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VARIABILITY AND CORRELATION STUDIES OF DRY MATTER WITH REFERENCE TO SELECTION CRITERIA IN FOXTAIL MILLET (*Setaria italica*)

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ABSTRACT

Twenty eight genotypes of *tenai* (foxtail millet) (*Setaria italica*) were studied for dry matter production, harvest index and grain yield with other seven characters. High PCV and GCV were obtained for root weight. Low heritability and low genetic advance were observed for grain yield and earhead weight. Medium heritability and medium genetic advance observed for all other characters indicated that these characters may be partially governed by additive genes. Grain yield is having positive association with total dry matter, earhead weight and straw weight but not with harvest index suggesting that harvest index alone will have no value for the improvement of grain yield. Though the grain yield is positively associated with total dry matter and earhead weight, selection for improvement of grain yield either through earhead weight or by direct selection for grain yield will not be of much use since these two traits have low heritability and genetic advance. So, selection through total dry matter production will be appropriate in the present *tenai* materials studied.

Progress in breeding high yielding cereal cultivars seems to be related to higher harvest indices with little change in biological yield (Donald and Hamblin, 1976). But, When *et al.*(1981) opined that selection for improvement of grain yield using harvest index was no more effective than selection for yield directly. A high harvest index for a plant community does not *per se* indicate a high grain yield per unit area. So, an attempt was made to study harvest index and dry matter production in releation to yield in *tenai*.

MATERIALS AND METHODS

An experiment was conducted with twenty eight genotypes of *tenai* (foxtail millet) *Setaria italica* Beauv chosen from the gene pool maintained at the Millet Breeding Station, School of Genetics, Tamil Nadu Agricultural University, Coimbatore during summer, 1984. They were raised in randomized block design with three replications. The plot size was 3m X 1.8m with a spacing of 22.5cm between the rows. The plants were thinned to leave 10cm between the plants on tenth day. The observations on the characters, *viz.*, plant height, number of tillers, days to 50 per cent bloom, days to maturity, total dry matter, earhead weight, straw weight, root weight and grain yield were made on ramdomly selected five plants in each plot. Harvest index was calculated as percentage of grain yield to the total dry matter. Mean values were subjected to statistical analysis (Panse and Sukhatme, 1961) and the significance tests were carried out for the F values (Goulden, 1952). Phenotypic coefficient of variability (PCV) and genotypic coefficient of variability (GCV) were computed by following method of Goulden (1952). Heritability estimates (Lush, 1940) genetic advance (Johnson *et al.*, 1955) and correlation coefficients (Miller *et al.*, 1958) were computed.

RESULTS AND DISCUSSIONS

The genetic parameters and correlation coefficients are presented in tables 1 and 2 respectively. The analysis of variance was significant for all the characters studied. PCV ranged from 16.53 for plant height to 76.45 for root weight whereas GCV ranged from 5.41 for earhead weight to 35.66 for root weight. Highest heritability was obtained for days to 50 per cent bloom (33.14) followed by days to maturity, number of tillers and plant height. Except for grain yield and earhead weight which showed lowest genetic advance (5.08 and 2.01) other characters may be controlled by additive genes yield partially (Panse, 1957). Association analysis revealed that grain yield is positively correlated with total drymatter and earhead weight but not with any other characters including harvest index. Total drymatter and straw weight were positively correlated with root weight and plant height. The plants with well establised root system grows taller with increased total drymatter through straw weight. Harvest index is

Table 1. Genetic parameters in *tenai*

Character	Phenotypic range	Mean	PCV	GCV	Heritability %	Genetic advance as % of Mean
Grain yield	2.22 - 10.94	5.43	35.29	9.31	7.00	5.08
Total drymatter production	6.17 - 33.72	21.31	44.18	22.57	26.10	23.57
Earhead weight	4.11 - 13.50	7.11	29.84	5.41	3.28	2.01
Straw weight	2.77 - 8.89	4.95	41.15	21.78	26.50	22.47
Root weight	1.39 - 10.56	3.75	76.45	35.66	21.76	34.27
Harvest Index	7.36 - 50.58	26.48	40.87	19.95	23.83	20.05
Plant height	75 - 132	108.67	16.53	9.10	30.29	10.32
Number of tillers	3 - 15	5.08	39.47	22.27	32.00	26.02
Days to 50% bloom	43 - 75	61.82	29.00	16.73	36.74	19.84
Days to maturity	74 - 98	86.76	18.28	10.41	32.45	12.22

PCV : Phenotypic co-efficient of variability

GCV : Genotypic co-efficient of variability

Table 2. Correlation coefficients in *tenai*

Character	Total dry matter	Earhead weight	Straw weight	Root weight	Harvest Index	Plant height	Numbers of tillers	Days to 50% bloom	Days to maturity
Grain yield	0.4962**	0.9469**	0.3290	0.0315	0.2122	0.1363	0.2707	0.598	0.429
Total drymatter production		0.5949**	0.0254	0.6044**	0.6750**	0.6224**	0.0640	0.2414	0.2489
Earhead weight			0.5013**	0.1293	0.0553	0.1455	0.3433	0.1554	0.1156
Straw weight				0.6295**	0.5541**	0.5839**	0.1148	0.1428	0.0240
Root weight					0.6085**	0.3809**	0.2017	0.0539	0.0799
Harvest Index						0.4877**	0.2161	0.1973	0.2747
Plant height							0.2143	0.2137	0.2001
Number of tillers								0.2487	0.2001
Days to 50% bloom									0.9765**

** = Significant at 1% level.

positively correlated with plant height and negatively with total drymatter, straw weight and root weight. Singh and Stoskopf (1971) also reported negative association of harvest index with stem weight in cereals. Rosielle and Frey (1975) observed negative correlation between harvest index and total dry matter. As grain yield is not significantly correlated with harvest index, improvement for grain yield through harvest index will not be of any use in the present materials studied. In the present material, improvement of yield could be achieved through the positively associated characters like earhead weight and total dry matter. Though earhead weight is associated with yield, this has the disadvantage of having low heritability and low genetic advance. So, for the improvement of grain yield we can depend on total drymatter production which is not influenced much by environment rather than direct selection for grain yeild which has low heritability and genetic advance and high influence of environment.

