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A high Yielding Disease-Resistant Pearl Millet Hybrid X-5 for Tamil Nadu

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A new hybrid combination involving L. IIIA and PT. 1921 was developed at Coimbatore. The hybrid, UCH-9, has recorded a mean grain yield of 3034 kg/ha in 30 irrigated trials and 1873 kg/ha in 20 rainfed trials. The percentage of increase over KM 2 and X-4 are 42.8 and 31.2 respectively under irrigation and 43.0 and 31.4 respectively under rainfed conditions UCH showed a resistant reaction to downy mildew. It possesses attractive long panicles with thick seed set and bold grains. In view of its high yield, resistance to downy mildew, wide adaptability and parental diversity from the presently ruling hybrids, UCH-9 was released, as X-5 for general cultivation in Tamil Nadu.

Pearl millet (*Pennisetum americanum* (L.) Leeke) is an important millet crop popularly cultivated in the arid tracts of India. Exploitation of heterosis on a commercial scale in this crop is carried out for the past two decades by utilizing cytoplasmic genic male-sterile lines. At present three popular hybrids KM-1 (BJ.104), KM-2 (BK 560-230) and X-4 (COH.2, MS. 5141A X PT 1921) are cultivated in Tamil Nadu. All these lines have a common seed parent.MS. 5141A. However, continuous use of a single male sterile line for a long period may be disastrous, especially in crops like pearl millet where problems such as downymildew disease are to be constantly tackled. Therefore,research work was carried out at the Millet Breeding Station, Coimbatore to identify new high yielding hybrid combinations that are different in their genetic make up from the presently cultivated ones and the results are reported.

MATERIAL AND METHODS:

Hybrid combinations were effected during 1979 summer season involving homozygous inbred lines selected for phenotypic superiority and abundance of pollen production and the male-sterile lines MS. 5141A and L. IIIA. Among these, the hybrid involving L. IIIA, a Punjab line possessing A1 cytoplasm and PT 1921, an African inbred was found to be promising in initial row yield trials. This combination was designated as UCH-9 (MH.116) and was tested in a total of 30 irrigated trials and 20 rainfed trials in Tamil Nadu during the period 1980 to 1982 and in the All India coordinated Trials during 1981. The hybrid was tested for its reaction to downy mildew and ergot diseases at Coimbatore during 1980 and 1981 and in the All India centres during 1981.

RESULTS AND DISCUSSION:

The yield performance of UCH-9 in comparison with X-4 and KM-2 has been furnished in table-I The hybrid recorded a mean grain yield of 3034 kg/ha in 30 irrigated trials including12 research station trials in Tamil Nadu over a three year period. The grain yield recorded by UCH-9 was 42.8 per cent

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higher than KM-2 and 14.2 per cent higher than X-4. In 12 centres of All India Coordinated Millet Improvement Project distributed over six different States of varying agro-climatic conditions, this recorded a mean grain yield of 2271 kg/ha as against the national check KM-1 (BJ.104) recording 1676 kg/ha, the increase in yield being 35.5 per cent (Anon, 1982).

The hybrid was also tested in twenty rainfed multilocation and adaptive research trials in Tamil Nadu. A mean yield of 1243 kg/ha was recorded by this hybrid while X-4 and KM-2 gave 946 and 869 kg/ha respectively The yield registered by UCH-9 was 31.4 per cent higher than X-4 and 43.0 per cent higher than KM-2. Thus, its stable high yielding potentiality under rainfed and irrigated conditions has been clearly brought out

In its reaction to downy mildew disease. UCH-9 showed a mean resistant score of 1.3 per cent infection as against 2.4 per cent of KM-2 and 2.0 per cent of X-4 under artifical conditions at Coimbatore. The susceptible check had 88.7 per cent. Its resistance to downy mildew disease was also confirmed in the All India trials during 1981. In sick plots of eleven centres, the hybrid showed no incidence in nine centres (Table 2) A mean score of 0.6 per cent was recorded by this hybrid whereas KM-1 (BJ 104) showed 8.1 per cent (Anon. 1982). For ergot disease, none of the genotypes available so far shows complete resistance. The hybrid UCH-9 was equal to KM- 2 in its reaction to this disease Both the hybrids scored 20 per cent infection at Coimbatore under inoculated condition.

