

PATH COEFFICIENT ANALYSIS IN PEARL MILLET

V. K. MANGA, B. S. GUPTA AND M. B. L. SAXENA

Central Arid Zone Research Institute, Jodhpur-342 003

ABSTRACT

Path coefficient and variability studies in thirty genotypes of pearl millet revealed high values of phenotypic and genotypic coefficients of variation and genetic advance for grain yield/plant. There was positive association of grain yield/plant with plant height, tillers/plant and ear weight, and negative association with days to ear emergence. Path analysis revealed direct contribution of tillers/plant and ear weight to grain yield and indirect contribution to grain yield of ear length and girth through ear weight.

INTRODUCTION

Pearl millet, a staple food of western Rajasthan occupies four million hectares of cropped area in the State. Average yield of this cereal is very low i.e. 210-285 kg/ha. To develop high yielding varieties, knowledge about the association of the yield components with grain yield under arid conditions of western Rajasthan is essential. The present investigation was, therefore, conducted to know the association of grain yield with yield components so that selection criteria may be formulated for improving yield of pearl millet under arid conditions.

MATERIAL AND METHODS

Thirty genotypes (including inbreds, hybrids and populations) of the pearl millet were grown in a randomised block design with three replications during *kharij*, 1980 at the Central Arid Zone Research Institute, Jodhpur. Each plot

had two rows of three metre length spaced 50 cm apart. Plant to plant distance was maintained at 15 cm. Observations were recorded on five randomly chosen plants for plant height, tillers/plant, days to first ear emergence, ear length, ear girth, ear weight, 250 grain weight and girth, ear weight, 250 grain weight and plants were used to compute the analysis of variance and covariance following Panse and Sukhatme (1967). The path coefficient analysis was conducted after Dewey and Lu (1959).

RESULTS AND DISCUSSION

Analysis of variance revealed significant variability in the plant material for all the characters studied. Genotypic (GCV) and phenotypic (PCV) coefficients of variation, heritability and genetic advance (Table 1) revealed that characters having high heritability (bs) did not necessarily have high GCV and genetic advance. Ear length, ear girth, plant height and days to first ear emergence

Table 1. Estimates of coefficients of variation, heritability and genetic advance in pearl millet

Characters	Coefficient of variation		Per cent Heritability (bs)	Genetic advance (% of mean)
	Phenotypic	Genotypic		
Plant height (cm)	18.04	13.44	55.50	20.63
Tillers/plant	38.58	21.04	29.74	23.63
Days to first ear emergence	14.31	11.07	59.83	17.63
Ear length (cm)	18.32	15.75	73.91	27.89
Ear girth (cm)	13.02	10.44	64.35	17.49
Ear weight (g)	34.63	19.63	32.15	22.90
250 grain weight (g)	16.12	9.81	37.02	12.05
Grain yield/plant (g)	55.05	29.15	28.04	31.80

showed high heritability (bs), low GCV and low genetic advance except ear length which had high genetic advance. Mukherji *et al.* (1982) also reported high heritability, low GCV and low genetic advance for these traits. High heritability and high genetic advance for ear length was earlier reported by Pokhriyal *et al.* (1967). Other traits viz., tillers/plant, ear weight, 250 grain weight and yield/plant had low values of heritability and low to moderate GCV except yield/plant which showed high PCV as well as GCV. Yield/plant also showed high genetic advance. The results confirm the findings of Mukherji *et al.* (1982) and Gupta and Dhillon (1974).

Grain yield/plant (Table 2) showed high positive correlations (both phenoty-

pic and genotypic) with plant height, tillers/plant, ear weight and 250 grain weight. Narsimha Rao and Damodaram (1964) also reported positive association of plant height and ear weight with yield. Ear length had non-significant correlation with yield/plant. Days to first ear emergence showed significant negative association with yield/plant. Similar results were reported by Pokhriyal *et al.* (1976). Component characters like ear length had positive significant association with plant height while ear weight showed positive significant correlation with ear length, ear girth and plant height. The 250 grain weight had positive association with ear weight only.

