BB-2-B	1.68	9	58	-0.3	115	55	3.1	7.9	1.0	0.1	6.3	0.9	4.8	1.8
29	SW92145-1P6S2-##-BB	2.10	10	56	0.8	109	50	3.1	8.1	2.0	0.1	31.3	0.9	7.8	1.4
49	G18SEQC3-74-1-3-1-1-BBBB(CHECK-1)	0.62	35	60	0.7	69	28	2.9	6.6	2.5	10.0	0.0	0.8	4.2	3.0
50	DTP1Y-C6-F234-2-2-3-2BBBB(CHECK-2)	1.51	4	60	2.9	130	52	2.2	3.5	1.0	12.6	0.0	1.0	6.4	2.0
	Grand Mean	1.16		59	1.8	109	48	2.9	7.8	1.9	7.2	5.3	1.0	7.0	2.2

Table 97. LET(EY) 9902. Mean data of the best lines under FAW and SCB. 1999 B.

Ent no	PEDIGREE	FAW rep 1	FAW rep 2	Mean	SCB rep 1	SCB rep 2	Mean
9	G21C4MH110-1-B-1-1-B-1-2-BB	7.0	3.0	5.0	8.5	9.5	9.0
35	G18SeqC3-17-1-1-2-2-BBBB	5.5	6.0	5.8	8.5	9.0	8.8
13	G22 22 C22MH81-1-B-1-1-B-2-2-BB	6.5	5.5	6.0	8.5	9.5	9.0
33	G18SEQc2-F141-2-2-1-1-1-2-##-2-B	5.5	6.5	6.0	9.0	8.5	8.8
38	G18SeqC3-85-1-1-2-2-B-B	6.0	6.0	6.0	9.0	9.0	9.0
42	G21-268-1-#1-2-#2-#-#1-BBB	6.5	5.5	6.0	9.0	9.0	9.0
46	G17TSRMH5-2-4-7-1-1-1-BBBBB	5.0	7.0	6.0	9.5	8.5	9.0
48	P31DMR#1-55-2-3-2-1-BBBBB RE	5.0	7.0	6.0	9.0	9.0	9.0
49	CHECK-1 G18SEQC3-74-1-3-1-1-BBBB	7.0	6.0	6.5	9.5	9.5	9.5
50	CHECK-2 DTP1Y-C6F234-2-#-2-2-3-2-BBBB	7.0	5.5	6.3	9.0	8.5	8.8
	Resistant check			6.0			6.5
	Susceptible check			5.5			5.0
	GRAND MEAN			5.9			8.4

Table 98. LET(EY) 9902. Mean data of the best lines under B.m and P.p. 1999 B.

Ent	PEDIGREE	B.m (1-5) Rep 1	B.m (1-5) Rep 2	P.p (1-5) Rep 1	P.p (1-5) Rep 2	Avg. B.m. (1-5)	Avg. P.p. (1-5)	Mean	Rk	PA (1-5)
18	P31C4S5B-41-##-7-BBB	1.5	1.5	1.5	2.0	1.5	1.8	1.6	1	3.0
24	P31C4S5B-85-##-2-3-BB	1.5	1.5	2.0	1.5	1.5	1.8	1.6	2	2.5
37	G18SeqC3-23-4-1-1-1-B-B	1.5	1.5	1.5	2.0	1.5	1.8	1.6	3	4.0
42	G21-268-1-#1-2-#2-#-#1-BBB	2.0	1.5	1.5	2.0	1.8	1.8	1.8	5	3.0
3	G 18 C25MH 39-1-4-B-2-2-BB	2.0	2.0	1.5	1.5	2.0	1.5	1.8	6	3.0
26	P31C4S5B-85-##-6-BB	2.0	1.5	2.0	2.0	1.8	2.0	1.9	8	3.0
5	G 18 C25MH 86-2-1-B-2-3-BB	2.5	2.0	1.5	1.5	2.3	1.5	1.9	9	3.0
6	G 18 C25MH276-2-1-B-2-1-BB	2.5	2.0	1.5	1.5	2.3	1.5	1.9	10	3.0
38	G18SeqC3-85-1-1-2-2-B-B	2.0	2.5	1.5	1.5	2.3	1.5	1.9	11	3.5
47	G21C22MH169#-1-2-1-1-BBBBB RE	2.0	2.0	2.5	2.5	2.3	2.0	2.1	27	3.5
48	P31DMR#1-55-2-3-2-1-BBBBB RE	2.0	1.5	2.5	1.0	2.5	2.5	2.5	45	3.5
49	CHECK 1= G18SEQC3 74-1-3-1-1-B*4	1.5	2.5	1.0	2.0	2.0	1.5	1.8	7	2.0
50	CHECK 2= DTP1YC6F2 34-2-#-2-3-2-B*4	1.5	2.0	1.5	1.5	1.8	1.5	1.6	4	3.0
	Grand Mean	2.2		2.0						

Tables: 95 to 98.

The mean grain yield was 1.16 t/ha, while DTA was 59 days after sowing. There was significant differences among lines in many traits except stem lodging and ears per plant. Three lines out of the 50 entries performed better than the check 2, while most of the lines had good yield than the check 1. The more yielding line was entry 45 (2.47 t/ha), however this line showed 21.4% of stalk lodging and 8.1 % for ear rot. While entry 11 had (1.82 t/ha) and showed resistant to lodging and ear rot. Other promising lines were entry 32, 1 and 41.

The ranking mean for FAW and SCM were 5.9 and 8.4, respectively. Only one line showed better performance than the resistant check. The resistant check was the best line in both FAW and SCB. Entry 9 was the best line with low value for FAW but has high value for SCB. All lineas in this trial were afected severely by SCB.

The average mean of B.m and P.p were 2.2 and 2.0, respectively. The two reference entries 47 and 48 showed more suceptibility to diseases than most of the lines in this trial. Six lines were more resistant to diseases than the best inbred lines as check. The best resistant line was entry 18, followed by entries 24 and 42. Five of the nine best lines involved lines from pool 18 which had good resistant to diseases.

Among the tropical yellow early lines the best performing lines that showed better differential responses to all four stresses are entries: 1, 39 and 45. On the 10 best lines that topped the trials under drought and low-N were: Entry 48 coincided in response under low-N and FAW-SCB. Entries 6 and 18 coincided with foliar diseases, drought and low-N. Entries 38 and 42 responded well to foliar diseases and FAW-SCB (Tables 95 to 98).

4.3 Evaluation of tropical late maturity white endosperm inbred lines under biotic and abiotic stresses. LET(LW) 9903.

Germplasm: 100 S4 to S13 inbred lines from P21, P22, P25, P29, P32, P43 and FAW.
Experimental design: 10 x 10 alpha lattice; 2 reps; one 2.5-m row
Planting density: 82,666 plts/ha
Location: Poza Rica (Mexico)

Tables: 99 to 102

The mean grain yield was 1.25 t/ha, while DTA was 66 days after sowing. Eighty six entries performed better than the 2 checks, which were high yielding under the drought conditions. The top yielding lines was entry 15 (3.61 t/ha), however this line had 23.1% od root lodging but was resistant for ear rot. The entry 86 (2.05 t/ha) showed resistant to lodging and ear rot. Other promising lines were entry 89, 45 and 57.

The ranking mean in both FAW ann SCB were 5.7 and 6.8, respectively. Six lines were better than the resistant check for FAW. Entry 52 had the lowest value for FAW showed better resistant than the resistant check. While entry 55 also showed good values for FAW and the lowest value for SCB, this line should be consider as resistant line for both insects.

The average mean of B.m and P.p were 2.2 and 1.9, respectively. Seven lines showed more

Table 99. LET(LW) 9903. Mean data of the best lines under drought at Tlaltizapan. 2000 A.

Ent no	PEDIGREE	Yld t/ha	Rk	MF days	ASI	EH PH	SEN1 1-10	SEN2 1-10	SEN3 1-10	LR 1-5	SPAD %	Lodg %	EA 1-5	EPP	ER %
36	LA POSTA SEQC3-H1-2-2-1-2-1-##-B-B	4.23	1	107	-2.0	0.57	2.0	2.7	4.5	1.5	38.2	11.1	2.5	1.33	14.9
73	(SEGR-6-5-#/NPH28-1)-1-1-1-BB-1-2-BB	3.25	2	102	2.5	0.49	1.5	2.5	3.0	1.4	42.2	0.0	2.5	1.06	12.5
15	SIR NON-TUX PEN O WHITE-28-2-1-2-B	3.05	3	101	3.0	0.46	2.0	1.6	2.5	2.0	42.0	12.7	2.6	1.18	15.4
75	(NPH-89 x NPH1101)-7-4-1-6-B-1-B-3-B-B	2.90	4	108	0.0	0.52	2.5	2.5	4.0	1.7	35.6	11.1	2.8	1.61	17.2
74	(NPH-89 x NPH1101)-1-1-3-2-B-1-B-2-B-B	2.77	5	105	-0.5	0.44	2.0	2.3	2.5	1.9	38.3	61.1	2.7	1.17	17.2
7	TS6*BS19S2/no173-1-2-3-1-B-B	2.69	6	107	-1.0	0.51	2.0	2.5	3.5	1.6	34.3	5.6	2.8	0.94	17.6
13	SIR TUX PEN O WHITE-15-3-3-1-B	2.61	7	105	0.0	0.55	2.0	2.0	4.0	2.2	52.5	83.3	2.8	1.00	17.6
14	SIR TUX PEN O WHITE-32-1-3-1-B	2.55	8	100	5.5	0.48	2.0	2.7	5.0	1.3	39.2	50.0	2.7	1.11	17.0
27	P43C9-56-1-1-1-2-B-B-B-B	2.52	9	105	0.0	0.52	1.5	2.4	4.5	1.9	41.8	16.7	2.5	0.94	15.0
84	((CML247 x CML254) x La Posta Seq. C3-H-20-4-3-2-1-1)-2-B-14-34-1-2-2-B	2.38	10	108	-1.5	0.62	1.0	2.2	3.0	1.4	37.9	66.7	3.0	1.22	19.4
97	CML247 (G24F119*G24F54)-6-4-1-1-BB-1-###-B*4	0.21	14	116	6.0	0.47	2.0	2.9	5.5	1.9	34.0	27.8	5.0	0.55	20.0
98	CML254 TUX P.SEQ-149-2-BBB-##-1-BB-1-###-B*4	2.35	11	113	1.0	0.55	1.5	1.5	2.0	1.5	45.4	16.1	2.5	1.44	15.1
99	CML-398	1.83	12	111	0.0	0.65	2.0	3.1	3.0	2.1	41.5	16.7	3.8	1.07	29.9
100	CML-399	1.79	13	114	0.0	0.51	2.0	1.7	2.0	1.5	38.9	34.0	3.2	1.47	20.1
	GRAND MEAN	1.32		109	2.1	0.51	2.2	3.2	5.3	2.2	34.1	25.0	3.4	0.92	19.3

Table 100. LET(LW) 9903. Mean data of the best lines under low-N at Poza Rica. 1999 B.

Ent	PEDIGREE	Yld t/ha	Rk	MF days	ASI days	PH cm	EH cm	SEN1 (1-10)	SEN2 (1-10)	Hm (1-5)	RL %	SL% (%)	EPP #	ER %
98	CML254 TUX P.SEQ-149-2-BBB-##-1-BB-1-#####-B*4	2.75	1	67	-0.1	116	60	1.8	3.3	1.7	10.3	-0.5	1.4	1.7
15	SIR NON-TUX PEN O WHITE-28-2-1-2-B	3.61	2	61	1.2	116	55	1.6	3.6	1.9	23.1	6.0	1.1	1.1
89	P302-2B*S9243-4-2-B1-B1-B-B	2.24	3	65	3.1	97	45	0.8	2.5	0.9	-0.9	-0.1	1.3	1.3
45	SEGR-5-1-#-3-4-4-B-B-1-1-B-B	1.89	4	67	-0.8	110	38	1.7	3.4	1.0	-0.4	-0.2	1.0	4.9
86	[249*SUWA1/ULITA*MPC1SEC1MRTS3]-1-46-1-1-B-1	2.05	5	68	0.8	105	45	2.3	3.8	1.0	0.0	0.2	1.0	2.6
38	TH-GA-251/S9243-2-1-#-1-B1-4-B1-B-B	1.84	6	69	1.8	112	60	2.1	3.5	2.1	17.0	0.1	1.1	4.5
71	[PNWA BCO(SD)xAC8243] F.S 4-B-3-B-1-1-B	1.90	7	68	-0.7	96	55	1.4	4.3	1.0	5.5	-0.3	1.0	3.9
74	(NPH-89 x NPH101)-1-1-3-2-B-1-B-2-B-B	2.21	8	68	-3.2	115	51	3.2	5.4	1.9	6.4	0.1	1.1	6.2
57	FAWGCA WHITE-3-3-1-3-B	1.98	9	64	-0.8	130	57	2.4	5.5	0.9	-1.1	0.4	1.0	3.0
99	CML398 (CHECK 1)	0.49	87	67	0.2	122	43	2.0	6.1	1.1	57.2	-0.2	0.9	8.6
100	CML399 (CHECK 2)	0.19	97	70	2.2	92	34	3.2	6.3	2.2	37.6	14.5	0.9	8.4
	Grand Mean	1.25		66	0.8	105	46	2.8	5.5	1.7	7.6	2.6	0.9	4.9

Table 101. LET(LW) 9903. Mean data of the best lines under FAW and SCB. 1999 B.

Ent no	PEDIGREE	FAW rep1	FAW rep2	Mean	SCB rep1	SCB rep2	Mean
52	P39BCOC3F13-1-2-1-2-BB	4.5	5.0	4.8	7.5	7.5	7.5
55	P39BCOC3F191-1-1-1-4-BB	5.0	5.0	5.0	5.5	4.0	4.8
56	P39BCOC3F293-1-1-1-2-BB	4.5	5.5	5.0	6.5	5.0	5.8
85	[249*SW-1/LIITA*MPC1SBC*MRTS3)-1-34-1-4-B-2	5.0	5.5	5.5	7.5	6.0	6.8
45	SEGR-5-1-#-3-4-4-B-B-1-1-B-B	5.0	6.0	5.5	6.5	7.5	7.0
53	P39BCOC3F25-1-1-1-1-BB	5.5	5.5	5.5	5.0	7.0	6.0
1	P21C5HC57-1-2-B-#*9-1-BBBB-B	4.5	7.0	5.8	7.0	7.5	7.3
10	POZARICA-8121 C0HC1-13-2-5-2-B	6.0	5.5	5.8	6.5	9.0	7.8
17	P25-S2No-13-2-3-1-BB	5.0	6.5	5.8	10.0	6.5	8.3
99	CML247 (G24F119*G24F54)-6-4-1-1-BB-f-####-B*4	5.5	7.0	6.3	7.0	8.0	7.5
100	CML254 TUXP.SEQ-149-2-BBB-##-1-BB-f-####-B*4	7.5	7.5	7.5	8.5	8.5	8.5
	Resistant check			6.0			7.0
	Susceptible check			5.5			4.0
	GRAND MEAN			5.7			6.8

Table 102. LET(LW) 9903. Mean data of the best lines under B.m and P.p. 1999 B.

