

## Development of Disease Resistant Pearl Millet (*Pennisetum typhoides*) (Burm. f) Stapf and (C.E. Hubb)

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In an attempt to breed high yielding and disease resistance cumbu variety, twenty five genotypes were screened for downy mildew resistance and crossed with T 23 D<sub>2</sub>A (a highly susceptible male sterile line). The F<sub>1</sub>s were assessed for yield and resistance to the disease. Among the cross combination involving a Nigerian type MS 7625 with T 23 D<sub>2</sub>A was found to combine resistance to downy mildew with high yield. A bulk population was derived from MS 7625 through limited inbreeding and subsequent increase through pan mixis. The resultant bulk was (UCVI) was tested in district trial. Based on the high yield with resistance to downy mildew as well as an escape mechanism for ergot incidence the UCVI was released as CO. 6 cumbu variety for large scale cultivation.

A new turn in the breeding of this millet in the recent past resulted in the release of several hybrids. But these hybrids became susceptible to the incurable disease like downy mildew and ergot. No sure chemical control is at present available for these diseases. Investigations were therefore taken up at Tamil Nadu Agricultural University to develop pearl millet varieties which could withstand such diseases.

### MATERIALS AND METHODS

The available gene pool consisting of 2116 genotypes at various stages of inbreeding was screened for field resistance to downy mildew. The genotypes which exhibited field resistance to downy mildew continuously for a period of three years were crossed with T23 D<sub>2</sub>A, the highly susceptible stand-

ard male sterile line. Based upon the field resistance in F<sub>1</sub> hybrids, inferences were made on the resistance mechanism of the male parents. Superior lines possessing resistance as well as combining ability based upon the performance of their hybrids with T23 D<sub>2</sub>A as well as other lines of interest were subjected to a direct yield test. The best lines from this test were initially subject to limited inbreeding and subsequently increased through panmixis in isolation taking advantage of the protogynous floral mechanism. Selections through female choice was applied for medium height (160 to 180 cm), fair tillering (4 to 5 tillers) medium long panicles (25 to 30 cm), medium duration (90 to 95 days), bold grains (8 to 10 g per 1000 seeds), resistance to downy mildew and high pollen production. The resultant bulk population

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after random mating for three seasons was tested for yield and for occurrence of disease.

## RESULTS AND DISCUSSION

Scoring of 1350 genotypes for field resistance to downy mildew during four different seasons revealed that 36 genotypes consistently showed resistance to downy mildew. Twentyfive of these were crossed with Tift 23D<sub>2</sub>A and tested for yield and for incidence of downy mildew. It could be inferred from the test of these F<sub>1</sub> hybrids that eighteen genotypes might possess dominant genes for resistance to downy mildew. The cross combination involving a Nigerian type MS 7625

TABLE I. Performance of MS 7625 in the initial trial (1974)

Varieties tested	Yield Kg/ha	Downy mildew incidence (%)
MS. 7625	2148	1.4
D. 4	1820	0
B. 55	1815	0.6
PT. 866/2	1778	2.3
MS. 7373	1770	4.4
D. 4.5	1440	14.1
PT. 956	1190	6.8
PT. 934	1060	0
IP. 525	800	0.4
H. B. 3 (check)	3096	96.1
SE	.214	
CD	638	

with T23D<sub>2</sub>A was found to combine high resistance to downy mildew with high yield. The type MS 7625 was compared with eight other genotypes for grain yield. The tests revealed the superiority of MS 7625 in grain yield,

to all the genotypes except HB<sub>3</sub> check. It also showed high field resistance to downy mildew (Table I).

A bulk population was derived from MS 7625 through limited inbreeding and subsequent increase through panmixis. Selection pressure was applied on this population with special reference to yield components and resistance to downy mildew. The resultant bulk was designated as UCV-1 (University Cumbu Variety-1). This was tested under yield trials and the results are presented in Table II. The occu-

TABLE II. Yield performance of the population UCV-1.

