



Magnitude and nature of associations in foxtail millet [*Setaria italica* (L.) Beauv.]

S. R. Maloo and J. Philip

Department of Plant Breeding and Genetics, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur 313 001

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The experimental material consisting of forty diverse varieties/strains of foxtail millet was planted in three set of environments viz *Kharif*, 91 (Udaipur : E_1 : Rainfed); *Rabi*, 1992-93 (Banswara : E_2 : Irrigated); and *Kharif*, 1993 (Udaipur : E_3 : Rainfed), in randomized block design with three replications in each environment. Observations were recorded on ten randomly selected plants in each environment for thirteen yield characters viz days to flower, days to maturity, plant height, effective tillers per plant, panicle length, peduncle length, weight of panicle, flag leaf area, seed yield per panicle, 1000-seed weight, biological yield per plant, seed yield per plant and harvest index. Quality characters like seed protein and seed oil content were also analysed in all the three environments following standard biochemical procedures. Correlations and path coefficients were computed for each environment separately.

Association studies revealed that seed yield per plant was strongly correlated with weight of panicle, seed yield per panicle, 1000-seed weight, biological yield and harvest index in all the three crop seasons. Further, plant height, panicle length and flag leaf area showed significant positive correlation with seed yield per plant in atleast two crop seasons. Similar results were also obtained by Reddy and Lakshmi [1] and Maloo *et al.*, [2] in foxtail millet. Biological yield, 1000-seed weight, seed yield per panicle and weight of panicle showed strong association with each other in all combinations at both levels in all the three environments. Seed yield per panicle and weight of panicle showed positive and strong association with flag leaf area, panicle length and plant height in all the three sets. However, plant height depicted strong association with panicle length in all the sets and with peduncle length in two environments. Both quality traits viz seed protein and seed oil content exhibited significant positive correlation with each other in E_1 and E_3 as

also reported earlier by Maloo *et al.*, [2]

Path coefficient analysis indicated maximum direct effects of biological yield and harvest index on seed yield (Table 1). Other characters like weight of panicle, seed yield per panicle, flag leaf area, 1000-seed weight, seed protein content, seed oil content and days to flower showed positive direct contribution in atleast one crop season. Weight of panicle and seed yield per panicle showed positive and high direct effect in only one environment whereas its genotypic correlation coefficient was much higher mainly due to its high indirect effect through biological yield and harvest index in all the three environments. The indirect contribution of these characters through each other as well as via seed oil content and flag leaf area in atleast one environment was high. However, plant height, panicle length, flag leaf area and 1000-seed weight even though had relatively low or negative direct effects, exhibited positive correlation with yield due to indirect contribution through biological yield and harvest index in all the three sets.

Considering the over all direct and indirect effects along with various associations among different yield attributing traits in three crop seasons, it could be concluded that biological yield, harvest index, weight of panicle and seed yield per panicle are to be considered as important parameters for selecting high yielding genotypes of foxtail millet.

References

1. Reddy C. D. R. and Lakshmi 1991. Harvest index and yield parameters in foxtail millet [*Setaria italica* (L.) Beauv.] Indian J. Genet., 51: 272-275.
2. Maloo S. R., Gupta R. P. and Sharma U. C. 1992. Character association, path analysis and selection indices in foxtail millet [*Setaria italica* (L.) Beauv]. Dryland Reso. Tech., 7: 223-239.