Diversification of parital genotypes is an important strategy in present day pearl millet breedin to avoid situations that prevailed during early 1970s when all the cultivad hybrids were devastated by dowy mildew disease. Sequential releaseof hybrids also, is a safe measure to tacle diseases caused by pathogens capable of developing new races quckly. The hybrid now developed has he male-sterile parent, L. IIIA, different from that of KM-1 KM-2 and X-4 vhich is a welcome feature in the preset context when MS.5141A is showing beak down of disease resistance in several localities of Tamil Nadu Both the male and female parents can be sown on the same day in hybrid seed poduction plots since there is synchronous flowering. Because of the profuse pollen producing capacity of the pollinator, number of rows of female parent in the seed productior plot of X-5 can be increased upto six as against the normal of four rovs.

In view of the above lesirable attributes the hybrid UCH-9 has been released as X-5 for general cultivation for Tamil Nadu. The morphological features of UCH-9 along vith its parental genotypes are furnished in table-3.

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TABLE 1 Performance of X 5 (UCH-9) in comparison with X-4 and KM-2

Nature of Trial	Year of testing	Number of traile	Mean grain Yield (Kg/ha) UCH-9	kM-2	X-4
a. Irrigated					
Research Station Trails	1981	7	3076	2025	2792
	1982	5	4078	2002	3373
	Mean		3494	2015	3056
Multilocation Trials	1981	1	2842	2039	2539
	1982	2	3914	3018	3171
	Mean		3556	2691	2961
Adaptive Research Trials	1980	1	2625	2300	2400
	1981	6	1906	1745	2093
	1982	8	3045	2338	2402
	Mean		2561	2098	2278
Mean of irrigated Trials		30	3034	2124	2658
Percentage on KM-2			142.8		
Percentage on X-4			114.2		
b, Rainfed					
Multilocation Trails	1981	3	1415	954	1001
	1982	1	1800	1096	1400
	Mean		1511	990	1101
Adaptive Research Trials	1981	6	897	681	784
	1982	10	1343	933	980
	Mean		1176	839	907
Mean of rainfed Trails		20	1243	869	946
Percentage on KM-2			143 0		
Percentage on X-4			131.4		

TABLE 2 Reaction to Downy mildew-All India (Sick plot condition-1981)

Centre	Downy mildew (Percentage)	
	UCH-9 (X-5)	KM-1 (BJ.104)
Aurangabad	0	0
Coimbatore	0	7.7
Dholi	0	13.4
Durgapura	0	0
Hissar	0	-
(ICRISAT)	0	12.0
Jamnagar	0	0
Jodhpur	0	0
Ludhiana	0.8	-
Pune	0	38.4
Gwalior	5.8	1.0
Mean	0.6	8.1

TABLE 3 Morphological description of X-5 and its parents

	L.IIIA	PT 1921	X-5
i) Origin	: A line from Ludhiana having the Tifton cytoplasm	Africa	L.IIIA X PT 1921
ii) Plant height	; 100-110 cm.	160-175 cm	170-180 cm
iii) Days to flower	. 50-55 days	45-50 days	45-50 days
iv) Days to maturity	: 95-100 days	90-95 days	90-95 days
v) Tiller number	. 4-5	3-5	4-6
vi) Ear length	. 30-35 cm	25-30 cm	30-35 cm
vii) Earth girth	; 2.0-2.2 cm	3.0-3.5 cm	2.0-2.5 cm
viii) 1000 grain weight (gm)	: 8 0-8 5	9.0 -10.0	8.5-9 0
ix) Distinguishing characters	: Leaves and leaf sheath light green, white midrip, cylindrical earhead with blunt tip. Anther colour yellow when fresh.	Bold grains, leaf and sheath sparsely hairy, leaves yellowish green, panicle spindle shaped, compact with good seed set another colour light to deep yellow when fresh grains light grey colour.	Tall hybrid with moderately thick stem and dark green leaves. Purple at nodes having long compact panicles, with thick seed set and bold grains