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ASSOCIATION ANALYSIS IN PROSO MILLET (PANICUM MILIACEUM L.)

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Phenotypic, genotypic and environmental Correlations and path coefficients were worked out in 50 genotypes of proso millet. Grain yield was positively and strongly correlated with plant height, straw yield and rachis number had positive direct effects on yield indicating that selection for the improvement of grain yield can be efficient if it is based on these characters. Plant height had a negative direct effect on grain yield.

Proso millet (*Panicum miliaceum* L.) a short duration cereal grown in India, Japan China, South Eastern Russia and in parts of Middle East holds promise for increasing grain production on the moisture limited high plains and in providing developing countries with a more dependable protein supply for human consumption. The importance of breeding for high grain yield in this crop is only recently realised in India although much strides had been made in western countries, particularly in Russia. A knowledge of the association of yield and its components in this crop will be of great help to breeders in evolving potentially high yielding genotypes.

MATERIALS AND METHODS

The experiment was conducted during Kharif 1977 at the Millets Breeding Station, Agricultural College and Research Institute, Coimbatore. Fifty genotypes of diverse geographic origin in proso millet were selected from the germplasm bank maintained at the Millets Breeding Station. The genotypes were studied in a randomised block design replicated thrice. Each genotype was sown in a ridge of 2 7m length. The spacing adopted was 40×15cm. Five plants were selected at random for each type in each replication and observations on days to 50% bloom, plant height number of panicles, length of primary panicle, weight of primary panicle, number of primary rachis in the primary panicle, 100 grain weight, straw yield and grain yield were recorded.

The mean values of five plants for each type in each replication were subjected to statistical analysis of variance. The phenotypic, genotypic and environmental correlation coefficients were worked out. Path

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coefficient analysis as applied by Dewey and Lu (1959) was used to partition the genotypic correlation coefficients into direct and indirect effects.

RESULTS AND DISCUSSION

The variances due to types for all the traits studied were significant at one per cent level. The phenotypic, genotypic and environmental correlation coefficients between grain yield and its eight components are furnished in Table 1.

The genotypic correlation coefficients were, in general, higher than the corresponding phenotypic correlation coefficients. This is in agreement with the earlier reports by Mahudeswaran and Murugesan (1973) in ragi and Singh *et al.* (1980) in rice. This emphasises the point that inspite of strong inherent association between various character pairs studied, the environment may modify the full expression of the genotypes (Nandpuri *et al.*, 1973). The genotypic correlation coefficients showed that grain yield was positively correlated with all the eight characters, the magnitudes of correlation coefficients being very high for plant hight (0 9669), straw yield (0.9375) and rachis number (0.9664). The inter-correlations between these attributes were also positive and high The possibility of effecting simultaneous improvement in these characters is thus apparent. Natarajan *et al.* (1978) in proso millet also recorded a positive association between plant height and grain yield. In little millet, Abinash Yadav and Srivastava (1976) reported positive association between straw yield and grain yield. This is in agreement with the findings of Verma and Singh (1971) in barnyard millet where also (positive association between number of branches in the main ear and grain yield was reported.

In the present investigation, none of the characters examined showed negative relationship with grain yield. But panicle weight, panicle number exhibited a negative significant correlation (-o.2791). According to Adams (1967), such negative correlations could arise primarily from developmentally induced relationship such as two developing components competing for limited nutrient and water supply. when two characters show negative phenotypic and genotypic correlations between them it would be difficult to exercise simultaneous selection of these characters in development of a variety (Newell and Eberhart 1961) As days to half bloom and plant height are positively correlated with grain yield, it preaupposes that if selection is made for higher grain yield the population would become tall and late. The environmental correlation of grain yield with panicle number (0. 7977) and straw yield (0.6827, were positive and high. Such associations imply that the environment favourable for one character is also favourable for the other.