Ent	PEDIGREE	B.m (1-5) Rep 1	B.m (1-5) Rep 2	P.p (1-5) Rep 1	P.p (1-5) Rep 2	Avg. B.m. (1-5)	Avg. P.p. (1-5)	Mean	Rk	PA (1-5)
85	[249*SW-1/LIITA*MPC1SBC*MIRTS3)-1-34-1-4-B-2	1.5	2.0	1.5	1.0	1.8	1.3	1.5	1	3.5
87	[264*247*SW-1/LIITA*MOC1SBC*MIRTS3)-1-13-1-1-B-1	1.5	1.5	2.0	1.5	1.5	1.8	1.6	2	3.0
7	TS6*BS19S2no173-1-2-3-1-BB	1.5	2.0	1.5	1.5	1.8	1.5	1.6	3	2.5
26	S9243-48-1-#1-#1-B1-B-B	2.0	1.5	1.5	1.5	1.8	1.5	1.6	4	3.0
45	SEGR-5-1-#-3-4-4-B-B-1-1-B-B	2.5	1.5	1.5	1.0	2.0	1.3	1.6	5	4.5
67	[P NVA. BCO.(S/D)xNPH-100] F.S 2-B-4-1-2-3-B	1.5	1.5	1.5	2.5	1.5	2.0	1.8	6	4.0
36	LA POSTA SEQC3-H1-2-2-1-2-1-#-#-B -B	2.0	1.5	2.0	1.5	1.8	1.8	1.8	7	3.0
9	P32MRRS F2-C2-10-2-BBBBBB	2.0	2.0	1.5	1.5	2.0	1.5	1.8	9	3.5
22	P43SRC9FS100-1-1-1sb-#1-B1-10-B1-B-B	2.5	1.5	1.5	1.5	2.0	1.5	1.8	10	2.5
97	CML247 (G24F119*G24F54)-6-4-1-1-BB-f-####-B*4 RE	1.5	2.0	2.0	1.5	1.8	1.8	1.8	8	3.0
98	CML254 TUXP.SEQ-149-2-BBB-##-1-BB-f-####-B*4 RE	2.5	2.5	2.0	1.5	2.5	1.8	2.1	71	3.5
99	CHECK 1= CML 398	2.0	2.5	1.5	2.5	2.3	2.0	2.1	68	3.0
100	CHECK 2= CML 339	1.5	2.0	1.5	2.5	1.8	2.0	1.9	22	3.5
	Grand Mean	2.2		1.9						

resistance to diseases than the best reference entry (CML247), while CML254 has susceptibility to diseases and has low performance. Twenty-one lines were superior than the best lines as check. The best resistant line was entry 85, followed by entries 87, 7, 26 and 45.

Tropical late maturity white inbred lines were also tested at six locations. Some of the top 10 lines across locations also yielded good under stresses. Entries 15, 75, 71 and 74 performed well to both stresses drought and low-N. Entry 36 yielded 4.2 tons/ha. Line derived from La Posta Sequia outyielded the best check CML339 (P_5) and CML399 (P_{21}). they produced 1.8 and 1.7 ton/ha.

CML254 RE yielded 2.4 tons/ha. Entry 36 also responded well to foliar diseases inoculation same as entry 7. Entries 45 and 98 performed well under low-N and foliar diseases and FAW inoculations and infestations. Entry 85 showed resistance to B. maydis and FAW (Tables 99 to 102).

4.4 Evaluation of tropical late maturity yellow endosperm inbred lines under abiotic and biotic stresses. LET(LY) 9904.

Germplasm: 54 S6 to S16 inbred lines from P24, P27, P28, G26 and FAW
Experimental design: 6 x 9 alpha lattice; 2 reps; one 2.5-m row
Planting density: 82,666 plts/ha
Location: Poza Rica (Mexico)
Tables: 103 to 106.

The mean grain yield was 1.04 t/ha, the lowest among the lowland tropical trials, while DTA was 65 days after sowing. Most traits showed significant differences except root lodging, stem lodging and ears per plant. Thirteen entries were better than the two checks. The top yielding line was entry 52 (2.21 t/ha), but had 25.0% root lodging, this line is the reference entry. The best line was entry 13 (2.18 t/ha) showed also resistance to lodging and ear rot. All the lines in this trial had 20 cm more plant height than the checks.

The ranking mean for FAW was 6.1 and for SCB was 6.3. Three lines were superior than the resistant check. Entry 33 was the best line resistant for both FAW and SCB. Other promising lines were entries 31, 34 and 35.

The average mean of B.m and P.p were 2.1 and 1.7, respectively. Seventeen lines were superior than the best reference entry. The two reference entries 51 and 52 showed more suceptibility to diseases than most of the lines evaluated here. Fourty lines were more resistant to diseases than the best inbred lines as check. The best resistant line was entry 43, followed by entries 37, 1, 18 and 38.

The best 10 tropical late maturing yellow endosperm lines, top performed lines under four stresses are presented in Tables 103 to 106. Four lines: Entries 5, 21, 36 and 42 were selected among the best 10 lines under both low-N and drought: Entries 37 and 17 yielded well under low-N and showed resistance to foliar diseases. Entries 3, 31 and 51 showed resistance to rust and B. Maydis and tolerance to FAW. Some of the 10 superior lines under all stresses also yielded good across six locations in Mexico, Thailand, Guatamala and Colombia.

Table 103. LET(LY) 9904. Mean data of the best lines under drought at Tlaltizapan. 2000 A.

Ent no	PEDIGREE	Yd t/ha	Rk	MF days	ASI	EHT PH	SEN1 1-10	SEN2 1-10	SEN3 1-10	LR 1-5	SPAD %	Lodg %	EA 1-5	EPP #	ER %
29	DK999F2-1-1-1-1-2-BB	3.38	1	105	-4.5	0.37	1.0	2.5	4.9	1.4	33.0	12.6	2.5	1.33	15.0
36	Ac8928-40-1-1-1-1-B	3.09	2	107	-1.1	0.56	0.9	2.2	3.9	1.0	34.7	41.5	2.5	0.95	18.0
42	G26SEQF135-3-3-1-1-1-2-BB	2.83	3	101	7.5	0.50	1.5	2.4	3.7	1.0	38.7	16.7	2.5	1.06	16.2
47	DTP2YC4H298-2-2-1-1-B-B	2.80	4	102	3.1	0.46	1.0	2.8	6.2	1.0	33.0	21.9	2.8	0.99	22.5
37	AC8328BNC5-35-2-2-1-2-BB	2.72	5	99	0.1	0.44	1.0	2.6	5.9	2.0	40.0	6.4	2.5	1.06	16.1
21	(NPH28-1xG25C25)xNPH28-1-2-1-1-3-1-B	2.58	6	103	4.0	0.48	1.0	2.2	3.5	1.0	38.3	33.6	2.8	0.94	17.9
5	(P26STE-27*26STE-39)-BBBB-#-BBB-#-BB-B-B	2.47	7	98	1.0	0.46	1.0	4.2	6.5	1.6	32.0	61.7	3.3	1.35	20.2
6	P27C5HC71-3-1-B-###-BBB-B-B	2.24	8	110	2.0	0.55	1.0	2.8	3.7	1.4	34.3	27.0	2.8	0.94	16.9
17	Ac8328BNC6-166-1-1-1-BB	2.23	9	103	1.0	0.45	1.1	2.7	4.5	1.1	33.8	1.5	2.5	1.05	15.6
38	G26SEQC3-6-2-1-1-2-BB	2.13	10	107	0.0	0.56	1.0	2.9	5.0	1.5	38.4	27.1	3.3	0.94	21.5
51	(P24F26*P27F1)-4-1-B-1-1-BB-f-#####-BBB-B RE	1.21	29	110	1.5	0.45	2.0	3.7	5.2	2.9	28.4	38.6	3.3	1.00	20.3
52	SINTAMTSR-23-3-2-3-2-BB-f-##-BBBB RE	0.98	36	117	4.6	0.64	1.5	3.5	5.9	2.4	33.5	14.9	1.8	0.20	11.4
53	CML347	0.46	47	108	-1.4	0.50	2.0	3.1	5.8	1.6	28.0	75.8	5.0	0.81	20.3
54	CML-348	1.00	35	112	2.1	0.58	1.9	4.0	5.2	2.2	30.5	40.2	4.0	0.79	24.4
	GRAND MEAN	1.38		107	2.2	0.52	1.6	3.6	5.8	1.7	32.0	38.0	3.7	0.91	20.4

Table 104. LET(LY) 9904. Mean data of the best lines under low-N at Poza Rica. 1999 B.

Ent	PEDIGREE	Yd t/ha	Rk	MF days	ASI days	PH cm	EH cm	SEN1 (1-10)	SEN2 (1-10)	Hrn (1-5)	RL% %	SL% %	EPP #	ER %	EA (1-3)
13	SAMTSR76-2-1-1-2-BBBB-#-BBBBBBBB	2.18	1	63	-1.5	122	53	2.1	4.5	1.0	-0.2	-2.3	0.9	1.0	1.0
36	Ac8928-40-1-1-1-1-B	1.65	2	67	-1.2	115	51	2.7	5.0	1.0	0.0	-0.3	1.3	2.7	2.0
21	(NPH28-1xG25C25)xNPH28-1-2-1-1-3-1-B	1.89	3	64	0.7	102	35	2.7	4.3	1.0	0.2	0.8	1.0	2.2	1.5
42	G26SEQF135-3-3-1-1-1-2-BB	1.35	4	66	2.9	101	43	2.6	3.6	1.0	0.2	0.2	1.2	6.2	2.5
50	[(CML297xCML304)xAC9080SR(FAM)]-F186-1-1-1-1-1-B]-1-2-1-2-1-B	1.48	5	64	0.1	102	40	2.3	4.6	1.0	25.2	0.0	1.1	3.0	1.0
52	SINTAMTSR-23-3-2-3-2-BB-f-##-BBBB RE	2.21	6	64	-0.1	118	55	1.8	5.3	1.0	25.0	6.2	0.9	4.6	1.0
39	G26C2346-1-1-1-1-B	2.01	7	65	0.4	146	64	3.1	5.0	1.0	-0.2	1.2	1.0	6.4	1.0
5	(P26STE-27*26STE-39)-BBBB-#-BBB-#-BBBB	1.74	8	61	0.7	123	52	3.1	6.9	1.5	0.2	0.1	1.3	2.2	1.0
26	AMATLCO-571-1-1-2-1-1-1-BBB	1.57	9	68	0.9	123	56	2.4	3.9	1.0	-0.1	0.1	0.9	4.9	2.0
53	CML347(CHECK-1)	1.14	14	63	0.8	102	41	2.8	6.1	1.0	-0.1	0.6	1.0	2.0	2.0
54	CML348(CHECK-2)	0.82	30	67	2.5	86	42	3.3	4.5	1.0	0.2	0.5	0.9	8.2	3.0
	Grand Mean	1.04		65	1.2	106	45	2.8	5.7	1.5	4.8	2.6	0.9	4.6	2.3

Table 105. LET(LY) 9904. Mean data of the best lines under FAW and SCB. 1999 B.

Ent no	PEDIGREE	FAW rep 1	FAW rep 2	Mean	SCB rep 1	SCB rep 2	Mean
33	P390AMC3F105-1-2-2-1-BB	4.0	4.5	4.3	5.0	5.0	5.0
31	P390AMC3F82-1-1-2-1-BB	5.0	6.0	5.5	5.0	7.0	6.0
34	P390AMC3F180-2-1-2-1-BB	5.0	6.0	5.5	5.5	6.0	5.8
35	P390AMC3F674-2-1-1-1-BB	5.5	6.0	5.8	5.0	5.5	5.3
51	(P24F26*P27F1)-4-1-B-1-1-BB-f-####-BBB-B RE	5.0	6.5	5.8	7.5	8.0	7.8
32	P390AMC3F104-2-1-1-2-BB	6.3	6.0	6.1	5.5	6.0	5.8
2	P24STEC1HC17-1-2-1-1-1-BBB-1-###-BBB-B-B	5.5	7.0	6.3	7.5	6.5	7.0
3	P24STEC1HC21-3-1-1-#-BBB-f-##-BB-B	6.0	6.5	6.3	7.5	6.0	6.3
53	CHECK-1 CML-347	8.0	6.5	7.3	8.0	7.0	7.5
54	CHECK-2 CML-348	7.0	6.5	6.8	9.0	8.5	8.8
	Resistant Check			5.5			4.0
	Susceptible Check			6.0			6.5
	CML-67-R			7.0			5.0
	Ki-S			7.5			7.5
	GRAND MEAN			6.1			6.3

Table 106. LET(LY) 9904. Mean data of the best lines under B.m and P.p. 1999 B.