REFERENCES

DONALD,C.M. and HAMBLIN,J. (1976). The biological yield and harvest index of cereals as agronomic and plant breeding criteria, **Adv. Agron., 28**: 361-405

GOULDEN, C.H. (1952). **Methods of Statistical Analysis.** John Wiley and sons, Inc., New York.

JOHNSON, H.W., ROBINSON, H.F. and COMSTOCK, R.E. (1955). Variability in soybeans. **Agron.J., 47**, 314-318

LUSH,J.C (1940) Intrasive correlation of off spring on dams as a method of estimating heritability of characters. **Proc.Amer.Soc. Animal Prod., 33**: 293-301

MILLER, P.A., WILLIAM,J.C., ROBINSON,H.F. and COMSTOCK, R.E. (1958). Estimates of genotypic and environment variances and co- variances in upland cotton and their implication in selection. **Agron J., 50** 126-131

PANSE, V.G. (1957). Genetics of quantitative characters in relation to plant breeding. **Indian J. Genet.Pl.Breed., 17**: 318-28

PANSE. V.G. and SUKHATME, P.V. (1961). **Statistical Methods for Agricultural Workers.** Indian Council of Agricultural Research, New Delhi.

2107

ROSIELLE,A.A. and FREY, K.J. (1975). Estimates of selection parameters associated with harvest index in root lines derived from a bulk population. *Euphytica* 24: 121 -131

SINGH,I.D. and STOSKOPF N.C. (1971). Harvest index in cereals. **Agron.J., 63** : 224-226

WHAN,B.R., RATHIJEN, A.J. and KNIGHT,R. (1981). The relation between wheat lines derived from the F2, and F3 generation for grain yield and harvest index. **Euphytica** 30: 419-43

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GENETICS OF RATOONING ABILITY IN RICE *Oryza sativa*

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ABSTRACT

A 6 x 6 diallel analysis involving six rice genotypes *viz., Bhavani,* MDU 3, IET 6262, IET 6709, IET 7552 and IET 9239 showed both general and specific combining ability variances significant for all the characters including ratooning ability. GCA variances were higher than SCA variances for all the traits and indicated the predominance of additive gene action. The parents IET 6709, IET 7552 and *Bhavani* possessed favourable genes for most of the traits and may be combined through recombination breeding to realize high ratoon yield as seen from high mean and significant *gca* effects. The hybrids *Bhavani*/IET 6262, *Bhavani*/IET 6709,IET 6709/IET 7552 and IET 6262/IET 6709 possessed high *per se* performance and *sca* effects for the traits regenerated tiller number, productive tiller number per plant besides ratoon yield and may be exploited in heterosis breeding.

The ability of a rice genotype to ratoon and regenerate new and more productive tillers is a compansatory mechanism to enhance rice productivity. Ratooning capacity is highly varied among the rice genotypes as it is mostly influenced by the gentic factors (Mahadevappa, 1979) for which the rice cultivars are to be evaluated for their combining ability. This assessment will help in proper choice of parents with high ratooning ability besides understanding the genetic architecture on ratooning mechanism in rice. With this view, an experiment was conducted to generate information on genetics of ratooning in rice.

MATERIALS AND METHODS

Six rice genotypes *viz., Bhavani*, MDU 3, IET 6262, IET 6709, IET 7552 and IET 9239 and their 30 hybrids obtained through 6x6 diallel fashion were the materials under study. All the parents and hybrids were raised at the Agricultural College and Research Institute, Madurai, during October, 1988. Thirty day old seedlings were transplanted with 20 x 10 cm spacing in randomised block design, replicated three times. Each entry was represented by two rows of 10 plants. At maturity, the plant crop was harvested 20 cm above the ground level. Ten plants in parents and five plants in hybrids were randomly selected per treatment per replication and observed for the following characters *viz.,* regenerated tiller number per plant,days to 50 per cent flowering. productive tiller per plant. plant height, panicle length, grain number per panicle, 100 grain weight and grain yield per plant. The general and specific combining ability and reciprocal effects were estimated by method I and model I of Griffing (1956).

RESULTS AND DISCUSSION

The analysis of variance for combining ability revealed that the variances due to general combining ability (GCA), specific combining ability (SCA) and reciprocal effects were significant for all the characters (Table 1). The estimates of GCA mean square were higher than the SCA mean square and ratio of GCA/SCA was more than unity for all the characters studied indicating the preponderance of additive gene action. Hence all the traits under study may be improved by selection through pedigree method of breeding. Ichii and Takayari (1988) reported significant additive as well as non- additive variances for percentage of ratoon tillers and height of ratoon plant.

The success of a breeding programme depends on choice of good parents and the potentiality of the parents are judged by their *per se* performance