

Short Communication

Path Analysis for Harvest Index in Proso Millet (*Panicum miliaceum* L.)

B.R.S. Baghel, S.R. Maloo and B. Vaid

Department of Plant Breeding & Genetics, Rajasthan College of Agriculture,
Udaipur 313 001, India

Harvest index is the ratio of economic yield to biological yield. Donald and Hamblin (1976) concluded that grain yield is proportional to harvest index (HI). Though, HI and grain yield are positively correlated, HI may have a real predictive value only in certain situations. Studies of Rosiella and Frey (1975) suggested that selection for yield through higher HI (despite its lower efficiency) would contribute usefully to high yield and the lines selected on the basis of HI may be agronomically superior to those selected on the basis of grain yield. Choice of parents with high HI values, even with low biological and/or economic yield has been suggested by Donald and Hamblin (1976) as it is possible to combine a high biological yield with a high HI. Hence, HI deserves a full assessment as a potential criterion for the choice of parents. Additionally, parents for hybridization can be selected on the basis of the potential complementarity of physiological components in order to isolate superior segregants.

Proso millet (*Panicum miliaceum* L.) is an important small millet grown in India under dry land, marginal and hilly ecological situations by poor farmers for both grain and fodder purposes. Owing to its minor area, very limited and inconclusive studies

have been made on HI to assess it as a selection criterion for yield improvement. Thus, the present study was aimed to analyze direct and indirect effects of various attributes to HI in relation to the improvement of grain yield in proso millet genotypes.

The experimental material for the present study consisted of 34 diverse varieties and strains of proso millet that were sown in randomized block design with three replications at two locations at Udaipur during the rainy season 1998. These two locations were designated as environment E₁ (Instructional Farm with clay loam soil with a pH 8.02 and 398.8 mm annual rainfall), and environment E₂ (Jang-Ki-Bari Farm with sandy clay loam soil with a pH 7.8 and 320.1 mm annual rainfall) at Udaipur. Each genotype was sown in 3 m long single row at 22.5 cm spacing between rows and 10.0 cm between plants within row in both the environments. Recommended and uniform agronomical practices as well as plant protection measures were adopted. Observations were recorded on 10 random plants for each genotype in each environment for HI and its contributory traits (Table 1). The mean values obtained were statistically analyzed for path coefficient analysis following the

Table 1. Path coefficient analysis for HI in proso millet, pooled over two environments*

Characters	Days to maturity	Plant height	Tillers/plant	Main panicle length	Primaries/panicle	Main panicle weight	1000-grain weight	Dry fodder yield/plant	Grain yield/plant	r
Days to maturity	0.07	-0.02	-0.14	-0.13	0.04	-0.08	0.33	-0.19	0.94	0.82**
Plant height	0.05	-0.03	-0.15	-0.13	0.03	-0.09	0.32	-0.21	0.99	0.79**
Tillers/plant	0.06	-0.02	-0.18	-0.14	0.04	-0.09	0.35	-0.25	1.07	0.84**
Main panicle length	0.06	-0.02	-0.16	-0.15	0.05	-0.09	0.35	-0.21	1.15	0.98**
Primaries/panicle	0.05	-0.02	-0.13	-0.14	0.05	-0.07	0.28	-0.21	0.85	0.67**
Main panicle weight	0.05	-0.02	-0.16	-0.13	0.03	-0.10	0.34	-0.19	1.07	0.89**
1000-grain weight	0.06	-0.02	-0.17	-0.14	0.04	-0.09	0.37	-0.22	1.09	0.92**
Dry fodder yield/plant	0.03	-0.01	-0.10	-0.07	0.02	-0.04	0.17	-0.46	0.58	0.13
Grain yield/plant	0.06	-0.02	-0.17	-0.15	0.04	-0.10	0.36	-0.24	1.13	0.91**

* Diagonal values indicate direct effect and non diagonal values represent indirect effect

** Significant at 1% level of significance, Residual effect: 0.10.

method given by Dewey and Lu (1959) for pooled data.

Analysis of variance revealed significant differences among the genotypes for all the characters studied which indicated presence of sufficient variation in the experimental material used in the present study. Correlation analysis revealed a close agreement between genotypic and phenotypic correlations indicating that the environmental influences were not significant. Genotypic correlations were of higher magnitude than their corresponding phenotypic correlations as also reported by Manoharan and Sivasubramaniam (1984).

HI showed significant and positive correlation with all the characters except dry fodder yield per plant. Significant correlation coefficients indicated that selection for these traits will improve the HI in proso millet. Mutual correlations among different characters like days to maturity, plant height, tillers per plant, main panicle weight, 1000-seed weight and grain yield per plant were also significant and positive which suggested simultaneous selection for all these traits would result in genetic improvement of HI.

Path analysis for HI in pooled analysis over environments showed that (Table 1)

maximum positive direct effect on HI was exhibited by grain yield followed by 1000-grain weight. Since these two parameters are major determinants of HI and are easy to measure, they will serve as selection criteria in isolating superior genotypes even in early segregating generations. Choudhary and Godawat (1994) and Chidambaram and Palanisamy (1995) also reported these traits as main components for HI.

Positive but low magnitude of direct effects of days to maturity and primaries per panicle were also recorded towards HI which indicated their being less important for effective selection. The grain yield per plant and 1000-grain weight exhibited significant positive correlations with HI because of indirect contribution and also due to characters like days to maturity, plant height, tillers per plant, main panicle length, primaries per panicle, main panicle weight and dry fodder yield per plant. Low magnitude of residual effect indicated that the traits included in the study explained approximately 90% of the variation in HI.

Hence, path analysis studies for HI based on pooled analysis revealed that grain yield, followed by 1000-grain weight, days to maturity and primaries per panicle contributed to HI directly as well as

indirectly through one another. These traits also showed strong positive significant genotypic correlations with HI and mutual correlations with each other. Therefore, due emphasis should be given for direct as well as indirect selection for these traits while breeding for high HI in proso millet.

References

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