Table 1. Path analysis showing direct and indirect effects of fourteen characters on seed yield per plant in foxtail millets for three environments

Characters		Days to flower	Days to maturity	Plant height	Effective tillers/plant	Panicle length	Peduncle length	Weight of panicle	Flag leaf area	Seed yield/panicle	1000-seed weight	Biological yield/plant	Harvest index	Seed protein content	Seed oil content	Correlation with yield
Days to flower	E ₁	-0.11	0.08	0.00	0.06	0.00	0.00	0.05	-0.02	-0.12	0.02	0.02	-0.11	0.03	0.01	-0.25
	E ₂	0.14	-0.02	-0.02	0.00	0.00	0.01	0.02	-0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.31*
	E ₃	0.15	-0.01	-0.01	0.01	0.00	0.00	0.72	-0.07	-0.85	0.01	-0.13	-0.03	0.00	-0.02	-0.22
Days to maturity	E ₁	-0.01	0.05	0.00	0.03	0.00	0.00	0.05	-0.02	-0.11	0.03	0.04	-0.07	0.04	0.03	0.22
	E ₂	0.14	-0.02	0.00	0.01	0.00	0.01	0.02	-0.02	0.01	0.02	-0.02	-0.02	0.01	0.00	0.23
	E ₃	0.05	-0.01	-0.04	0.00	0.00	0.00	-0.99	0.01	0.97	0.01	0.06	-0.02	-0.01	0.01	0.04
Plant height	E ₁	0.01	0.00	-0.09	0.02	0.02	-0.01	0.19	-0.01	-0.44	0.04	0.52	0.30	-0.09	0.14	0.60**
	E ₂	0.01	0.00	-0.24	-0.00	0.01	-0.01	0.03	0.02	0.02	0.00	0.13	0.13	0.00	0.05	-0.10
	E ₃	0.01	0.00	-0.18	0.01	0.01	-0.01	-5.65	0.18	5.72	-0.01	0.33	-0.07	0.00	0.00	0.22
Effective tillers/plant	E ₁	0.05	-0.02	0.01	-0.14	0.00	0.00	-0.13	0.03	0.22	-0.01	0.03	-0.09	0.01	-0.02	-0.08
	E ₂	0.00	0.00	0.00	0.08	0.00	0.02	0.01	-0.01	0.01	-0.02	-0.01	0.00	0.00	0.00	0.06
	E ₃	-0.03	0.00	-0.03	-0.06	0.00	0.00	-2.01	0.13	2.04	-0.01	0.20	-0.03	0.01	0.00	0.22
Panicle length	E ₁	-0.01	0.01	-0.04	0.02	0.04	0.00	0.22	-0.02	-0.49	0.03	0.46	0.46	-0.09	0.13	0.71**
	E ₂	0.03	0.00	-0.09	0.02	-0.02	-0.01	0.04	-0.02	0.03	-0.01	0.09	0.00	0.01	0.03	0.11
	E ₃	-0.01	0.00	-0.15	-0.01	-0.01	0.00	-6.88	0.17	6.95	0.00	0.35	-0.03	0.01	0.01	0.43**
Peduncle length	E ₁	0.03	-0.02	-0.04	-0.01	0.00	-0.02	0.10	0.00	-0.22	0.01	0.23	0.26	-0.08	0.09	0.35**
	E ₂	-0.01	0.00	-0.03	-0.03	0.00	-0.07	0.01	0.00	0.01	0.02	-0.05	0.03	0.00	0.01	-0.10
	E ₃	0.01	0.00	-0.07	0.00	0.00	-0.01	0.58	0.06	-0.61	0.00	0.06	-0.16	0.00	-0.02	-0.15
Weight of panicle	E ₁	-0.02	0.01	-0.05	0.05	0.02	0.00	0.35	-0.03	-0.77	0.04	0.75	0.55	-0.10	0.21	0.92**
	E ₂	0.04	0.00	-0.08	-0.01	-0.01	-0.01	0.08	-0.03	0.06	0.05	0.35	0.22	0.00	0.00	0.68**