Table 2. Phenotypic (r_p) and genotypic (r_g) correlations among different traits in pearl millet

Traits		Tillers/plant	Days to first ear emergence	Ear length	Ear girth	Ear weight	250 grain weight	Grain yield/plant
Plant height	r_p	0.349	-0.320	0.508**	0.034	0.437*	0.170	0.480**
	r_g	0.330	-0.196	0.421	-0.349	0.215	0.041	0.443
Tiller/plant	r_p		0.333	0.101	-0.146	0.100	0.219	0.739**
	r_g		-0.179	-0.169	-0.653	-0.292	0.231	0.710
Days to first ear emergence	r_p			-0.111	-0.073	-0.224	-0.259	-0.375*
	r_g			0.036	0.094	-0.162	-0.324	-0.414
Ear length	r_p				0.103	0.625**	0.179	0.349
	r_g				-0.098	0.641	0.125	0.194
Ear girth	r_p					0.596**	0.145	0.186
	r_g					0.513	-0.062	-0.140
Ear weight	r_p						0.384*	0.609**
	r_g						0.163	0.487
250 grain weight	r_p							0.388**
	r_g							0.287

**, * Significant at $P=0.01$ and 0.05 levels respectively.

Table 3. Direct (underlined) and indirect effects of various traits on grain yield/plant in pearl millet

Traits	Plant height	Tillers/ plant	Days to first ear emergence	Ear length	Ear girth	Ear weight	250 grain weight	Genotypic correlation with grain yield/plant
Plant height	0.0137	0.3119	0.0259	0.0731	-0.0135	0.1812	-0.0036	0.4425
Tillers/plant	0.0045	0.9449	0.0237	0.0293	-0.0252	-0.2467	0.0206	0.7099
Days to first ear emergence	-0.0027	-0.1694	-0.1322	-0.0063	0.0036	-0.1964	0.0289	0.4144
Ear length	0.0257	-0.1593	-0.0048	-0.1738	-0.0038	0.5410	-0.0112	0.1939
Ear girth	-0.0048	-0.6174	-0.0124	0.0170	0.0386	0.4330	0.0055	-0.1404
Ear weight	0.0029	-0.2760	0.0214	-0.1113	0.0198	0.8445	-0.0145	0.2867
250 grain weight	0.0006	0.2184	0.0427	-0.0218	-0.0024	0.1379	-0.0889	0.2867

Residual effect = - 00780

Tillers/plant and ear weight had high positive direct effects on yield/plant (Table 3). Direct effects of plant height and ear girth were positive but low, whereas direct effects of days to first ear emergence, ear length and 250 grain weight were negative. Phul *et al.* (1974) reported negative direct effects of days to flowering and positive direct effects on tiller number, plant height and ear length. Indirect effects of ear length and ear girth via ear weight were also high and girth via tillers/plant, however, resulted in non-significant association of this character with yield. Plant height via tillers/plant had high indirect positive effects on yield. Similar results were reported by Phul *et al.* (1974).

The study revealed that tillers/plant and ear weight were highly associated with grain yield and had high positive direct effects. These characters, therefore, may be given major emphasis in the selection programme for higher yield. Likewise, selection for earliness may also be considered for improving the yield potential of the pearl millet.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. K. A. Shankarnarayan, Director, Central Arid Zone Research Institute, Jodhpur for the facilities.

REFERENCES

- Dewey, D. R. and Lu, K. H. 1959. A correlation and path coefficient analysis of components of Crested Wheat Grass seed production. *Agron. J.* 51 : 515-18.
- Gupta, V. P. and Dhillon, B. S. 1974. Variation in chemical composition and components of yield in *bajra* grain. *Indian J. Genet.* 34 : 22-26.
- Mukherji, P., Agrawal, R. K. and Singh, R. M. 1982. Variability, correlation and path coefficients in inbreds of pearl millet (*Pennisetum typhoides*). *Madras agric. J.* 69(1) : 45-50.
- Narsimha Rao, D. V. and Damodaram, G. 1964. Studies on correlation of certain plant characters to yield in pearl millet (*P. typhoides* S. & H.) *Andhra agric. J.* 11 : 22-25.
- Panase, V. G. and Sukhatme, P. V. 1967. *Statistical methods for agricultural workers.*, I.C.A.R., New Delhi, 361 p.
- Phul, P. S., Gupta, S. K. and Gill, K. S. 1974. Association analysis of some morphological and physiological traits in pearl millet. *Indian J. Genet.* 34 : 346-51.
- Pokhriyal, S. C., Mangath, K. S. and Gangar, L. K. 1967. Genetic variability and correlation studies in pearl millet (*P. typhoides* S. & H.) *Indian J. agric. Sci.* 37 : 77-82.
- Pokhriyal, S. C., Mangath, K. S. and Patil, R. R. 1976. Agronomic traits influencing seed yield in pearl millet. *Indian Journal of Heredity.* 8(3/4) : 49-52.