Ent	PEDIGREE	B.m (1-5) Rep 1	Rep 2	P.p (1-5) Rep 1	Rep 2	Avg. B.m. (1-5)	Avg. P.p. (1-5)	Mean	Rk	PA (1-5)
43	P.28 MDR-F3-#-s2-##29-2-4-2-1-1-B-B-B	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1	3.5
37	AC8328BNC5-35-2-2-1-2-BB	1.5	1.5	1.5	2.0	1.5	1.8	1.6	2	3.5
1	P24C8HC96-B-4-BBBB-B-B	1.5	2.0	1.5	1.5	1.8	1.5	1.6	3	3.5
3	P24STEC1HC21-3-1-1-#-BBB-f-##-BB-B	2.0	1.5	1.5	1.5	1.8	1.5	1.6	4	3.0
18	Ac8328BNC5-6-1-2-1-2-BB	1.5	2.0	1.5	1.5	1.8	1.5	1.6	5	3.5
38	G26SEQC3-6-2-1-1-2-BB	1.5	2.0	1.5	1.5	1.8	1.5	1.6	6	3.5
27	AMATLCOHS92-1-1-3E-1-4-2-1-B	2.0	2.0	1.0	1.5	2.0	1.3	1.6	7	3.5
17	Ac8328BNC6-166-1-1-1-BB	2.5	1.5	1.5	1.5	2.0	1.5	1.8	8	3.5
31	P390AMC3F82-1-1-2-1-BB	2.5	1.0	1.0	1.5	2.3	1.3	1.8	9	3.0
30	P345C5HS306-2-1-2-1-1-BB	1.5	1.5	2.0	2.5	1.5	2.3	1.9	10	3.5
51	(P24F26*P27F1)-4-1-B-1-1-BB-f-####-BBB-B RE	2.5	2.5	2.0	2.0	2.5	2.0	2.3	53	3.0
52	SINT.AM.TSR-23-3-2-3-2-BB-f-##-BBBB RE	1.5	2.5	1.5	2.0	2.0	1.8	1.9	18	4.0
53	CHECK 1= CML 347	2.0	2.5	1.5	2.0	2.3	1.8	2.0	41	3.5
54	CHECK 2= CML 348	2.5	2.0	1.5	2.0	2.3	1.8	2.0	42	3.5
	Grand Mean	2.1		1.7						

4.5 Corn Stunt Complex

In 1995, a Special Stunt Project was established with the objective to identify stunt resistant maize germplasm at CIMMYT. The field screening activities were done using artificial infestation with leafhopper (*Dalbulus maydis*) vector of the pathogens causing the disease "hot spots" in Central America where the incidence of the disease is endemic. These vectors were infected with corn stunt spiroplasma (CSS) and maize bushy stunt phytoplasma (MBS). After four years of continued effort on stunt resistance, several types of germplasm were developed and evaluated in yield trials. The project was conducted by Dr. Miguel Barandiaran until the end of 1999.

During 1999 B, five yield trials with stunt resistant maize germplasm were evaluated in Poza Rica and Cotaxtla, Mexico to study the yield potential and the same trials were sent out to Central America locations to evaluate their response under natural infestation in late plantings to ensure a better level of infestation.

4.5.1 Evaluation of 100 white and yellow lines from P73, P75 & P79 - LET-99B.

Germplasm: 100 S4-S6 lines

Experimental design: 10 x 10 alpha lattice; 2 reps; one 5.0 m row

Planting density: 82,666 plts/ha

Location: Santa Rosa (Nicaragua) and Bani (Republica Dominicana)

Tables: 107 and A260 to A262.

The average grain yield was 1.09 t/ha and 35.7% for ear rot across two locations. In Santa Rosa the average grain yield was 1.31 t/ha and 21.4 % for ear rot, while in Bani the grain yield mean was 1.81 t/ha, and highest ear rot 47.6%. Thirty-eight lines had higher yield than the reference entry (Entry 98). The best yielding lines were entries 31 (4.70 t/ha) and 76 (4.14 t/ha), these lines also showed resistance to ear rot. However, all lines in this trial had high values for root lodging. The best two yielding lines also showed high resistance to Corn Stunt disease similar than CML247 which is the best check line with resistance to Corn Stunt (Table 107).

Table 107. Mean data of the best tropical corn stunt resistant lines across two locations. 1999 B. LET 99B.

Ent	PEDIGREE	Yd1	Yd2		MF	FF		PH	EH	EH/	E/P	RL	SL	EA	M	ER	PCS	ECS
		t/ha	t/ha	Rk	days	days	ASI	cm	cm	PH		%	%	1-5	%	%	%	%
31	P73TLC3#-99-1-1-1-1-#	4.70	4.91	*(1)*	57	57	0.0	209	102	0.48	0.70	80.2	0.0	2.0	18.5	4.2	0.0	0.0
76	P76TLC2#-119-1-1s-#	4.14	4.48	*(2)*	54	54	0.0	182	93	0.51	0.80	107.3	0.0	3.0	18.3	7.6	6.3	8.3
74	STAROSA P76C3S2(36)-2-2-1-1-1-2-#	3.23	3.73	*(3)*	59	62	2.5	173	88	0.51	0.96	61.1	0.0	2.5	18.2	13.4	0.0	0.0
94	P79RH-181-1-1-#	2.60	3.06	*(4)*	57	57	0.0	166	91	0.55	0.97	90.5	0.0	3.2	18.6	14.9	0.0	0.0
95	P79RH-211-1-2-#	2.15	2.44	*(5)*	59	61	1.5	154	73	0.47	0.75	100.1	0.0	2.9	18.3	11.9	6.0	2.6
13	P73TLC3#-74-1-2-2-3-#	1.97	2.36	*(6)*	61	63	2.0	192	93	0.49	0.89	89.0	0.0	3.9	18.7	16.3	6.3	0.0
62	P73C5-LIN59-B-1-1-1-2-#	1.84	2.22	*(7)*	63	64	1.5	191	92	0.48	0.86	97.0	0.0	3.0	18.4	17.2	6.8	0.0
78	P76TLC2#-158-3-1-#	1.79	2.44	*(8)*	59	61	2.0	205	106	0.51	0.79	90.4	0.0	3.2	18.5	26.4	3.8	0.0
9	P73TLC3#-74-1-1-1-2-#	1.79	2.64	*(9)*	55	57	2.0	169	89	0.52	0.53	94.2	0.0	2.8	18.6	32.2	2.4	12.5
14	P73TLC3#-74-2-2-1-1-#	1.78	2.51	*(10)*	59	61	2.0	193	92	0.47	0.58	65.8	0.0	3.2	18.7	29.2	1.8	0.0
97	CML247	0.48	0.74	*(92)*	61	63	2.0	137	71	0.51	0.32	56.3	0.0	4.5	18.6	35.0	0.0	0.0
98	CML 50	1.20	1.50	*(39)*	58	60	1.0	158	86	0.55	0.66	81.1	0.0	3.7	18.6	19.8	6.1	4.6
99	CML 310	0.66	1.25	*(78)*	58	59	1.0	165	81	0.49	0.55	38.1	0.0	3.9	18.6	47.3	13.4	2.5
100	LOCAL CHECK	0.38	0.68	*(96)*	61	63	2.0	132	68	0.51	0.27	20.5	0.0	4.6	18.3	43.4	1.9	25.0
	CHECKS MEAN																	
	GRAND MEAN	1.09	1.70		58	60	1.4	166	85	0.51	0.59	82.5	0.0	3.8	18.5	35.7		
	LSD 0.05		1.29		.	.	.	.	.	.	0.4	.	.	0.9	.	43.3		
	CV %		35.01		1.4	2.0	50.0	6.6	12.0	9.4	28.9	18.0		13.5	3.1	77.6		
	F Value		1.20		.	.	.	.	.	.	1.24	.	.	0.84	.	0.62		
	P(F>f)		0.18		.	.	.	.	.	.	0.14	.	.	0.81	.	0.99		
	NUMBER OF LOCATIONS		2		1	1	1	1	1	1	2	1	1	2	1	2		

4.5.2 Evaluation of tropical corn stunt resistant yellow test crosses - SCY-99B.

Germplasm: 30 S4 x Testers yellow test crosses and three checks

Experimental design: RCBD; 2 reps; two 5 m row

Planting density: 66,333 plts/ha

Location: El Ejido (Panama)

Tables: 108 and A263.

The average grain yield in this location was 5.94 t/ha, most of the crosses tested here showed good resistance to ear rot. Fourteen hybrids were superior than the best yielding check, also these hybrids were superior than the best reference entry (CML287 x CML413) which involve two testers lines. The top yielding stunt hybrid was entry 12 (7.19 t/ha), followed by entry 27 (7.10 t/ha) and entry 6 (7.05 t/ha). Other promising hybrids with high grain yield and low ear position were entries 8 and 16 (Table 108).

Table 108. Mean data of the top yielding yellow test crosses in Panama. 1999. SCY-99B.

Ent	PEDIGREE		Yd1 t/ha	Yd2 t/ha	Rk	MF days	PH cm	EH cm	EH/ PH	E/P	RL %	EA 1-5	PA 1-5	Cu 1-5	ER %	M %
12	P79RH -138-1-2-B	x CML 287	7.19	7.33	(1)	59	216	125	0.58	0.99	3.9	2.5	3.0	2.8	2.0	29.5
27	P79RH -211-1-1-B	x CML 413	7.10	7.18	(2)	61	197	112	0.57	0.99	9.9	2.0	3.5	3.3	1.0	26.9
6	P79RH -127-1-1-B	x CML 287	7.05	7.05	(3)	57	205	100	0.49	1.00	2.5	2.0	2.5	2.0	0.0	28.1
8	P79RH -129-3-3-B	x CML 287	6.92	6.92	(4)	59	199	96	0.48	0.88	0.0	1.0	3.0	3.0	0.0	31.1
16	P79RH -177-3-3-B	x CML 287	6.83	6.90	(5)	58	204	95	0.47	0.99	0.0	1.8	3.3	3.5	1.0	28.7
22	C88-S/N5-#-B	x CML 287	6.77	6.84	(6)	55	206	115	0.56	0.99	10.6	1.8	3.3	3.3	1.0	28.0
15	P79RH -177-3-2-B	x CML 287	6.61	6.75	(7)	58	203	105	0.52	0.97	4.0	2.3	3.5	3.3	2.1	29.4
11	P79RH -138-1-1-B	x CML 287	6.55	6.55	(8)	60	230	118	0.51	0.96	3.8	2.0	3.0	2.8	0.0	29.6
20	P79RH -59-3-4-B	x CML 287	6.54	6.61	(9)	58	211	96	0.45	1.00	12.4	1.8	3.3	3.5	1.0	32.1
18	P79RH -41-1-5-B	x CML 287	6.49	6.62	(10)	58	188	97	0.52	1.00	4.9	2.3	3.3	3.3	1.9	27.7
31	Testigo local mas rendidor		6.34	6.55	(15)	62	210	114	0.54	1.01	10.1	2.5	3.5	2.8	3.2	28.4
32	CML 287 X CML 413		6.01	6.26	(20)	60	203	101	0.50	1.00	3.9	2.3	3.0	3.0	4.0	29.6
33	SINT. MAZORCA. LARGA		5.36	5.53	(23)	62	194	94	0.48	0.99	10.0	3.0	3.0	2.8	3.1	30.9
	CHECKS MEAN		5.90	6.11		61	202	103	0.51	1.00	8.0	2.6	3.2	2.8	3.4	29.6
	GRAND MEAN		5.94	6.07		59	199	102	0.52	0.99	7.1	2.3	3.2	3.1	2.1	29.1
	LSD 0.05			1.30		2.3	32.2	19.8	0.1	0.1	9.3	0.7	0.4	0.7	4.5	2.7
	CV %			10.46		1.9	7.9	9.4	13.4	7.0	9.0	15.8	6.5	11.8	6.9	4.5
	CORRELATION WITH Yd2					-0.31	0.50	0.40	0.16	0.12	-0.18	-0.50	-0.17	0.11	-0.34	-0.30
	P(F>f) FOR CORRELATION					0.08	0.00	0.02	0.38	0.50	0.32	0.00	0.35	0.54	0.06	0.09

4.5.3 Evaluation of tropical stunt yellow test crosses - TSCY-99B.

Germplasm: 50 S_4 x Tester plus four checks.

Experimental design: 6 x 9 Lattice, 2 reps; two 5 m row

Planting density: 66,333 plts/ha

Location: Poza Rica (Mexico)

Tables: 109 and A264

The average grain yield in this location was 7.18 t/ha, most of the crosses tested here showed good resistance for ear rot and corn stunt disease. Fifteen hybrids were superior than the best yielding check, also these hybrids were superior than the best reference entry (CML287 x CML285) which involve two tester lines. The top yielding stunt hybrid was entry 17 (8.68 t/ha), followed by entry 15 (8.63 t/ha) and entry 5 (8.51 t/ha). Nine hybrids had more than 8.0 t/ha showed their high yielding potential for use in future hybrid combinations. However, most of the hybrids evaluated here showed highest ear placement, such characteristic is undesirable (Table 109).

Table 109. Mean data of the top yielding test crosses in Poza Rica. 1999. TSCY-99B.

Ent	PEDIGREE			Yd1	Yd2		MF	FF		PH	EH	EH/	E/P	RL	SL	EA	PA	Ru	ER	BH	ER	M	CS
				t/ha	t/ha	Rk	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	1-5	1-5	%	%	%	%
17	P79RH -138-2-1-B	x	CML 287	8.68	8.68	(1)	59	60	0.5	284	169	0.59	0.93	9.6	6.0	2.5	3.0	2.0	1.5	1.3	0.0	26.6	2.4
15	P79RH -138-1-1-B	x	CML 287	8.63	8.84	(2)	57	58	1.0	303	174	0.57	0.96	14.6	3.6	2.5	3.0	2.5	1.3	1.2	2.4	25.7	0.0
5	P79RH -118-1-1-B	x	CML 287	8.51	8.85	(3)	58	58	0.5	300	175	0.58	0.92	47.6	13.1	2.8	3.3	2.0	1.8	37.7	3.9	24.8	0.0
3	P79RH -117-1-3-B	x	CML 287	8.41	8.63	(4)	56	56	0.0	290	155	0.53	0.95	22.6	8.3	2.5	3.0	2.3	1.3	6.3	2.5	24.3	0.0
7	P79RH -118-2-3-B	x	CML 287	8.32	8.65	(5)	59	59	0.0	287	158	0.55	0.95	37.6	21.5	3.0	2.8	3.5	1.5	6.4	3.8	25.2	0.0
32	C88-S/N5-#-B	x	CML 287	8.29	8.63	(6)	54	54	0.0	291	162	0.55	0.92	10.9	7.2	2.8	3.0	3.0	1.8	3.9	3.9	21.7	0.0
2	P79RH -117-1-2-B	x	CML 287	8.13	8.33	(7)	56	56	0.5	299	165	0.55	0.98	1.2	4.8	2.5	2.8	2.0	1.5	10.9	2.5	23.0	4.8
22	P79RH -169-1-2-B	x	CML 287	8.11	8.11	(8)	54	55	1.0	285	165	0.58	0.93	21.1	1.2	2.5	2.8	3.8	1.5	9.0	0.0	26.4	0.0
13	P79RH -133-2-2-B	x	CML 287	8.00	8.46	(9)	57	57	0.0	305	175	0.57	0.88	34.5	7.1	2.3	3.5	2.3	1.5	62.2	5.4	26.2	0.0
30	P79RH -59-3-4-B	x	CML 287	7.97	8.17	(10)	55	56	1.0	290	166	0.57	0.92	8.2	6.9	2.5	3.3	4.0	1.3	3.9	2.4	26.7	1.1
51	CML 287	x	CML 285	7.66	7.96	(17)	55	53	-2.0	271	156	0.58	0.94	14.1	9.5	2.5	2.8	2.8	1.8	0.0	3.8	24.3	1.2
52	C88-S/N15-#-B	x	CML 413	5.74	5.93	(52)	56	56	0.0	248	141	0.57	0.91	7.3	7.3	2.8	3.0	2.8	1.5	13.8	3.2	24.5	2.9
53	CML 287 X CML 413			7.90	8.00	(11)	57	56	-0.5	275	166	0.60	0.99	6.1	7.3	2.5	3.3	2.5	1.8	18.6	1.2	24.7	0.0
54	SINT. MAZORCA. LARGA			7.70	8.17	(16)	57	58	0.5	289	157	0.54	1.00	4.8	8.3	2.5	3.3	2.8	2.0	21.7	5.7	24.1	0.0
	CHECKS MEAN			7.25	7.51		56	56	-0.5	271	155	0.57	0.96	8.1	8.1	2.6	3.1	2.7	1.8	13.5	3.5	24.4	1.0
	GRAND MEAN			7.18	7.57		56	57	0.3	280	162	0.58	0.94	19.1	7.0	2.8	3.3	2.5	1.8	20.0	5.1	24.5	1.4
	LSD 0.05				0.99		1.6	1.5	1.5	15.0	27.8	0.1	0.1	19.2	12.6	0.6	0.8	0.8	0.6	18.3	8.2	1.6	3.7
	CV %				6.48		1.4	1.3	2.9	2.6	8.4	8.0	6.2	9.6	10.5	11.0	12.4	16.6	16.0	8.5	8.7	3.1	5.9
	CORRELATION WITH Yd2						0.16	-0.01	-0.24	0.60	0.53	0.07	0.18	0.14	0.34	-0.38	-0.19	0.08	-0.29	0.01	-0.09	0.28	-0.21
	P>F FOR CORRELATION						0.25	0.96	0.08	0.00	0.00	0.64	0.18	0.33	0.01	0.00	0.17	0.56	0.03	0.92	0.52	0.04	0.13

