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INHERITANCE OF GRAIN SIZE IN PEARL MILLET

BALZOR SINGH AND O. P. GOVILA

Division of Genetics
Indian Agricultural Research Institute
New Delhi 110012

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ABSTRACT

In a diallel analysis of crosses involving diverse parents for 1000-grain weight, it has been observed that bold grain showed dominant genes with positive additive effect. Inbred K-560-230-23 has been found to be a suitable parent for improvement of grain size. Highest yield was obtained from the cross K-560-230-23 × J104 involving inbred lines with bold grain. Thousand-grain weight has high positive correlation with yield. Development of male sterile lines with bold grain is suggested to improve the yielding ability of hybrids.

Key words: *Pennisetum americanum*, pearl millet, inheritance, grain size.

In pearl millet (*Pennisetum americanum*) (L.) K. Schum) breeding programmes, a lot of emphasis is being given to incorporate bold grain in the hybrids and parent lines with a view to improve yield. In the past, some authors [1, 2] studied the inheritance of grain size and reported different types of gene action. However, studies involving very bold grain with diverse parents were lacking. The present investigation has been undertaken to understand the inheritance of 1000-grain weight and its relationship with yield.

MATERIALS AND METHODS

The materials used in the present investigation comprised six inbred lines, K-560-230-23, M-46, J-104, 5141-B, 5054-B and 3383-B, having diverse grain size. Diallel crosses among these lines were attempted in 1983. The 6 parents and 15 F_1 were sown in 1984 in three replications. Observations were recorded on 10 randomly selected plants for 1000-grain weight and yield per plant. Statistical analysis was carried out following Eberhart and Gardner [3].

RESULTS AND DISCUSSION

Significant mean squares for parents, hybrids and parents hybrid components in the analysis of variance (Table 1) showed that significant differences existed between hybrids and parents, and among hybrids themselves for 1000-grain weight.

Mean squares due to gca were significant and due to sca nonsignificant. Thus, additive genetic variance was predominant for grain size.

Table 1. ANOVA for 1000-grain weight of parents and crosses in pearl millet

Source	d.f.	MS
Replications	2	0.00
Treatments	20	7.18*
Parents	5	10.39*
Hybrids	14	6.14*
Parents vs hybrids	1	5.68*
gca	5	4.65*
sca	15	1.64
Error	40	0.0097

*Significant at 5% level.

Among the parents, K-560-230-23 and J-104 showed high mean values (Table 2). Only three parents showed significant positive effect while the other three showed significant negative values. Similarly, variety effect was positive only for K-560-230-23 and J-104. These two parents also exhibited maximum average midparent values. It can be inferred that these parents carry dominant genes with positive additive effects. Thus, K-560-230-23 and J-104 are desirable inbreds for improvement of 1000-grain weight.

Table 2. Mean gca V(I) and average midparental (MP) values for 1000-grain weight (g) of parent lines

Parent	Mean	gca	V(I)	Average MP values
K-560-230-23	9.5	0.812*	20.00	41.46
M-46	6.3	0.116*	−9.63	29.61
MS-5141-B	5.6	−0.802*	−13.00	28.26
MS-5054-B	5.5	−0.348*	−13.70	27.98
MS-3383-B	5.0	−0.711*	−16.96	26.69
J-104	8.7	0.969*	33.66	46.77

SE (Gi-Gj) = 0.370; SE G (1) = 0.268

A perusal of Table 3 shows that crosses K-560-230-23 × M-46 and K-560-230-23 × J-104 showed high values for grain weight. It is interesting to note that when small seeded male sterile lines like 5141-B, 5054-B and 3383-B were used as parents, the seed size in F_1 generally remained small. Therefore, all these important male sterile lines do not contribute towards grain size which is an important component of yield. The entire pearl millet hybrid programme in this country is based on MS-5141-A and MS-5054-A. In this study, the highest yield was obtained in cross K-560-230-23 × J-104. None of the parents in this cross are male steriles but both

have large grain size. The two characters, 1000-grain weight and yield, are also positively associated at phenotypic level (r=0.79). Therefore, the female parents commonly used in the pearl millet breeding programme lack in this important yield component. It is suggested that incorporation of bold grain character in the male sterile lines may improve the chances of producing higher yielding hybrids than at present.

Table 3. Mean 1000-grain weight and yield per plant

Cross	1000-grain wt. (g)	Yield per plant (g)
K-560-230-23 × M-46	9.1	60.7
K-560-230-23 × 5141-B	6.1	45.9
K-560-230-23 × 5054-B	7.0	32.4
K-560-230-23 × 3383-B	5.3	35.8
K-560-230-23 × J-104	10.5	90.8
M-46 × 5141-B	7.6	30.6
M-46 × 5054-B	8.2	77.6
M-46 × 3383-B	7.5	61.8
M-46 × J-104	6.5	28.4
5141-B × 5054-B	5.6	29.3
5141-B × 3383-B	5.6	29.5
5141-B × J-104	8.1	64.7
5054-B × 3383-B	8.1	76.5
5054-B × J-104	7.5	35.7
3383-B × J-104	8.4	50.0
CD at 5%	0.22	3.9

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