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27-1-1986

NATIONAL SEMINAR
ON
BREEDING CROP PLANTS FOR RESISTANCE TO PESTS AND DISEASES

1582

May. 25-27. 1983.

Published
May 1985.

SCHOOL OF GENETICS
TAMILNADU AGRICULTURAL UNIVERSITY
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ties with a second gene should be available. This sequential - release strategy has been employed for BPH resistance. Thus, five BPH-resistant varieties with the *Bph 1* gene were released in 1973-74. In 1976 those varieties began to show susceptibility at some Philippine locations. But by that time, multiple pest resistance varieties with the *Bph 2* gene for resistance were available and were released as replacements for varieties with *Bph 1* for resistance. We now have breeding lines with the *Bph 3* and *bph 4* genes for resistance.

We are also trying to pyramid two major genes for BPH resistance. *Bph 1* and *Bph 2* are closely linked and cannot be combined; so are *Bph 3* and *bph 4*. *Bph 1* and *Bph 3*, *Bph 1* and *bph 4*, *Bph 2*, *Bph 3* and *bph 4* segregate independently of each other and can be combined together. We envisage that varieties with two resistant genes will have a longer useful life.

Four known genes for BPH resistance are also being transfered to isogenic backgrounds by backcrossing. We are also searching for additional resistance genes. When 6 to 8 isogenic lines with different BPH-resistant genes become available, we plan to evaluate the feasibility of developing multiline varieties.

For traits that are under polygenic control, such as stem borer resistance, we use a diallel selective mating system. The method involves: 1) crossing a number of moderately resistant parents in all possible combinations 2) intercrossing the F_1 populations in all possible combinations; 3) screening the double-cross F_1 progeny for resistance; and 4) intercrossing the selected plants found to be more res istant than either parent. We will continue the crossing, screening, selection, and recrossing until minor genes from different sources are accumulated.

Sorghum Improvement for Pest Resistance at ICRISAT

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ICRISAT has identified four major pests on sorghum as priority for its research. These are shootfly, stem borer, midge and headbugs. Sources of resistance have been identified for shootfly, stem borer and midge, and are being utilized in the breeding program. Headbug resistant sources are being searched for.

In case of shootfly, resistance has been combined with reasonable grain yields and quality. Two phenotypic traits, trichomes and glossiness, appears to be associated with shootfly resistance. Good progress has also been made in developing an array of improved midge resistant lines. The details on the shootfly and midge resistant lines are furnished in Tables 1 to 3.

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Table 1. Sorghum cultivars resistant to midge

S. No.	Cultivar	S. No.	Cultivar
1	AF-28	13	IS-8721
2	DJ-6514	14	IS-8724
3	TAM-2566	15	IS-9807
4	IS-271	16	IS-10712
5	IS-2761	17	IS-11117
6	IS-3461	18	IS-12213
7	IS-7005	19	IS-12666C
8	IS-7687	20	IS-14864
9	IS-8264	21	IS-14871
10	IS-8571	22	IS-14876
11	IS-8711	23	IS-15107
12	IS-8713	24	IS-19474

Table 2. List of some promising shootfly resistant lines

Entry	Plant height (cm)	Days to 50%		Grain yield kg/ha	Resistance* indices	Recovery score
		Flower	Maturity			
PS-21185	160+7	67+0.7	100+0.5	3116.7+500	3.0	4.5
PS-14103	170+7	64+0.7	97+0.5	3294.5+500	2.9	4.0
PS-18601**	161+5	67+0.8	90+0.8	3622.2+337	2.8	4.5
PS-20608	131+7	65+0.7	97+0.5	2766.7+500	2.5	3.5
PS-18822-4**	162+5	69+0.8	100+0.8	2733.3+377	2.7	4.0
PS-18817-3**	195+5	62+0.8	95+0.8	3088.9+377	2.2	4.5
PS-19230	197+5	63+0.8	96+0.8	4333.3+377	2.8	2.0
PS-19796	130+5	66+0.8	98+0.8	2688.9+377	2.5	2.0
PS-21209	135+4	63+1.0	95+0.9	3177.8+387	1.56	3.5

*Obtained by using IS-1054 as standard shootfly resistanr check.

**Have multiple resistance.

Table 3. List of promising midge resistant breeding lines

S. No.	Origin	Pedigree
1	PM-6751	(SC-108-3 x S-GIRL-MRI)-19-1-1-1-1
2	PM-7388	(NES-705 x 830 x IS-2579C)-10-1-1-2-1
3	PM-7540	(SPV-135 x DJ-6514)-11-1-6-1-2
4	PM-7357	(IS-12573C x PHYR)-20-1-1-1-1-1
5	PM-7390-3	(IS-12573C x PHYR)-15-1-2-1-3
6	PM-7422-2	(SC-108-3 x DJ-6514)-12-1-1-2-1
7	PM-7060	(IS-152 x DJ-6514)-1-1-1-1-1
8	PM-6946	(IS-12573C x SC-108-3)-19-3-3-1-1
9	PM-8590	(E35-1 x TAM-2566)-1-7-1-1-1
10	PM-7349	(IS-12753C x SC-108-3)-18-5-2-1-1
11	PM-7061	(IS-152 x DJ-6514)-8-1-1-1-1
12	PM-7279	(IS-152 x IS-2579C)-1-1-1-1-1
13	PM-7092	(SC-108-3 x S-GIRL-MR-1)-19-1-1-1-1
14	PM-6904	)IS-12573C x SC-108-4-8)-7-5-1-1-1
15	PM-6902	(IS-12573C x PHYR)-2-1-4-1-1
16	PM-6958	(IS-12573C x SC-108-4-8)-7-5-7-1-1

Heterosis for Grain Yield and Resistance to Grain Moulds in Sorghum[1]

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An investigation was undertaken to study the magnitude of heterosis for two agronomic traits viz. grain yield and resistance to grain moulds, caused by *Fusarium moniliforme* Sheldon and *Curvularia lunata* Wakker (Boed). It was also aimed to assess the possi-bility of combining these two traits together for developing new sorghum grain hybrids.

Materials and Methods

Two sets ef experiments were formulated, i.e. one for each pathogen. In one set, eight lines IS 2261, M 35052, E 35-1, IS 3443, J 2579, IS 2327, CSV-1 and CSV-3 were crossed with four male sterile lines i,e. CK60A, 3660A, 5800A and 1587A. In another set eleven lines; CSV-1, CSV-3, CO 21, CO 22, IS 3541, Mothi, SPV-121, IS 14332, IS 2435, K-3 and AS 3880 were crossed with five male sterile lines i.e. CK 60A, 5800A, 3660A, 1587A and 2219A.

The resultant hybrids, 32 in set I and 55 in set II were sown along with their respective parents in a randomised block design separately. Each entry was one row of 2.7 m. length with inter-row and inter plant spacings of 45 cm. and 15 cm. respectively. In first experiment, the magnitude of heterosis (mid parent) and heterobeltiosis for grain yield and resistance to *Fusariun moniliforme* and in the second experiment for

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