4.5.4 Evaluation of 36 tropical corn stunt resistant white single crosses - TSCW-99B.

Germplasm: 31 S_4 x Tester, plus five checks.

Experimental design: 6 x 6 alpha lattice; 2 reps; two 5.0 m row

Planting density: 66,333 plts/ha

Location: Poza Rica (Mexico)

Tables: 110 and A265

The average grain yield in this location was 7.27 t/ha, most of the crosses tested here showed good resistance for ear rot and corn stunt disease. Three hybrids outyielded (CML247 x CML254), but eight hybrids were superior than the best reference entry. The top yielding stunt hybrid was entry 22 (8.62 t/ha), followed by entry 27 (8.61 t/ha) and entry 23 (8.51 t/ha). Eight hybrids had more than 8.0 t/ha showed high yield potential for use in future hybrid combinations. However, most of the hybrids evaluated here showed highest ear placement, such characteristic is undesirable (Table 110).

Table 110. Mean data of the top yielding white test crosses in Poza Rica. 1999. TSCW-99B.

Ent		Yd1	Yd2		ER	MF	FF		PH	EH	EH/	E/P	RL	SL	EA	PA	Ru	BH	ER	M	CS
no	PEDIGREE	t/ha	t/ha	Rk	%	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	1-5	%	%	%	%
22	P73TLC3# -90-1 x CML 254	8.62	8.82	(1)	2.2	56	56	0.5	293	162	0.55	1.07	17.9	1.2	2.5	3.3	2.5	4.2	1.8	25.0	0.0
27	P76TLC2# -158-3 x CML 254	8.61	9.16	(2)	6.0	57	56	-1.0	310	183	0.59	1.23	10.7	8.4	3.0	4.8	2.5	4.6	2.3	25.8	2.4
23	P73TLC3# -99-3 x CML 254	8.51	8.95	(3)	4.9	55	54	-1.0	284	175	0.62	1.27	7.2	10.9	3.3	3.3	1.8	1.0	2.0	25.3	4.8
30	STAROSA P76C3S2(24)-2-3 x CML 254	8.35	8.67	(5)	3.7	57	57	0.0	270	159	0.59	0.96	1.2	6.0	2.3	3.0	2.3	3.7	1.3	22.1	3.6
2	P73TLC3# -99-1-1 x CML 247	8.32	8.92	(6)	6.8	54	54	0.0	275	145	0.53	0.88	9.5	8.3	3.0	2.5	1.8	35.4	2.0	24.9	2.4
12	P73TLC3# -166-1-1 x CML 254	8.25	8.57	(7)	3.8	56	56	0.5	280	165	0.59	0.98	9.5	8.4	2.8	3.5	2.3	2.5	1.8	24.7	1.2
7	P73TLC3# -11-1 x CML 254	8.13	8.43	(8)	3.6	57	57	0.5	273	168	0.61	1.01	0.0	3.7	2.0	3.0	1.8	3.6	1.3	26.9	7.3
6	P73R2-25-1-1 x CML 254	8.00	8.21	(11)	2.5	56	57	0.5	270	153	0.57	0.95	5.8	18.7	2.8	3.3	2.3	2.4	1.8	25.1	2.4
16	P73TLC3# -3-2-1 x CML 254	7.98	8.39	(12)	4.9	55	56	1.0	283	178	0.63	0.96	5.9	19.9	2.8	3.5	2.3	6.1	1.8	25.2	7.1
31	STAROSA P76C3S2(35)-2-1 x CML 254	7.67	8.24	(13)	7.0	57	58	1.0	289	162	0.56	1.26	1.3	7.5	3.3	3.5	2.0	9.1	2.0	25.1	11.3
32	(CML 247 x CML 254) x R1	8.00	8.44	(10)	5.1	58	57	-0.5	266	155	0.58	0.93	3.6	2.4	2.0	2.5	1.0	23.1	1.5	29.5	3.6
33	(CML 247 x CML 254)	8.37	8.59	(4)	2.6	57	57	0.0	253	150	0.59	0.94	6.1	0.0	2.5	2.5	1.0	14.1	1.5	27.9	0.0
34	(CML 254 x CML 264)	8.07	8.07	(9)	0.0	59	58	-1.0	262	144	0.55	1.04	1.2	1.2	2.5	2.8	2.0	0.0	1.8	26.7	6.0
35	(CML 264 x CML 273)	7.18	8.03	(21)	10.6	57	59	2.0	277	145	0.52	0.98	1.2	0.0	3.0	2.8	2.0	31.8	2.0	26.1	1.2
36	Sint. Mazorca Larga	7.49	8.76	(16)	14.5	57	58	0.5	288	165	0.57	0.98	16.6	9.2	2.5	3.5	3.3	13.2	1.8	24.7	2.3
	CHECKS MEAN	7.82	8.38		6.6	57	58	0.2	269	152	0.56	0.97	6.1	2.6	2.5	2.8	1.9	16.4	1.7	27.0	2.6
	GRAND MEAN	7.27	7.81		7.0	56	56	0.2	275	160	0.58	1.02	6.4	6.7	2.8	3.2	2.2	13.6	1.8	24.7	4.4
	LSD 0.05		0.90		9.2	1.8	2.0	1.5	17.8	13.5	0.0	0.2	10.5	8.2	0.7	0.6	0.8	20.6	0.7	2.2	8.2
	CV %		5.48		7.8	1.6	1.7	2.9	3.1	4.0	3.6	7.4	10.3	7.7	12.3	9.0	18.0	10.6	19.7	4.2	10.5
	CORRELATION WITH Yd2				-0.28	0.45	0.40	0.08	0.41	0.30	0.08	0.23	0.29	-0.03	-0.36	0.08	-0.40	0.03	-0.06	0.58	-0.27
	P>F FOR CORRELATION				0.10	0.01	0.02	0.63	0.01	0.08	0.66	0.18	0.09	0.88	0.03	0.64	0.01	0.84	0.72	0.00	0.11

4.5.5 Evaluation of 36 tropical corn stunt resistant white three-way crosses - TTWCW-99B.

Germplasm: 28 three-way crosses and eight checks

Experimental design: 6 x 6 alpha lattice; 2 reps; two 5.0 m row

Planting density: 66,333 plts/ha

Locations: Poza Rica (Mexico), Santa Rosa (Nicaragua) and El Ejido (2) Panama, Cuyuta (Guatemala) and El salvador (El Salvador)

Tables: 111 and A266 to A272.

The average grain yield across locations was 6.51 t/ha, most of the crosses tested here showed good resistance for ear rot and corn stunt disease. Entries 22 and 27 outyielded the female cross (CML247 x CML254), but eighteen hybrids were superior than the best reference entry and local checks. The top yielding TWC corn stunt resistant hybrid was entry 1 (8.50 t/ha), followed by entry 4 (7.83 t/ha). Other promissing hybrids were entries 19 (7.61 t/ha) and 2 (7.49 t/ha). Plant height and ear placement is tall (Tables 111 and A271).

Table 111. Mean data of the top yielding white test crosses across 6 locations. 1999. TTWCW-99B.

Ent	PEDIGREE	Yd1 t/ha	Yd2 t/ha	Rk	Ant days	Silk days	ASI	PH cm	EH cm	EH/ PH	E/P	RL %	SL %	EA 1-5	PA 1-5	BH %	ER %	M %
1	(CML 247 x CML 254) x P73TLC3#74-1-2-2-B	8.50	8.63	(1)	58	58	1.0	230	124	0.53	1.11	5.8	0.1	2.8	3.2	8.1	1.4	23.1
4	(CML 247 x CML 254) x P73TLC3#74-2-5-2-B	7.83	7.88	(2)	58	59	1.4	232	119	0.51	0.97	1.5	0.0	2.5	2.6	0.5	0.6	24.3
19	(CML 254 x CML 264) x P73TLC3#74-2-5-2-B	7.61	7.65	(4)	58	58	1.2	236	122	0.50	1.01	3.2	0.0	2.7	3.0	0.3	0.5	23.1
2	(CML 247 x CML 254) x P73TLC3#74-1-2-2-1	7.49	7.54	(5)	58	58	1.0	232	123	0.52	0.97	2.0	0.1	2.6	2.6	0.7	0.6	24.3
5	(CML 247 x CML 254) x P73TLC3#74-2-6-1-B	7.49	7.66	(6)	58	58	0.8	232	121	0.52	0.87	3.0	0.1	2.5	2.7	2.2	2.3	23.9
7	(CML 247 x CML 254) x P73TLC3#96-3-3-3-1	7.40	7.53	(7)	57	57	0.6	227	127	0.55	0.97	5.4	0.4	2.6	3.1	2.2	1.8	23.6
3	(CML 247 x CML 254) x P73TLC3#74-1-2-2-2	7.28	7.36	(8)	58	58	0.6	228	122	0.52	0.98	1.9	0.4	2.5	2.6	1.1	1.0	24.8
10	(CML 247 x CML 254) x P73TLC3#99-1-1-1-B	7.24	7.43	(9)	57	57	0.3	237	125	0.52	0.96	1.1	0.4	2.6	2.9	0.7	2.5	23.3
20	(CML 254 x CML 264) x P73TLC3#74-2-6-1-B	7.13	7.34	(10)	58	58	1.3	233	123	0.52	0.94	2.8	0.9	3.0	3.1	3.3	2.9	22.0
6	(CML 247 x CML 254) x P73TLC3#96-3-3-2-1	6.87	7.02	(11)	56	56	0.6	214	114	0.53	0.97	1.4	0.0	2.8	3.1	1.2	2.1	20.9
29	CML-149 x CML-186	5.67	6.04	(31)	56	56	1.1	231	123	0.52	0.95	2.3	1.0	3.3	3.7	4.1	6.2	21.7
30	(CML 247 x CML 254) x R1	6.63	6.83	(18)	58	57	0.6	227	115	0.50	0.99	1.0	0.0	3.0	3.1	0.9	2.8	24.6
31	(CML 247 x CML 254)	7.65	7.69	(3)	59	58	0.8	205	116	0.56	0.96	-0.4	0.0	2.5	2.6	1.0	0.4	26.0
32	(CML 254 x CML 264)	3.52	3.57	(36)	59	59	1.0	206	98	0.48	1.11	0.3	0.0	2.8	3.3	0.0	1.3	24.4
33	(CML 264 x CML 273)	6.56	6.81	(19)	59	59	0.9	217	109	0.50	0.96	0.2	0.0	3.1	3.1	1.3	3.7	22.9
34	Sint. Mazorca Larga	5.13	5.36	(35)	58	59	1.3	239	125	0.52	0.97	1.3	0.0	3.1	3.3	7.6	4.4	22.2
35	Testigo local mas rendidor	5.70	5.90	(30)	57	58	1.2	222	120	0.54	0.95	1.7	0.2	2.7	3.1	2.8	3.3	20.3
36	Testigo local susceptible	5.33	5.47	(34)	56	56	0.9	227	114	0.51	0.91	7.3	1.0	3.1	3.8	4.0	2.7	19.2
					0.17	-0.28	0.36	0.31	-0.10	-0.25	-0.21	0.09	-0.12	0.01	0.39	0.36	-0.08	-0.05
	CHECKS MEAN	5.77	5.96		58	58	1.0	222	115	0.51	0.98	1.7	0.3	3.0	3.2	2.7	3.1	22.7
	GRAND MEAN	6.51	6.71		57	58	0.5	228	121	0.53	0.95	2.0	0.3	2.9	3.1	3.1	3.0	22.7
	LSD 0.05		0.97		1.7	1.3	0.8	11.6	8.9	0.0	0.1	16.7	5.9	0.5	0.7	13.8	5.8	1.8
	CV %		12.71		1.4	1.6	1.9	5.1	7.4	7.1	7.7	11.7	7.7	15.3	13.6	9.7	9.2	7.0
	F Value		3.08		1.54	1.27	1.01	0.64	0.62	0.73	0.66	0.01	0.05	3.70	7.03	0.02	0.03	0.80
	P(F>f) FOR CORRELATION		0.00		0.04	0.09	0.48	0.99	1.00	0.96	0.99	1.00	1.00	0.00	0.00	1.00	1.00	0.89
	NUMBER OF LOCATIONS		6		3	5	3	5	5	5	5	3	3	6	3	2	6	5

4.5.6 Evaluation of 20 stunt open pollinated varieties & synthetics - OPV-99B.

Germplasm: 13 OPVS and Synthetics, plus four checks

Experimental design: 4 x 5 alpha lattice; 2 reps; two 5.0 m row

Planting density: 66,333 plts/ha

Locations: Cotaxtla (Mexico), El Ejido (Panama), Santa Rosa (Nicaragua), cayes (Haiti) and San Cristobal (Republica Dominicana).