	E ₃	-0.01	0.00	-0.10	-0.01	0.01	0.00	-9.78	0.18	9.89	-0.02	0.43	0.16	0.01	0.04	0.80**
Flag leaf area	E ₁	-0.03	0.02	-0.01	0.05	0.01	0.00	0.14	-0.08	-0.25	0.01	0.10	0.19	0.01	0.06	0.21
	E ₂	0.02	0.00	0.07	-0.01	0.00	0.00	0.06	-0.08	0.03	0.02	0.26	0.23	0.01	-0.03	0.55**
	E ₃	-0.04	0.00	-0.11	-0.03	0.02	0.00	-6.34	0.28	6.39	-0.02	0.40	0.08	0.01	0.03	0.65**
Seed yield/panicle	E ₁	-0.02	0.01	-0.05	0.04	0.02	0.00	0.34	-0.02	-0.80	0.05	0.64	0.60	-0.10	0.22	0.96**
	E ₂	0.04	0.00	-0.07	-0.01	-0.01	-0.01	0.08	-0.03	0.06	0.05	0.36	0.23	-0.01	0.00	0.70**
	E ₃	-0.01	0.00	-0.10	-0.01	0.01	0.00	-9.78	0.18	9.39	-0.02	0.43	0.17	0.01	0.04	0.81**
1000-seed weight	E ₁	-0.03	0.03	-0.04	0.01	0.01	0.00	0.15	0.00	-0.38	0.10	0.51	0.04	-0.03	0.08	0.44**
	E ₂	0.02	0.00	0.00	0.02	0.00	-0.01	0.04	0.02	0.03	0.11	0.32	0.25	-0.01	-0.02	0.70**
	E ₃	-0.02	0.00	-0.02	-0.01	0.00	0.00	-4.48	0.11	4.57	0.04	0.28	0.16	0.01	0.04	0.61**
Biological yield/plant	E ₁	0.00	0.00	-0.05	0.00	0.02	0.00	0.23	-0.01	-0.52	0.05	0.97	-0.09	-0.05	0.15	0.70**
	E ₂	0.00	0.00	-0.05	0.00	0.00	0.01	0.05	-0.04	0.04	0.06	0.55	0.24	0.00	-0.02	0.84**
	E ₃	-0.03	0.00	-0.10	-0.02	0.01	0.00	-7.57	0.20	7.67	-0.02	0.55	-0.03	0.01	0.03	0.70**
Harvest Index	E ₁	0.01	-0.01	-0.03	0.01	0.02	0.00	0.19	-0.01	-0.48	0.00	-0.10	0.98	-0.12	0.18	0.64**
	E ₂	0.05	0.00	0.06	0.00	0.00	-0.01	0.04	-0.04	0.03	0.06	0.28	0.47	-0.01	-0.03	0.90**
	E ₃	-0.01	0.00	0.03	0.00	0.00	0.00	-3.36	0.04	3.39	-0.01	-0.03	0.49	0.01	0.11	0.66**
Seed protein content	E ₁	-0.02	0.02	0.05	-0.01	-0.02	-0.01	-0.21	0.00	0.49	-0.02	-0.28	-0.74	0.16	-0.15	-0.72**
	E ₂	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.01	-0.01	-0.02	-0.04	-0.08	0.06	0.02	-0.01
	E ₃	-0.01	0.00	-0.02	-0.02	0.00	0.00	-2.79	0.07	2.76	-0.01	0.19	0.13	0.04	0.09	0.43**
Seed oil content	E ₁	0.01	-0.01	0.05	-0.01	-0.02	-0.01	-0.31	0.01	0.73	-0.03	-0.60	-0.67	0.12	-0.23	-0.97**
	E ₂	0.02	0.00	-0.08	0.00	0.00	0.00	0.00	0.02	0.00	-0.02	-0.03	-0.09	0.01	0.13	-0.11
	E ₃	-0.02	0.00	0.00	0.00	0.00	0.00	-2.90	0.04	2.32	-0.01	0.09	0.29	0.02	0.18	0.53**

Residual effects : E₁ = 0.06, E₂ = -0.03, E₃ = 0.08; *Significant at 5 per cent level; **Significant at 1 per cent level; Diagonal values (in bold) represent direct effect