The genotypic correlation coefficients were apportioned into direct and indirect effects by path analysis and are presented in Table II. The low residual effect signifies that the characters chosen are appropriate. The present investigation singled out straw. yield as the most important one because of its highest positive direct effect (1 6025) on grain yield Besides the indirect effect of straw yield via other characters was also positive and high. such positive direct effect of dry plant weight on grain yield was also deduced in rice (Vijayan, 1971 Nageshs 1976) and wheat (Sindhu *et al.*, 1976) Besides straw yield, panicle length and rachis number also registered positive direct effects (0.6428 and 0 5110 respectively) on grain yield. This is in accordance with the findings in *little* millet (Abinash Yadav, 1976) and rice (Swamy Rao and Goud, 1971) where also positive direct of panicle length on grain yield existed.

Plant height exhibited a very high positive correlation with grain yield It also showed positive interrelationships with other characters. However it had a negative direct influence (-1 3075) on yield. From the above it is evident that selection for the improvement of grain yield in Proso millet can be efficient if it is based on straw yield. panicle length and rachis number. The importance of straw yield was also indicated by Mahadevappa and Ponnaiya (1963) in ragi while formulating selection index. Pearson and Buckolt (1973) also proposed a selection procedure based on rachis number in sorghum. In a standing crop of proso millet panicle length can advantageously be used as a criterion for selection, since this character is easier to evaluate than the other two.

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REFERENCES

ABINASH YADAV AND D.P. SRIVASTAVA: 1976. Path analysis in *Panicum miliare* *Indian J Genet.*, *36*; 64-68.

ADAMS, N.W. 1967. Basis of Compensation in crop plants with special reference to the field bean, *Phaseolus vulgaris crop Sci.*, 7: 505-10.

DEWEY, O.R. and K H L.U, 1959. A correlation and path analysis of components of crested wheat grass seed production. Agron. J . 57. 515-16.

MAHADEVAPPA, M and B.W.X. PONNAIYAN 1963. Investigations on the formulation of selection index for yield *Madras agric. J.* *50* : 84-85.

MAHUDESWARAN. K. and M. MURUGESAN 1973. Correlation and path analysis in *Eleusine Coaoana* Gaertn. *Madras agric. J. 60*. 1287-91.

NAGESHA. K. 1976. Biometrical studies in short duration types of rice (*Oryza Sativa L.*) M.Sc (Ag) thesis, Tamilnadu Agrl. University, Coimbatore.

NANDPURI, K.S., SURIAN SINGH and TARSEM LAL 1973. Studies on the genetic variability and correlation of economic characters. In tomato, *J Res PAU 10* ; 316-21.

NATARAJAN. U.S., T.S. RAVINDRAN and R. APPADURAI. 1978. A path coefficient analysis of yield and yield components in proso millet (*Panicum miliaceum* Linn.) *Madras agric. J.*, *65* ; 430-34.

NEWELL. L.C. and S.A. EBERHART. 1961. Clone and progeny evaluation in the improvement of witch grass, *Panicum viratum L.* Crop Sci. 7 ; 117-21.

PEARSON, J.D. and A.J. BUCKOLT. 1973. Effectiveness of phenotypic selection based upon selected components of yield in grain *sorghum bicolor* (L) Moench. Agron. Abst.. (1973) p. 12.

SINDHU, C.S., K. S. GILL, and B. S GAAT, 1976 Correlation and path analysis in wheat (*Triticum so stivum* L). J. Res., PAU. 13, 235—34.

SINGH, R.P.. D. D. PANDEY and J. N. PAI, 1980 Genetic variability and correlation studies in rice (*oryza sativa* L.) Madras agric. J 67: 682-86.

SWAMY, RAO T and J.V. GOUD. 1971. Recent trends in rice breeding in Mysore state. V path analysis of yield components. *Z pflanzenzucht* 65: 203-05.

VERMA, G. and K. P SINGH. 1971. Selection based on multiple character in barnyard millet (*Echinochloa crus-galli (L)* Beauv.) Indian J agric-sci, 41. 762-67.