Tables: 112 and A273 to A279.

The average grain yield across locations was 3.67 t/ha, and high values for ear rot 19.7 %. In this trial the OPV and Synthetic had less yield than the best check. Most of the entries tested here showed high ear rot values. In Haiti location, all entries showed high values for number of plants with Corn Stunt Disease, except two entries (CML273 x CML264, and CMS93133 x R1), which are good resistant materials for Corn Stunt. At Nicaragua, Santa Rosa location, most of the entries had good values for Corn Stunt and again the two resistant checks above mentioned were the best resistant materials for both ears and plants corn stunt disease (Tables A273 to A279).

The trial was also evaluated at Poza Rica, Mexico, infested and non-infested, showed good diferential response to CSD (Table 113). New corn stunt resistant syntehtics P73NIC7, P73NIC2 and P73NISA1 yielded up to 7.2 tons per hectare under non infested conditions with a minimal decrease in yield of 7.1, 5.3 and 7.9% respectively under heavy infestation with CSD. PRM should recommend to substitute all varieties based on Population 73 with the new synthetics CSD resistant varieties.

Table 112. Mean data of the top yielding open pollinated varieties & synthetics. 1999. OPV-99B.

Ent		Yd1	Yd2		MF	FF		PH	EH	EH/	E/P	RL	SL	EA	PA	ER	M
		t/ha	t/ha	Rk	days	days	ASI	cm	cm	PH		%	%	1-5	1-5	%	%
1	Sint. Bco.Stunt-1	4.16	4.78	(4)	55	57	1.0	210	117	0.56	0.85	35.4	0.0	2.9	12.5	13.0	18.6
2	Sint. Ama.Stunt-1	3.85	5.02	(6)	54	56	1.3	202	101	0.50	0.81	59.0	0.0	3.6	15.7	23.3	17.0
3	Sint. Bco.Stunt-2	3.73	4.70	(7)	56	58	1.1	203	109	0.53	0.82	18.8	0.0	3.3	12.7	20.7	18.3
9	P79NIC1	3.68	4.40	(8)	56	58	1.4	207	116	0.56	0.92	59.4	0.0	3.0	16.9	16.4	17.6
4	Sint. Ama.Stunt-2	3.67	4.58	(9)	55	57	1.2	197	100	0.50	0.74	56.9	0.0	3.5	20.6	19.7	18.2
6	P76NIC1	3.66	4.76	(10)	55	58	1.3	208	108	0.51	0.90	79.3	0.0	3.6	17.0	23.1	17.7
11	P79GHB	3.55	4.19	(11)	56	58	1.4	200	110	0.55	0.78	75.7	0.0	3.2	19.2	15.2	17.9
12	P73C3	3.54	4.28	(12)	54	57	1.3	196	98	0.49	0.86	68.3	0.0	2.8	22.1	17.3	16.8
17	Ac8328	3.50	4.57	(13)	55	57	0.8	202	110	0.54	0.85	64.0	0.0	3.6	21.7	23.4	19.0
13	P78C2	3.46	4.20	(14)	55	57	1.0	206	108	0.52	0.90	74.6	0.0	3.0	22.4	17.6	15.5
7	P76SAL1	3.23	4.20	(15)	56	59	1.5	210	108	0.51	0.82	41.7	0.0	3.9	19.8	23.1	17.0
16	PR9243	3.22	4.27	(16)	56	58	1.4	215	116	0.54	0.89	70.4	0.5	3.9	25.0	24.6	18.7
8	P73NIC2	3.15	4.05	(17)	56	58	1.4	204	107	0.53	0.78	69.0	0.0	3.8	17.2	22.2	16.6
15	SINT.MAZORCA LARGA	3.01	3.56	(18)	58	61	1.8	211	113	0.54	1.51	51.8	0.0	2.6	24.0	15.5	19.0
10	P73NISA1	2.93	3.84	(19)	55	57	0.9	195	92	0.47	0.97	82.3	0.0	3.3	14.9	23.7	17.3
5	P73NIC1	2.81	3.78	(20)	55	58	1.7	203	114	0.56	0.70	52.7	0.0	3.6	11.6	25.5	18.0
14	Testigo local resistente	4.32	5.72	(3)	55	57	1.4	207	122	0.62	0.86	67.8	0.0	3.7	11.0	24.5	18.2
18	CML 273 x CML 264	4.76	5.64	(2)	56	59	1.5	197	103	0.52	1.03	-1.5	0.0	2.8	8.7	15.6	18.7
19	CMS933133 x R1	5.23	5.66	(1)	55	57	1.1	211	105	0.49	0.90	50.6	0.0	2.3	8.5	7.5	17.6
20	Testigo local susceptible	4.14	5.26	(5)	55	58	2.1	210	105	0.50	0.80	45.6	0.0	3.8	15.7	21.3	19.3
					-0.36	0.21	0.37	0.38	0.19	0.32	0.07	-0.01	0.01	0.24	0.38	-0.18	0.18
	CHECKS MEAN	4.61	5.57		55	58	1.5	206	109	0.53	0.90	40.6	0.0	3.1	10.9	17.2	18.5
	GRAND MEAN	3.67	4.57		55	58	1.3	205	108	0.53	0.89	56.1	0.0	3.3	16.8	19.7	17.8
	LSD 0.05		0.90		1.0	1.1	0.8	16.8	14.1	0.1	0.4	32.4		1.4	14.1	14.9	1.7
	CV %		13.76		1.4	1.6	2.1	7.1	12.8	13.8	23.5	23.7		35.5	43.0	7.7	9.8
	F Value		1.29		0.85	0.71	0.67	0.84	0.66	0.64	2.29	1.36		0.94	0.86	0.95	0.61
	P(F>f)		0.16		0.72	0.89	0.88	0.76	0.95	0.96	0.00	0.24		0.60	0.63	0.59	0.98
	NUMBER OF LOCATIONS		5		4	4	3	5	5	5	4	2	2	5	2	5	5

Evaluation and selection of lines under stress environments constitutes one key element in the breeding process in line development. It has helped CIMMYT Maize Program to build yield stability in the tropical germplasm and to include broader adaptation to our products, hybrids, synthetics and OPV's. These activities are an integral part of sub-projects 2 and 3 in Global Project-2 (G2).

The lines selected from each trial will be crossed in NC-II mating designs depending on the Heterotic Groups to form new hybrids and synthetic varieties resistant or tolerant to stress environments.

It is recommended that CIMMYT Outreach staff in R2 and R5 test the best performing lines at their location to make efficient use of the germplasm identified in this project.

IV. International Performance Trials

1. Evaluation of CIMMYT tropical white hybrids. CHTTW.

Twenty-eight tropical white single cross hybrids and two local checks were evaluated under a 5x6 alpha lattice design, two rows, five meters long plots and three replications per location. Trials were shipped to 40 locations in Latin America and Asia. This report presents information from 20 locations. Highly significant differences were found for genotypes and G x E interaction for yield, days to pollen and moisture.

CMS973023, CMS973059, CMS973063, CMS973007, CMS973049 and CMS973025 outyielded the best seed industry hybrid check across locations with half a ton/per hectare. They showed more resistance to ear rot, root and stalk lodging than the checks. Same hybrids outyielded the reference check CML247 x CML254 by 10% more yield (Table 71).

Best hybrids selected for **Brazil** are: CMS973059 and CMS973049. For **Colombia:** CMS973023, CMS973059, CMS973049, CMS973007, CMS973035, CMS973003, and CMS973025. **Venezuela:** CMS973023, CMS973059, CMS973063, CMS973025, CMS973029, and CMS973003. **Guatemala:** CMS973035, CMS973029, CMS973023 and CMS973059. **Honduras:** CMS973023, CMS973063, CMS973035, CMS973025 and CMS973029. **Mexico:** CMS973063, CMS973007, CMS973029, CMS973057. **India:** CMS973023, CMS973059, CMS0973063 and CMS973041. **Philippines:** CMS973023, CMS973059, CMS973063, CMS973007, CMS973025 and CMS973037 (Table 72).

2. Evaluation of CIMMYT tropical yellow hybrids CHTTY.

18 tropical yellow single cross hybrids plus two local checks were evaluated under an alpha lattice design 4x5, plot size 2 rows, five meters long, 3 replications per site. The trials were shipped to 41 sites in the tropical mega-environment. Information presented here was collected from 20 locations in Latin America and Asia.

Highly significant differences for the response of genotypes were found for yield and the majority of agronomic traits G x E was significant only for yield.

CMS973038, CMS973028, CMS973026, CMS973018 and CMS973030 outyielded the best checks from the seed industry across locations.

The superior hybrids also showed resistance to ear rot while the checks more susceptibility. Root lodging of the top yielding hybrids was similar to the checks.

Best performing hybrids for each country and individual location are presented in (Table 73 and 74). Five hybrids outyielded CML287 x CML413.

It is highly recommended to the coordinators and breeders of Projects R2 and R5 to use the information to assist national programs in selecting the best hybrid combination to enhance yield productivity in the regions.

Across Means Table 71. **CIMMYT Hybrid Trial -Tropical White, (CHTTW - 1999)**

No. Locations: 21

Ent. No.	Pedigree	Grain yield (Kg/ha)	Days Silk (d)	Days Pollen (d)	Plnt ht (cm)	Ear ht (cm)	Stem Lodg (%)	Root Lodg (%)	Ear Rot (%)	Ear/ Plnt (ratio)	Moist (%)	Plant Harv (no.)	Plnts Germ (no.)	Husk Cover (1-5)	Ear Asp. (1-5)	Husk Cover (%)
14	CMS 973023	6962	62	58	221	115	2.5	12.1	4.8	1.0	23.0	39.2	34.1	2.6	2.1	18.9
25	CMS 973059	6953	62	58	240	130	1.9	11.9	3.9	1.0	23.7	39.2	36.0	2.1	2.4	14.6
27	CMS 973063	6937	61	57	232	120	1.8	9.3	3.8	1.0	23.0	38.7	34.6	1.8	2.0	6.9
6	CMS 973007	6932	61	57	237	123	1.2	9.7	4.6	1.0	22.9	39.0	36.8	1.8	2.0	9.2
23	CMS 973049	6906	59	56	226	109	1.7	10.5	3.4	1.1	23.7	38.2	34.7	2.1	2.3	5.4
19	CMS 973035	6864	61	57	234	127	3.0	11.9	3.8	1.2	23.4	39.1	34.8	1.7	2.5	2.2
15	CMS 973025	6811	62	59	232	128	2.2	9.2	3.3	1.1	23.1	39.5	37.1	1.3	2.3	1.4
17	CMS 973029	6763	64	60	241	135	2.7	13.8	2.0	1.1	23.8	38.8	36.0	1.6	2.3	3.7
24	CMS 973057	6756	62	58	239	124	1.8	17.9	5.8	1.0	22.6	37.4	32.7	1.5	2.1	14.3
20	CMS 973037	6689	64	60	240	131	1.9	10.2	4.5	1.0	22.9	39.4	34.5	1.6	2.3	3.6
26	CMS 973061	6668	61	57	223	106	1.5	8.7	4.2	1.0	23.0	39.4	36.0	2.2	2.3	11.9
8	CMS 973011	6618	59	55	229	117	2.8	13.4	8.7	1.0	22.0	37.4	36.7	1.9	2.4	18.9
22	CMS 973047	6599	60	56	239	123	2.8	9.8	2.3	1.0	23.5	36.0	34.1	1.8	2.2	4.8
3	CMS 973003	6583	60	56	222	113	3.0	14.2	5.2	1.0	22.7	39.7	36.0	1.1	2.1	2.1
21	CMS 973041	6565	63	59	243	135	2.0	8.9	3.9	1.1	23.7	39.3	37.9	1.7	2.5	5.7
1	CMS 973001	6554	60	56	218	110	1.1	8.1	2.7	1.0	22.0	38.7	36.4	1.2	2.3	1.6
18	CMS 973031	6417	62	58	225	123	2.5	9.1	3.5	1.0	22.1	39.1	35.6	2.0	2.3	2.3
7	CMS 973009	6384	63	59	223	117	1.7	9.7	5.1	1.1	22.6	38.6	36.3	1.8	2.4	16.3
26	CMS 933133 (RE)	6379	62	58	218	118	1.7	11.3	3.1	1.0	23.9	39.3	34.5	1.9	2.1	14.5
16	CMS 973027	6268	61	57	238	134	3.0	12.8	1.9	1.1	23.7	39.6	37.4	1.4	2.1	2.8
12	CMS 973019	6182	61	57	220	118	2.5	8.9	4.8	1.0	22.4	39.2	36.4	1.6	2.4	21.3
9	CMS 973013	6079	60	56	218	116	2.1	16.0	5.4	1.0	22.3	38.9	36.9	2.0	2.5	20.5
10	CMS 973015	6056	60	56	214	110	1.9	15.4	6.0	1.0	22.7	38.1	33.7	1.9	2.6	18.3
2	CMS 953063	6018	61	57	213	105	1.7	9.6	4.3	1.0	23.0	39.1	36.9	1.6	2.4	2.1
5	CMS 973005	5838	61	57	236	133	2.4	11.4	4.9	1.0	22.1	38.1	35.0	1.9	2.7	28.9
4	CMS 953105	5836	64	59	226	117	1.4	10.3	4.6	1.0	23.9	39.0	37.9	1.6	2.4	7.0
13	CMS 973021	5730	60	57	212	107	1.2	7.2	6.8	1.0	22.6	39.2	35.6	1.5	2.7	7.5
11	CMS 973017	5693	62	59	223	120	2.2	9.5	9.8	1.0	23.5	39.0	34.1	2.9	3.0	50.9
29	LOCAL-CHECK-1	6322	58	56	225	117	2.3	11.3	7.3	1.1	21.8	37.1	27.9	1.9	2.7	10.2
30	LOCAL-CHECK-2	5545	59	56	235	120	2.6	12.5	8.8	1.0	21.2	33.6	31.7	2.0	2.7	9.0
	Means	**6430**	**61.3**	**57.3**	**228.1**	**120.0**	**2.1**	**11.2**	**4.8**	**1.0**	**22.9**	**38.6**	**35.3**	**1.8**	**2.4**	**11.2**
	No.Locations	**21**	**18**	**18**	**21**	**21**	**17**	**16**	**14**	**19**	**20**	**20**	**3**	**6**	**13**	**8**
	Effect of genotype	**	**	**	**	**					**	**				
	Genotype X Location Interaction	**	**NS**	**	**NS**	**NS**					**	**NS**				
	5% LSD	**509.59**	**0.7788**	**0.9817**	**6.816**	**4.696**					**1.0635**	**1.642**				
	C.V. (%)	**10.43**	**1.9271**	**1.538**	**5.749**	**8.002**					**6.8367**	**7.1094**				