Year	UCV-1	Standards	
		HB. 3	BJ. 104
1975-76	Trial 1	1203	822
1975-77	Trial 1	2560	1723
	Trial 2	3038	— 1888
	Trial 3	2846	— 2850
	Trial 4	2740	— 1489
	Trial 5	2528	— 2148
	Trial 6	3504	— 1763
	Trial 7	2560	— —

rence of downy mildew in this bulk during various seasons both under field as well as under artificially infected conditions is presented in Table III. The results amply testify the superiority of UCV-1 even to standard hybrids such as BJ.104 and PHB.14 and some of the already acclaimed varieties like PSB.3 (Punjab) and Vijay Composite (Andhra Pradesh) in some of the trials. The distinct improvement in the grain yield potential of UCV-1 over that observed in the initial trial of the nine genotypes (Table I) can be attributed to

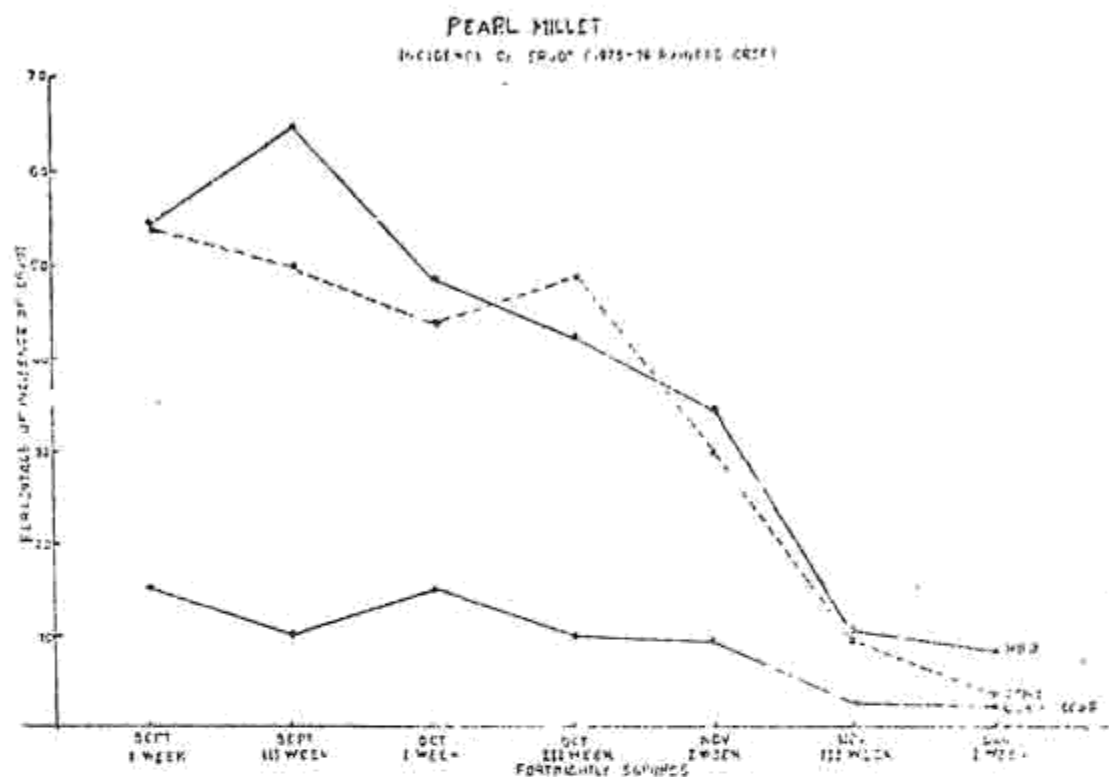


Fig. 1.

TABLE III. Comparative incidence of downy mildew in UCV. 1, HB. 3 and T. 23D<sub>2</sub>B

Year	Percentage of incidence of downy mildew		
	UCV. 1	HB. 3	T.23D <sub>2</sub> B
1973-74	1.5	53.0	100
1974-75	Nil	61.9	100
1975-76	0.1	75.0	100
1975-76 (Sick plot)	0.2	50.0	100
1976-77 (Sick plot)	0.7	—	100
1976-77 (Trials)	Nil	—	100

the rejuvenation of the limited inbreeding depression through subsequent panmixis. In addition to the reasonably high yield, UCV.1 seldom recorded plants affected with downy mildew resulting in green ear (Table III).

A fortnightly sowing trial was conducted to assess the relative incidence

of ergot in UCV-1 and the results are illustrated in Fig.1. It is noteworthy from the results that the incidence of ergot was uniformly low in UCV-1 as compared to the hybrid which produced scanty pollen and showed very high incidence (65%) of ergot in certain seasons. As none of the inbreds in the world collections have so far been observed to be resistant to artificial infection by ergot, the low incidence in UCV.1 was inferred to be due to its high pollen productivity.

Based on the high yield with resistance to downy mildew and an escape mechanism avoiding ergot incidence, UCV-1 was released as a variety for general cultivation in the name of CO.6 cumbu. Being a variety, the problem of annual renewal of seeds by the farmers is not also necessary.