VIJAYAN, P.K. 1971. Biometrical studies of yield components in rice (*Oryza sativa L.*) varieties hybrids and their derivatves. Ph.D Thesis Univ. Madras

Table 2. Path analysis showing the direct and indirect effects of eight characters on grain yield in proso milte

characters	Days to half bloom	plant height	panicle number	panicle length	Panicle weight	Rachis number	Grain weight	Straw yield	rg with grain yield
Days to half bloom	—*0.3665*	—0.6792	—0 0518	0.2385	0.0155	0.2448	0.0374	1 0440	0 4817**
Plant height	—0.1904	—*1.3075*	—0 0333	0.5930	—0.0720	0 4362	0.0297	1.5113	0.9669**
Panicle number	—0.2864	—0.6454	—*0.0675*	0.2374	0.0335	0.1957	0.0433	1 0706	0.5811**
Panicle length	—0 1360	—1.2062	—0.0249	*0.6428*	—0.0736	0.3738	0.0080	1.1014	0 6850**
Panicle weight	0.0472	—0.7838	0.0188	0 3936	—*0 1201*	0 3356	—0 0128	0 6658	0 5443**
Rachis number	—0.1756	—1 1161	—0.0259	0.4699	—0.0789	*0.5110*	0.0 00	1.3119	0.9064**
Grain weight	—0.1493	—0.4230	—0.0319	0 0558	0.0167	0.0556	*0 0917*	0.7293	0 3448*
Straw yield	—0.2387	—1.2331	—0.0451	0 4418	—0 0499	0.4184	0.0417	*1.6025*	0.9374**

Residual effect : 0.3286
Underlined figures' denote direct effects

*, ** : Significant at 5 and 1% levels of probability respectively

Table 1. Phenotypic (rp), genotypic (rg) and environmental (re) Correlation coefficients between different pairs of characters in proso millet

		Plant hight	Panicle number	Panicle length	Panicle weight	Rachis number	Grain weight	Straw yield	Grain yield
Days to half bloom	rp	0.4492**	0.6310**	0.3064*	—0 — 0388	0.3922**	0.3331*	0.5059**	0.3304*
	rg	0.5195**	0.7816**	0.3711**	—0.1287	0.4791**	0.4073**	0.6516**	0.4817**
	re	0 2222	— 0.0726	0.1595	0.4099**	0.0599	0.0270	0.1949	0.0207
Plant height	rp		0 4067**	0 8314**	0.5512**	0 6825**	0.2258	0.7136**	0.6895**
	rg		0.4936**	0.9225**	0.5995**	0 8536**	0.3235*	0.9431**	0.9669**
	re		0 2587	0.6652**	0.4139**	0 2368	—0.0430	0.3167*	0 2586
Panicle number	rp			0.2899*	—0.1917	0.3094*	0.3105*	0 6806**	0.6764**
	rg			0.3693**	—0.2791*	0.3829**	0.4722**	0 6681**	0.5811**
	re			0.1728	—0.0011	0.1742	—0.0101	0.6975**	0.7977**
Panicle length	rp				0.5559**	0.6309**	0.0660	0.4997**	0.5195**
	rg				0 6124**	0.7310**	0.0868	0.6873**	0.6850**
	re				0.4589**	0.4364**	0.0220	0 2237	0.3001*
Panicle weight	rp					0.5738**	—0.1094	0 3220*	0 3912**
	rg					0 6567**	- 0.1392	0 4165**	0.5443**
	re					0.2915*	0.0007	0.1323	0.1183
Rachis number	rp						0 0940	0 6166**	0.6343**
	rg						0 1086	0 8187**	0.9064**
	re						0 0498	0.1448	0.1849
Grain weight	rp							0.3096*	0.2551
	rg							0.4551**	0.3449*
	re							0 0192	0.1052
Straw yield	rp								0.8235**
	rg								0.9375**
	re								0.8827**

* **: Significant at 5 and 1% levels of probability respectively.