País	Localidad	No. Set	País	Localidad	No. Set
Brazil	Guaira	32	México	Cotaxtla	31
Colombia	Buga	5		Nextipac	12
	Palmira	6		Pedro Escobedo	15
	Turipana	4		Poza Rica	29
Guatemala	Cuyuta	30		Puerto Vallarta	17
	Tiquisate, Finca las Vegas	16		Silao	14
Honduras	Omonita	33		Valle de Yaqui	41
India	Bangalore	37	Philippines	Kabacan, Cotabato	7
	Karnal	39		San Felipe, Ilagan, Isabela	28
	Ludhiana	10	Venezuela	El Limon, Maracay	24
	Udaipur	40			

Table 72. **Mean grain yield (t/ha) by locations and overall means**
(Rendimiento medio de grano (t/ha) por localidad y medias generales)

CIMMYT Hybrid Trial Tropical Late Maturity White (CHTTW) **Year: 1999** **No. Locations: 21**

Ensayo de híbridos tropicales de madurez tardía de grano blanco de CIMMYT (CHTTW) Año: 1999 No. Localidades: 21

Ent. No.	Entry Name Entradas	South America					Central, North America and Caribbean										Asia						Overall means Medias generales		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Grain yield (t/ha) Rendimiento grano (t/ha)	Days to silk Días a flor	Plant ht (cm) Altura de planta (cm)
14	CMS 973023	4.1	6.4	9.6	9.4	9.8	6.5	8.0	8.7	9.8	6.1	4.9	8.2	2.5	4.4	2.9	13.4	8.6	5.0	4.4	6.7	6.9	7.0	62	221
25	CMS 973059	5.6	6.6	11.3	9.4	9.0	6.0	8.1	7.7	9.0	5.8	5.6	9.3	2.4	5.4	1.2	12.8	8.5	5.5	4.3	7.5	4.8	7.0	62	240
27	CMS 973063	4.3	5.2	9.9	8.5	9.5	6.2	7.4	9.0	9.5	5.7	5.3	10.3	2.7	5.1	2.2	13.6	7.0	5.1	6.4	6.8	6.0	6.9	61	232
6	CMS 973007	4.9	6.5	10.7	7.8	8.8	6.7	7.6	8.4	8.8	5.5	5.0	9.6	2.7	5.3	1.7	12.8	7.7	5.0	6.4	6.9	6.6	6.9	61	237
23	CMS 973049	5.0	6.9	11.6	9.6	9.1	5.1	8.2	8.4	9.1	5.6	5.1	8.8	2.5	5.3	2.3	12.4	6.5	6.1	5.8	5.9	5.6	6.9	59	226
19	CMS 973035	4.3	6.6	11.5	8.5	9.5	6.8	8.3	9.5	9.5	6.3	5.6	9.1	2.8	4.7	2.1	10.7	7.2	5.2	3.8	6.0	6.1	6.9	61	234
15	CMS 973025	4.5	6.3	9.6	8.2	10.2	6.4	7.9	9.4	10.2	5.3	5.1	9.7	2.4	5.1	2.4	11.1	5.7	4.9	5.4	7.1	5.9	6.8	62	232
17	CMS 973029	2.8	6.3	10.0	8.8	10.1	6.4	8.4	9.6	10.1	5.9	6.3	10.3	2.8	5.7	2.5	7.4	7.9	4.2	4.3	5.9	6.4	6.8	64	241
24	CMS 973057	4.0	6.5	9.7	8.4	8.6	5.6	7.2	7.4	8.6	5.3	6.1	10.1	1.7	5.7	2.2	13.7	8.9	5.4	5.9	4.5	6.3	6.8	62	239
20	CMS 973037	3.2	6.0	10.1	9.3	9.0	5.9	7.9	8.2	9.0	6.1	5.6	8.8	2.7	5.7	1.4	12.1	6.4	4.3	5.2	6.8	7.0	6.7	64	240
26	CMS 973061	4.4	5.3	10.3	9.1	8.1	6.5	7.7	7.5	8.1	6.3	5.3	9.0	2.4	5.3	1.6	12.2	6.2	6.2	6.3	6.2	6.0	6.7	61	223
8	CMS 973011	4.1	6.3	9.2	7.9	9.7	5.1	7.8	7.9	9.7	6.0	5.8	9.0	2.1	5.4	2.3	12.8	7.1	3.6	6.2	4.9	6.2	6.6	59	229
22	CMS 973047	3.6	7.0	9.6	9.4	9.6	6.2	7.9	8.3	9.6	4.8	5.8	9.4	1.6	6.0	1.4	13.1	7.7	3.2	3.8	4.7	5.8	6.6	60	239
3	CMS 973003	2.7	6.3	11.6	7.7	10.4	5.0	7.8	7.8	10.4	5.7	4.8	8.7	2.7	5.0	2.2	10.7	6.5	5.2	5.5	5.4	6.1	6.6	60	222
21	CMS 973041	5.2	5.2	9.6	8.9	9.0	5.4	7.1	7.1	9.0	4.6	4.4	9.9	2.7	4.3	1.6	13.5	8.0	5.1	5.8	5.8	5.8	6.6	63	243
1	CMS 973001	3.8	5.9	10.2	8.8	9.4	5.3	7.5	7.6	9.4	5.1	5.0	8.6	2.7	5.0	2.6	11.0	6.7	5.0	6.7	4.9	6.3	6.6	60	218
18	CMS 973031	4.1	5.5	10.1	8.3	9.2	5.8	7.1	7.5	9.2	4.7	4.3	9.5	2.1	4.5	1.8	12.1	6.4	5.5	5.2	7.1	4.7	6.4	62	225
7	CMS 973009	4.0	4.7	9.4	8.5	8.4	6.1	7.4	8.1	8.4	5.2	4.6	9.2	2.8	4.6	2.2	14.2	6.2	4.7	5.1	4.9	5.6	6.4	63	223
28	CMS 933133 (RE)	4.1	5.4	9.8	8.0	9.1	6.6	8.0	7.5	9.1	5.1	4.7	9.4	2.8	5.0	1.9	11.5	5.8	4.6	4.1	6.2	5.3	6.4	62	218
16	CMS 973027	4.1	5.7	9.8	7.2	8.9	6.4	7.7	7.2	8.9	5.2	4.7	8.9	2.7	4.9	1.6	10.3	7.1	4.4	5.2	6.0	4.7	6.3	61	238
12	CMS 973019	3.3	4.5	10.1	6.9	9.5	5.5	7.4	8.2	9.5	4.7	4.7	7.8	2.4	4.6	1.4	11.0	6.5	4.5	7.4	6.1	3.7	6.2	61	220
9	CMS 973013	3.3	3.9	9.9	6.7	8.3	5.3	7.6	8.1	8.3	5.3	5.0	7.7	1.7	4.3	1.3	12.2	7.0	4.9	6.6	5.6	4.8	6.1	60	218
10	CMS 973015	3.3	5.0	9.9	7.2	7.8	5.3	6.4	7.7	7.8	6.2	4.6	7.5	1.8	4.9	2.4	11.0	7.7	4.3	3.8	6.4	6.5	6.1	60	214
2	CMS 953063	3.6	5.9	8.6	8.5	8.4	5.1	6.9	7.7	8.4	5.8	4.5	7.7	2.2	4.7	2.3	10.6	5.7	4.4	4.8	4.8	5.9	6.0	61	213
5	CMS 973005	4.3	3.9	8.4	7.6	8.0	6.1	6.4	7.8	8.0	5.4	4.8	8.8	2.4	4.4	1.7	10.7	7.3	3.9	5.2	5.1	2.6	5.8	61	236
4	CMS 953105	3.4	5.2	8.8	8.3	7.5	5.5	7.7	7.1	7.5	4.3	4.7	8.1	2.3	4.3	0.5	11.2	6.2	4.5	5.3	4.5	5.5	5.8	64	226
13	CMS 973021	4.8	4.8	8.0	7.1	7.7	5.5	6.5	6.4	7.7	5.2	4.2	7.6	2.3	4.8	1.9	10.2	7.3	3.8	4.6	5.0	5.1	5.7	60	212
11	CMS 973017	3.6	5.4	8.8	8.2	8.3	5.3	6.9	7.0	8.3	5.2	4.1	7.2	2.3	4.3	1.4	11.0	7.0	3.8	2.6	5.4	3.6	5.7	62	223
29	Local check 1	4.8	5.1	11.2	6.7	8.1	5.1	7.7	7.6	8.1	6.4	6.4	7.9	3.1	6.3	2.9	12.6	5.5	6.5	1.9	5.9	3.0			
30	Local check 2	2.3	5.0	4.2	8.7	4.5	4.0	8.2	7.5	4.5	7.0	5.7	8.6	3.9	6.0	3.8	12.0	6.9	3.4	2.0	4.1	4.0			
	Mean	4.0	5.7	9.9	8.3	9.0	5.8	7.5	8.0	9.0	5.4	5.0	8.9	2.4	5.0	1.9	11.8	7.0	4.7	5.2	5.8	5.6	6.5		
	CV %	21.2	9.2	5.3	6.1	6.1	7.4	5.0	6.4	6.1	11.0	7.4	5.6	11.0	8.2	14.3	6.8	3.1	9.8	9.0	14.1	10.2			

No.	Country País	Location Localidad	No.	Country País	Location Localidad	No.	Country País	Location Localidad
1	Brazil	Guaira-SP	8	Honduras	Omonita	15	Mexico	Valle de Yaqui
2	Colombia	Buga	9	Mexico	Cotaxtla	16	India	Bangalore
3	Colombia	Palmira	10	Mexico	Nextipac	17	India	Karnal
4	Colombia	Turipana	11	Mexico	Pedro Escobedo	18	India	Ludhiana
5	Venezuela	El Limon, Maracay	12	Mexico	Poza Rica	19	India	Udaipur
6	Guatemala	Cuyuta	13	Mexico	Puerto Vallarta	20	Philippiness	Kabacan, Cotabato
7	Guatemala	Tiquisate, Finca las Vegas	14	Mexico	Silao	21	Philippiness	San Felipe, Ilagan, Isabela

Across means Table 73. **CIMMYT Hybrid Trial -Tropical Yellow, (CHTTY - 1999)**

No. Locations: 20

Ent. No.	Pedigree	Grain yield (Kg/ha)	Days Silk (d)	Days Pollen (d)	Plnt ht (cm)	Ear ht (cm)	Stem Lodg (%)	Root Lodg (%)	Ear Rot (%)	Ear/ Plnt (ratio)	Moist (%)	Plant Harv (no.)	Plnts Germ (no.)	Husk Cover (1-5)	Ear Asp. (1-5)	Husk Cover (%)	Plnts Asp. (1-5)	Ear Rot (1-5)	Curv (1-5)	Stalk Rot (%)	Stunt (%)	Pucc rust (1-5)	Helm (1-5)	Downy Mildew (%)	Corn Earworms (1-5)
16	CMS 973038	6412	58	68	252	136	2.0	14.4	4.2	1.0	23.7	42.3	42.1	2.0	2.3	24.2	2.4	1.8	2.4	7.1	2.0	1.8	2.1	0.7	4.8
13	CMS 973028	6348	58	67	246	127	3.1	13.8	6.3	1.0	23.2	41.2	42.6	1.5	2.2	2.8	2.2	2.0	2.6	6.4	10.6	1.7	1.9	0.0	4.0
12	CMS 973026	6437	57	66	240	123	6.1	15.0	6.2	1.0	23.8	42.1	41.3	2.0	2.2	12.9	2.8	1.6	2.6	4.8	6.0	1.8	2.1	1.4	5.0
9	CMS 973018	6331	57	66	255	135	4.2	22.9	4.9	1.0	24.3	40.3	41.5	1.5	2.4	2.4	2.5	1.7	2.8	3.2	5.0	1.8	2.0	0.8	4.8
11	CMS 973022	6222	60	66	234	120	6.7	13.7	8.2	1.0	24.1	41.3	42.2	1.8	2.5	3.8	2.2	1.7	2.6	5.8	5.2	1.8	2.2	1.6	5.9
14	CMS 973030	6316	58	68	245	124	5.3	13.3	5.9	1.0	22.2	42.5	43.3	1.7	2.3	2.0	2.7	1.9	2.6	6.6	8.2	2.0	2.1	1.3	5.6
10	CMS 973020	6242	59	67	235	124	3.0	11.7	4.3	1.0	24.0	42.3	43.1	1.6	2.4	6.8	2.2	1.9	2.4	4.5	8.7	1.8	1.9	0.9	4.3
17	CMS 953066	6208	59	66	234	136	2.0	8.0	3.8	1.0	24.8	42.1	41.5	1.5	2.2	3.8	2.3	1.6	3.0	4.3	13.0	1.8	2.1	3.2	4.1
18	CMS 933080 (RE)	6120	59	68	250	137	3.0	14.9	4.5	1.0	24.0	42.1	42.7	1.7	2.3	16.1	2.4	1.8	2.4	5.2	3.1	1.9	2.1	0.0	4.5
6	CMS 973012	6111	58	66	228	125	4.3	9.9	5.2	1.0	24.0	42.5	44.4	1.5	2.4	4.5	2.5	1.8	2.8	8.1	9.1	1.9	2.2	0.8	5.3
5	CMS 973010	6082	59	67	237	129	3.4	10.9	4.1	1.0	24.0	41.4	42.9	1.5	2.4	5.2	2.2	1.8	2.5	3.5	8.0	1.8	2.0	0.0	3.8
4	CMS 973008	6005	59	68	243	136	2.8	11.4	5.4	1.0	24.5	41.3	43.4	1.5	2.5	1.6	2.5	1.7	2.6	8.7	1.0	1.7	1.9	0.0	4.4
8	CMS 973016	5882	58	66	235	138	4.1	14.7	5.6	1.0	22.6	41.2	43.0	1.6	2.3	3.4	2.3	1.9	2.8	5.6	12.1	1.8	2.3	0.0	5.3
15	CMS 953022	5783	59	68	248	147	2.9	11.9	4.0	1.0	23.9	41.3	43.5	1.5	2.2	6.4	2.2	1.8	2.5	9.9	4.8	1.8	2.1	0.0	4.1
3	CMS 973006	5739	59	67	247	126	8.8	19.3	4.8	1.0	23.7	42.5	41.8	1.8	2.5	4.3	2.5	2.0	2.5	6.4	7.8	1.8	2.0	0.0	3.6
7	CMS 973014	5793	57	65	221	125	2.0	11.5	5.0	1.1	22.6	42.4	43.4	1.9	2.6	11.3	2.6	1.9	2.3	6.3	11.5	1.8	2.2	2.8	5.0
2	CMS 973004	5664	58	66	238	134	3.3	17.6	6.3	1.0	22.4	41.9	43.0	1.8	2.5	4.6	2.7	1.8	3.5	3.8	9.6	2.2	2.3	1.6	7.1
1	CMS 973002	5211	56	64	235	109	2.2	16.5	11.9	1.0	21.3	40.7	43.3	1.8	2.7	8.2	2.9	2.3	3.0	5.2	7.1	2.2	2.3	3.6	7.9
19	LOCAL-CHECK-1	5651	56	64	229	108	5.7	13.9	7.6	1.0	22.3	40.7	38.1	2.1	2.6	10.4	2.9	2.1	2.6	2.2	10.3	1.9	2.1	0.0	6.1
20	LOCAL-CHECK-2	5693	56	64	233	119	4.6	14.4	8.4	1.0	22.7	40.5	37.9	1.7	2.5	7.7	2.7	2.4	2.6	6.3	8.3	1.9	2.1	0.0	5.9
	Means	**6050.4**	**58.3**	**66.5**	**240.1**	**129.6**	**3.8**	**14.0**	**5.6**	**1.0**	**23.5**	**41.7**	**42.7**	**1.7**	**2.4**	**6.9**	**2.4**	**1.8**	**2.7**	**5.8**	**7.4**	**1.8**	**2.1**	**1.0**	**5.0**
	No. Locations	**20**	**18**	**18**	**18**	**19**	**16**	**16**	**12**	**17**	**20**	**19**	**5**	**6**	**16**	**7**	**12**	**2**	**2**	**2**	**1**	**6**	**8**	**1**	**2**
	Effect of genotype	**	**	**	**	*					**	NS													
	Genotype X Location interaction	**	NS	NS	NS	NS					NS	NS													
	5% LSD	**479.14**	**0.6634**	**0.9317**	**6.565**	**17.976**					**0.7308**	**2.0662**													
	C.V. (%)	**10.71**	**1.5719**	**3.1286**	**5.987**	**40.024**					**5.8806**	**7.4920**													

Pais	Localidad	No. Set	Pais	Localidad	No. Set
Brazil	ardinopolis-SP	31	India	Bangalore	37
Colombia	Buga	14		Bangalore (2)	40
	Cordova	13		Karnal	35
	El Cerrito, Valle Cauca	11		Ludhiana	36
Ecuador	Porto Viejo	1		Rayalkole	18
	Porto Viejo	2	Indonesia	Jambegede, East Java	27
Guatemala	La Maquina	29	México	Cotaxtla	30
	Tiquisiate, Finca las Vegas	9		Poza Rica	28
Honduras	Danli	33		Puerto Vallarta	10
			Philippines	Kabacan, Cotabato	15
			Venezuela	El Limon, Maracay	25

Table 74. **Mean grain yield (t/ha) by locations and overall means**
(Rendimiento medio de grano (t/ha) por localidad y medias generales)

CIMMYT Hybrid Trial Tropical Yellow (CHTTY) **Year: 1999** **No. Locations: 20**

Ensayo de híbridos tropicales de grano amarillo de CIMMYT (CHTTY) Año: 1999 No. Localidades: 20

Ent. No.	Entry Name Entradas	South America							Central, North America and Caribbean						Asia							Overall means Medias generales		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Grain yield (t/ha) Rendimiento grano (t/ha)	Days to silk Días a flor	Plant ht (cm) Altura de planta (cm)
12	CMS 973026	7.4	7.7	5.7	8.2	4.9	3.9	6.5	5.2	6.9	4.3	9.1	9.0	2.6	10.3	4.3	8.1	5.2	6.6	8.3	4.5	6.4	57	240
16	CMS 973038	6.2	8.3	6.2	7.3	5.6	3.6	6.5	5.2	7.1	4.4	8.6	8.6	2.1	8.6	4.9	8.8	6.1	6.6	7.6	6.1	6.4	58	252
13	CMS 973028	6.4	7.7	5.8	8.7	6.0	3.2	6.0	5.3	6.6	4.8	6.7	7.5	2.5	11.7	5.4	8.5	5.1	6.5	7.6	5.1	6.3	58	246
9	CMS 973018	6.6	7.8	5.9	8.5	5.3	4.2	4.9	4.5	6.5	5.1	9.3	8.5	1.9	10.5	4.8	8.2	5.3	6.6	7.1	5.4	6.3	57	255
14	CMS 973030	6.8	8.2	6.6	8.8	5.3	5.0	5.3	5.3	6.9	4.4	8.7	8.5	2.2	7.7	3.9	8.4	6.5	5.5	7.3	5.0	6.3	58	245
10	CMS 973020	6.1	7.3	6.8	8.4	5.5	4.4	5.5	4.8	6.6	4.5	7.7	8.2	2.6	9.1	5.2	7.6	5.3	6.4	7.6	5.3	6.2	59	235
11	CMS 973022	5.8	8.6	8.1	8.6	4.4	3.5	5.1	3.6	6.8	4.1	8.6	8.3	2.2	9.7	5.2	8.6	4.7	6.5	7.0	5.0	6.2	60	234
17	CMS 953066	6.3	7.8	7.4	7.3	4.3	3.7	6.2	4.7	5.7	6.0	9.2	8.2	1.9	7.5	4.7	9.1	5.2	6.3	7.4	5.3	6.2	59	234
18	CMS 933080 (RE)	6.3	8.1	7.0	7.0	5.1	3.8	6.2	4.9	7.2	4.5	7.9	8.8	2.3	8.1	4.4	7.1	5.8	6.0	7.3	4.6	6.1	59	250
6	CMS 973012	6.2	7.0	7.4	8.2	4.5	3.9	6.2	4.3	5.7	5.9	8.4	7.2	2.3	7.3	4.0	8.4	5.8	6.5	7.6	5.4	6.1	58	228
5	CMS 973010	6.2	7.6	6.0	8.4	5.0	4.1	5.0	4.3	6.2	4.7	7.5	7.6	2.5	9.8	4.7	7.6	5.6	6.0	7.8	4.8	6.1	59	237
4	CMS 973008	6.0	8.0	6.4	7.3	4.8	3.4	5.5	4.9	6.1	4.1	7.1	8.4	2.5	9.6	3.9	8.7	5.7	5.9	7.3	4.5	6.0	59	243
8	CMS 973016	5.4	7.7	6.3	7.6	4.5	4.0	4.8	4.3	6.7	3.9	7.4	7.6	1.8	9.2	4.7	7.9	5.1	6.3	7.8	4.8	5.9	58	235
7	CMS 973014	6.6	6.1	5.9	7.1	4.7	3.4	5.2	4.5	5.6	5.1	7.2	7.0	2.2	8.0	4.8	8.8	5.7	6.3	7.1	4.6	5.8	57	221
15	CMS 953022	5.3	7.6	7.1	7.8	4.9	3.6	5.8	4.5	6.8	4.4	7.5	7.2	2.2	8.6	4.6	7.2	5.0	5.6	6.1	3.9	5.8	59	248
3	CMS 973006	4.3	7.0	6.2	8.4	4.6	3.8	3.6	5.3	6.0	4.9	7.2	6.6	2.6	6.9	5.9	6.4	5.5	6.0	7.5	6.1	5.7	59	247
2	CMS 973004	6.0	6.5	5.5	8.4	3.3	2.0	4.0	3.9	5.6	4.1	7.4	7.1	1.8	9.7	5.2	7.9	5.2	6.7	7.5	5.5	5.7	58	238
1	CMS 973002	5.7	6.0	6.5	8.1	3.6	3.5	4.4	2.5	5.3	3.5	6.8	6.9	1.4	8.1	4.9	6.2	4.2	6.1	6.4	3.9	5.2	56	235
19	LOCAL CHECK - 1	6.2	6.0	6.0	8.2	3.8	2.4	4.3	4.4	5.4	6.4	7.2	6.5	2.5	11.1	3.3	5.2	6.1	4.3	7.5	6.1			
20	LOCAL CHECK - 2	6.1	6.8	6.1	6.0	3.7	2.0	4.7	4.3	6.7	5.5	6.1	6.3	2.4	11.0	4.1	7.7	3.0	5.3	7.8	8.3			
	MEANS	6.1	7.5	6.5	8.0	4.8	3.7	5.4	4.6	6.3	4.6	7.9	7.8	2.2	8.9	4.8	8.0	5.4	6.2	7.3	5.0	6.1		
	C.V. (%)	6.56	6.37	8.04	8.49	11.5	14.7	10.9	8.6	6.5	10.3	5.8	4.5	11.3	5.6	13.9	2.5	12.4	8.0	6.5	13.7			

No.	Country País	Location Localidad	No.	Country País	Location Localidad
1	Brazil	Jardinopolis-SP	11	Mexico	Cotaxtla
2	Colombia	Cordova	12	Mexico	Poza Rica
3	Colombia	Buga	13	Mexico	Puerto Vallarta
4	Colombia	El Cerrrito, Valle Cauca	14	India	Bangalore
5	Ecuador	Porto Viejo	15	India	Bangalore (2)
6	Ecuador	Porto Viejo (2)	16	India	Karnal
7	Venezuela	El Limon, Maracay	17	India	Ludhiana
8	Guatemala	La Maquina	18	India	Rayalkole
9	Guatemala	Tiquisiate, Finca las Vegas	19	Indonesia	Jambegede, East Java
10	Honduras	Danli	20	Philippiness	Kabacan, Cotabato

V. Seed Increases, Shipments and Distribution.

3130 kg. of tropical maize seed were distributed to 46 countries. The shipments contain 6652 hybrids, lines, synthetics, experimental varieties, populations, pools, normal and QPM. The most important contributions during 1999 were the distribution of QPM maize seed to several countries, principally Mexico, to speed up the launching of the national QPM project in the tropics and subtropics. 1701 kg. of seed were distributed to NAR's in the public and private sector (Table 113).

30 different types of trials, including the evaluation of more than 1200 hybrids were tested in 9 locations in the tropical mega-environment.

VI. Training activities.

More than 40 working days were spent in training activities in Mexico and outreach locations. Two training courses in Mexico with the participation of 22 trainees from different countries. Lectures to visiting scientists, seed weeks.

VII. Trips, Meetings and Publications.

The poster entitled "Stability and yield performance of high quality protein maize hybrids across 35 locations in the tropical mega-environment" H.S. Córdova and S. Pandey was accepted for presentation in the 1999 ASA Meetings. The abstract was revised and sent on time for publication and presented in the ASA Meetings held in Salt Lake City, Oct. 31-Nov.4, 1999. The information contained in this poster is very exciting because it includes 35 locations.

In collaboration with the leaders of National maize program seed industry and Directors of CENTA and ICTA at El Salvador and Guatemala, we have designed strategies to test and promote hybrid technologies in the farmer's hands in a very effective and cost effectively timing. Hugo Córdova traveled twice to Guatemala and five times to El Salvador to guarantee that the strategy is working. Our relation with FUNDAGRO (Eduardo Palomo) top agribusiness organization, opened new avenues for the future of agriculture research in this country. SIADES awarded Hugo Córdova with the "1999 Ingeniero Agrónomo del Año" in response to his long professional achievements, the Minister of Agriculture delivered the award in June, 1999. Our extended relationship with the seed industry in El Salvador and Guatemala contributed to rapidly put in the farmer's hands the new maize hybrid technology.

Antonio Turrent, National Maize Program Coordinator, and ten scientists visited Poza Rica station during two days, they were shown the demonstration block, QPM, different trials, seed production plots and nurseries, at night we had a five hour meeting to discuss the future collaborative QPM research. After the visit, a clear commitment from INIFAP directors and scientists was expressed on the need of more strong collaboration.

A field day for visiting QPM demonstration trials at Celaya, Gto. was attended by more than 100 SAGAR authorities, INIFAP directors, Jorge Kondo, INIFAP General Director, Rodrigo Aveldaño, Executive Director of Agriculture, scientists, seed industry, PRONASE and agroindustry organizations.

Conferences by INIFAP and CIMMYT staff demonstrated the excellent QPM hybrids which will outyield the best seed industry checks. Jorge Kondo released the hybrids to the seed industry.

During 1999, the following four thesis were advised by Hugo Córdova.

- Efectos genéticos en seis líneas de maíz para evaluar características agronómicas y variabilidad de semillas. (M.C. Mario Ernesto Vázquez Badillo) Doctor en Ciencias.

- Heterosis entre líneas emparentadas como alternativas en la producción de cruzas simples modificadas de maíz (*Zea mays* L.) subtropical. (M.C. José Luis Quemé) Doctor en Ciencias.

- Aptitud combinatoria de líneas tropicales de maíz (*Zea mays* L.) de alta calidad protéica Ing. Fidencio Guerra, El Salvador). Maestria en Ciencias.

- Respuestas correlacionadas para rendimiento y aptitud combinatoria de líneas precoces tropicales de maíz (*Zea mays* L.) (Gilberto Avila), Ingeniero Agrónomo.

M.C. Vázquez already defended his final examination on October 21, 1999, his thesis work included crosses of CIMMYT x UAAAN germplasm and versed on the efficiency of selection for physiological seed quality traits. The new Ph. D. has been hired by the "Centro de Semillas" at UAAAN.

M.C. Quemé's thesis work is versed in the work of utilization and selection of sister lines for modified single cross hybrid in subtropical CIMMYT germplasm, he is now at the end of the fourth semester, had already collected all data for his thesis and presented his preliminary exam in October 22, 1999. He is expected to defend his thesis in early March 2000.

All these students are making an excellent contribution to agriculture research in Mexico and enhancing the efficiency of the graduate work of UAAAN.

Hugo Córdova attended two events in UAAAN: Second National Congress on Specialty Corn, held in September 10, and Seed Course in Transgenics held October 22 to 23 in both cases he presented the Conference: "Desarrollo y Promoción de Híbridos de Alta Calidad Protéica: Logros y Estrategias".

After two years of non stop work in the tropical lowland subprogram, we believe we have achieved a good level of progress in fixing problems in operation and selection methods and introducing new ideas and strategies in breeding techniques and field operation that are being reflected in new and better quality products, in hybrids, normal, QPM germplasm and OPV's more attractive to farmers.

Table 113. Seed shipment and trials distributed by the tropical lowland maize subprogram

SHIPT. NO.	COUNTRY PAIS	INSTITUTION INSTITUCION	MATERIAL SENT MATERIALES ENVIADOS	Seed Quantity C.Semilla (KG)
4	Argentina	Pioneer, Nidera, INTA	84 LINES, 1 HYDRID	7.680
3	Bolivia	RIMOC, IBTA, CIAT	5 LINES, 1 TRIAL, 9 EVS	32.300
3	Brazil	FAP/MIND WINGS,EMBRAPA, DCPA,	121 LINES, 2 HYBRIDS 3 TRIALS	8.700
1	Burundi	IDSAB	23 LINES	0.420
1	Cameroon	IRAD - BAMBUI	4 EV'S, 3 POOLS QPM	2.500
4	China	CAS, ICBC, CRIBA, YAAS	41 LINES, 4 EVS, 2 POPS	11.241
21	Colombia	NOVARTIS, PROCAMPO, CIMMYT, S. VALLE	305 LINES, 17 HYB., 25 EVS, 7 POOLS, 19 TRIALS	177.000
1	Congo	L'Institut Nat. pur L'etude et la Res. Agro.	1 POP	0.700
1	Costa Rica	Ministerio de Agricultura y Ganadería	1 TRIAL	2.700
2	Cuba	Ministerio de Agricultura y Ganadería	2 TRIALS, 20 LINES	6.350
1	Dom. Republic	Cuerpo de Paz,	1 EV'S	1.300
2	Ecuador	INIAP, SEMILLAS NACIONALES	1 TRIAL, 5 LINES	5.110
1	Egypt	ARI, FCRI	17 POP, 12 LINES	2.300
6	El Salvador	CENTA	8 LINES, 6 HYBRIDS, 3 TRIALS	49.200
4	Ethiopia	IAR	53 LINES, 40 HYBRIDS, 2 EVS	22.310
1	France	Limagrain Genetics	21 LINES	0.500
2	Germany	HSAG, IFP	36 LINES	2.050
1	Ghana	Crops Research Institute	244 LINES	3.100
11	Guatemala	ICTA, CRISTIANI, CIMMYT, MICROCOMPUTACION	1212 LINES, 44 HYBRIDS, 4 EVS, 16 POPS, 20 TRIALS	179.220
2	Haiti	CRDA /MARNDR	2 TRIAL	4.800
3	Honduras	DICTA-SAG, SRN	42 LINES, 2 TRIALS	7.500
16	India	DMR, HPKV, UAT, PROAGRO, IRI, NARDI, DA, IL, CEO, BISCO	282 LINES, 13 HYBRIDS, 25 EVS, 22 POPS	21.267
1	Korea	Crop Genetic Resources Intitute	68 LINES, 27 POP	6.800
1	kenya	KARY-Regional Research Centre Mtwapa	8 LINES, 4 HYBRIDS, 1EV	0.434
1	Malaysia	MARDI Research Station	12 LINES	0.350
1	Marroco	INRA	5 LINES	0.110
39	Mexico	INIFAP, PIONEER, SEMYCA, CICY, S. ARAHI, IDAO, UACH, UAAAN, ASGROW, ASPROS, S. CORREA, CERES, UAG, GENOTEC, MII, CP.	609 LINES, 58 HYBRIDS, 16 EVS, 16 POPS, 7 POOLS	1701.170
2	Mozambique	SEMOC, FHI	123 LINES, 6 HYBRIDS, 3 EVS, 6 POPS	22.300
2	Nepal	CIMMYT, NMR	47 LINES	2.650
3	Nicaragua	INTA	4 TRIALS, 1 EV, 1 HYBRID	74.800
1	Pakistan	Rafhan Maize Products Co Ltd.f	43 LINES	1.000
4	Panama	IDIAP, UP	6 LINES, 11 TRIALS, 1 EV	35.500
2	Paraguay	MAG-IICA-CRIA	2 LINES 1 TRIAL	5.700
3	Peru	UNALM, MAP	268 LINES, 12 HYBRIDS, 3 EVS, 10 POPS	27.980
3	Philippines	GSI, USM, UPLB	172 LINES	4.800
1	Rep. Dominicana	CESDA	2 TRIALS	12.200
1	Rwanda	I.S.A.R.	5 EVS QPM	2.500
1	Suriname	IICA, Technical Cooperation Agency	5 EVS	1.100
8	Thailand	CIMMYT, NSFC	186 LINES, 40 HYBRIDS, 13 POPS, 19 TRIALS	87.780
1	Togo	ITRA	2 EVS QPM	10.000
1	Trinidad & Tobago	The University of The West Indies	8 EVS	4.500
3	USA	WG,LLC, HAFF, TEXAS A&M U.	92 LINES, 2 EVS, 11 POPS	8.400
7	Venezuela	SEMILLAS ARAGUA, FONAIAP, DANAC	75 LINES, 15 HYBRIDS, 11 EVS	69.000
3	Vietnam	Southern Seed Company, NMRI	42 LINES, 8 EVS, 2 POPS	5.716
3	Zimbabwe	CIMMYT	706 LINES, 3 HYBRIDS, 25 POPS	19.500
39	MEXICO	CIMMYT	815 LINES, 132 HYBRIDS, 17 EVS, 22 POPS, 11 POOLS	477.781
222	46		MATERIALS SENT 6863	3130.319

VIII. Summary

Inter-population improvement using reciprocal recurrent selection (RRS) in the tropical lowland, has been enhanced focussing on selection against biotic and abiotic stresses, with the support of the Entomology, Pathology and Physiology units. In the tropical subprogram one cycle of S_2 recurrent selection will be completed in two years. The formation of new experimental varieties will be speeded-up. Two new sets of populations heterotic to each other (2 white and 2 yellow) are being formed.

22 new synthetic, OPVs were formed, advanced to F_2 and tested in international trials; new synthetic cultivars are more uniform and more appealing to farmers. Yield in the synthetics is similar to the normal experimental varieties.

Six synthetics resistant to insects (FAW), to drought and low nitrogen, were developed, advanced to F_2 and will be tested in international trials in the year 2000.

New corn stunt disease (CSD) resistant synthetics: P73 NIC1, P73 NIC2, P73 NISA1, yielded up to 7.2 tons per hectare, under non infested conditions with a minimal decrease in yield of 7.1, 5.3 and 7.9% respectively under heavy CSD infection. The single cross hybrid CML247 x CML254 suffered a yield reduction of 47%. All 3 synthetics were resistant to *B. maydis* and *P. polisora.*

10 lines with good GCA adapted to tropical lowland, were identified and proposed for immediate release; some lines are resistant to insects, drought, low-N, foliar diseases and ear rot.

6 new white and yellow tropical elite inbred lines 'testers' were identified and are in current use. The new testers will eventually replace the earlier tropical testers.

More than 1500 tropical new hybrid combinations with adaptation to tropical lowland, in Latin America and Asia were tested in several locations in stressed and non-stressed environments in 1999. Superior hybrids outyielded the best seed industry check up to 30% and, possessed superior agronomic traits.

8 QPM hybrids with tropical adaptation were released by INIFAP. The ceremony was attended by the Mexican Secretary of Agriculture, Prof. Timothy Reeves and Dr. Norman Borlaug. The best hybrids yield 10% better than the best seed industry checks and contain 60 to 100% more triptophan and lysine. It is planned to plant 500,000 ha of QPM in Mexico soon.

In collaboration with R5 and PRM, we released QPM hybrid HQ-61 in El Salvador. The ceremony was attended by the Vice President, Minister of Agriculture, Minister of Foreign Relations, Vice President of Nicaragua, public, private and seed industry representatives, Dr. Norman Borlaug and Dr. Shivaji Pandey and other CIMMYT Staff. The government of El Salvador presented a plan to cover 70% of the area planted with QPM maize in four years. The plan for seed production in 2000 is to produce 800 tons of seed to enable the planting of 40,000 hectares by 2001. In Guatemala we released HB-PROCTICTA with similar results as in El Salvador.

In 1999 we tested 23 tropical QPM hybrids at 28 locations in Asia and Latin America. Best QPM hybrids outyielded the best seed industry checks by region and countries (Figs. 15 and

16).

Research in swine feeding conducted in September 1999 and January 2000 in El Salvador and in Guatemala is very promising and very similar to the earlier studies conducted in the 1970's and in 1994. In both cases, pigs fed with QPM gained 600 g/day while the ones fed with normal maize gained only 300 g/day.

In collaboration with R5 and SAMP in Venezuela, FONAIAP tested tropical and CIMMYT Cali hybrids in seven locations in the State of Portuguesa. Results across several locations indicate that the CIMMYT hybrid CLO2198 x CML274 yielded 10.5 t/ha and the best check 8.5 t/ha, while the Pioneer hybrid yielded 6.5 t/ha. QPM results in Venezuela are also very exciting. The hybrid (CML142 x CML15) x CML176 topped the trial at Guarico with 6.5 t/ha, 15% more than the seed industry check. The best selected hybrid will be tested in strip tests in 2000.

In Peru tropical yellow hybrids yielded up to 14 t/ha up to two tons more than the best checks. Superior hybrids identified will be evaluated in strip tests in 2000.

In Colombia yellow QPM hybrid CML161 x CML165 and white endosperm (CML144 x CML159) QPM hybrids outyielded the best seed industry check G-5324 and Cargill C-343 respectively, by more than 1 t/ha with double lysine and triptophan content. QPM hybrids are being proposed for release in 2001.

We have shipped 12 trials including QPM hybrids to Ecuador, Paraguay and Bolivia for the purpose of testing in multi-location trials in 2000.

In Thailand G2 in collaboration with R2 and ARMP, tested six different trials at the Suwan Farm site. In each trial at least two entries outyielded the best seed industry check by 1-2 t/ha. Even allowing for heavy residual herbicide damage, CIMMYT tropical hybrids demonstrated superiority for yield potential and resistance to ear rot and *P. polysora.*

G2 in collaboration with F4 identified 8 new white endosperm elite QPMs with good GCA for immediate release. The lines were identified from the results of advanced test crosses conducted in 10 locations during 1999/A and B cycles. New F_2 pedigree breeding population using elite QPM lines and normal white and yellow elite coded inbred lines have been developed and pedigree selection will be continued in 2000.

A very important alliance emerged between the CIMMYT Maize Program and Grupo Maseca-Central America Andean Region. Grupo Maseca visited the CIMMYT Maize Program in early February and expressed their desire to join forces with CIMMYT in promoting QPM hybrid maize in Central America (Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica) and South America (Colombia, Venezuela) through promoting and recommending our hybrids released by National Programs in "El Club del Maiz de Maseca", using the most advanced agronomic technologies and the best QPM hybrids available. We had a meeting with the Directors also in Guatemala during the release of HB-Proticta. They are prepared to purchase the hybrid seed from small private companies in each country and distribute to farmers, eliminating the intermediaries.

Our collaboration with SG2000 was enhanced during the meeting held at CIMMYT in November 1999. We presented a progress report on QPM development and transfer that was regarded as impressive by most of the members. An enhanced collaboration emerged from

that meeting with the promise of more interaction for the promotion of our products to farmers.

1999 was very positive scenario for the relationship between CIMMYT's Maize Program and NARS in Mexico. A true partnership between INIFAP and CIMMYT was also established, with INIFAP providing 200 kg. of basic seed that was sent to Guatemala, for hybrid seed production. There also has been mutual public recognition of QPM development. Fundación Mexicána para la Investigación Agrícola also recognized our effort by granting 100,000 to CIMMYT to continue research on QPM.

CIMMYT and Texas A&M have initiated a partnership by identifying areas of common interest and developing a joint proposal with emphasis on tolerance to drought and heat, aflatoxins and breeding for QPM hybrid development.

In association with QPM germplasm improvement, assistance from the University of Arizona has allowed CIMMYT to produce antibodies that react with the maize elongation factor 1a, that is highly correlated to lysine content of the endosperm. Antibodies were produced and provided to NARs with germplasm improvement programs for QPM maize. Serological tests will help in the selection process needed to develop QPM maize, using the ELISA technique.

Fig. 15 Yield performance of best white QPM hybrid

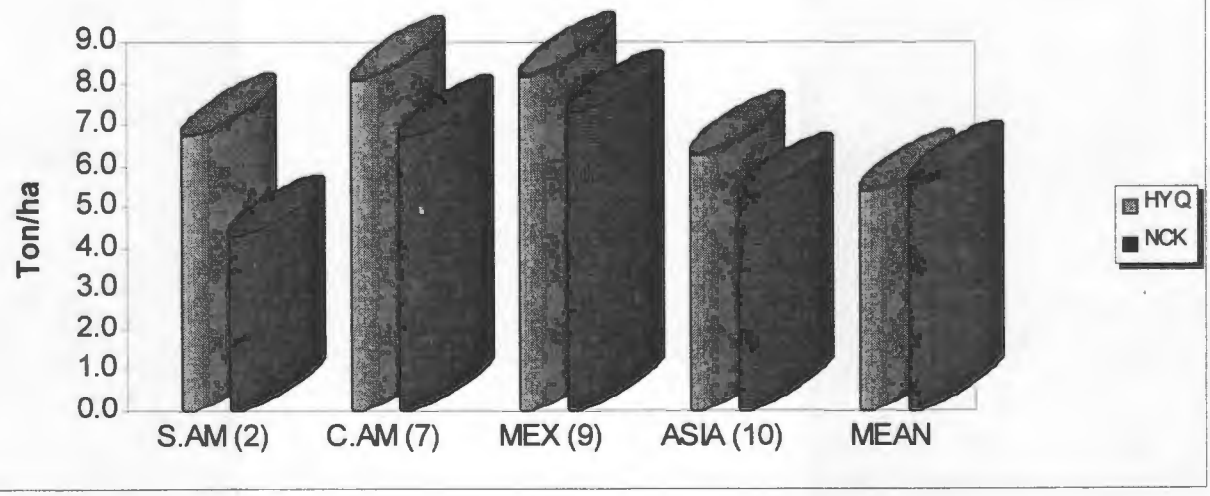


Fig. 16 Yield performance of best white QPM hybrids