Annals of Arid Zone 63(1): 121-123, 2024

Short Communication

Estimates of Variability, Heritability and Genetic Advance in Foxtail Millet

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Received: February 7, 2024   Accepted: March 19, 2024

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Citation
Yadav, Y., Dhoot, R., Kumhar, S.R. and Roy, C. 2024. Estimates of variability, heritability and genetic advance in foxtail millets. Annals of Arid Zone 63(1): 121-123

doi: 10.59512/aaz.2024.63.1.15

https://epubs.icar.org.in/index.php/AAZ/article/view/148210

Foxtail millet (*Setaria italica* (L.) P. Beauv) known globally as Italian millet, Italian foxtail, German millet, Siberian millet, Foxtail bristle grass is having highest production among all small millets making its sixth most important grown grain. In India it is well known as Kangni (Hindi), Kang (Gujarati), Navane (Kannada), Kaon dana (Bengali), Kavalai, and Tenai (Tamil) and is important crop next to finger millet among the small millets. At present, foxtail millet is cultivated in Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Rajasthan, Madhya Pradesh, Uttar Pradesh and north eastern states of India. Millets are far superior than other cereal crops like rice and wheat nutritionally (Shingane *et al.,* 2016). Protein content in foxtail millet grains ranges from 11.13 to 18.75%, being greater than rice (7%-9%), wheat (11%-14%), and maize (8%-11%) (Hou *et al.,* 2022). Having a comparable nutritional profile to common millet, 4 percent oil, with 7% crude fibre. Mature grain is good source of digestible protein than rice and wheat and also contains beta-carotene, antioxidants, vitamins, calcium, iron, potassium, magnesium, zinc. Contains more vitamins and is source of seven of the eight necessary amino acids that the human body cannot generate (Zhang *et al.,* 2007), grains are also very good source of thiamine, riboflavin and niacin.

Foxtail millet is mainly cultivated in the semi-arid regions of the country concentrating in middle to south Indian parts. It is not grown in western hot arid region, hence to assess the adaptability of the crop 36 genotypes of foxtail millet were evaluated in Jodhpur conditions. The experiment was carried out at instructional farm, College of Agriculture, Jodhpur. Geographically, it is located between 26°15′ N to 26°45′ North latitude and 73°00′ E to latitude 73°29′ East longitude at an altitude of 231 meter above mean sea level. This region falls under agro-climatic zone Ia (Arid Western Plains Zone) of Rajasthan. Genetic variation was assessed by observing five competitive plants selected at random from each genotype grown in randomized block design. The observation recorded were days to 50% flowering, number of productive tillers per plant, plant height, days to maturity, flag leaf length, flag leaf width, ear length, ear width, straw weight, 1000 grain weight, grain protein, harvest index, chlorophyll content and grain yield per plant. The genotypic and phenotypic coefficient of variation (GCV and PCV) were computed as suggested by Burton, 1953, broad sense heritability (Lush, 1949) and genetic advance (Johnson *et al.*, 1955) were also computed.

Table 1: Mean, range, variability, heritability (broad sense) and genetic advance as per cent of mean of the characters

Characters	Mean	Range	Coefficient of Variation		Heritability % (broad sense)	Genetic advance	Genetic advance as % of mean
			Genotypic	Phenotypic			
Days to 50% flowering	48.72	44.33-56.33	5.48	7.35	55.58	4.09	8.41
Number of productive tillers per plant	4.87	3.73-7.00	15.48	19.66	62.01	1.22	25.12
Plant height(cm)	100.44	84.87-128.80	9.11	12.50	53.17	13.76	13.69
Days to maturity	74.06	65.67-80.67	4.524	6.79	44.42	4.59	6.21
Flag leaf length(cm)	35.85	29.27-40.47	5.83	8.35	48.78	3.01	8.39
Flag leaf width(cm)	1.82	1.53-2.4	11.17	15.4	52.6	0.303	16.69
Ear length(cm)	10.98	8.07-16.40	8.27	12.41	44.41	2.20	11.36
Ear width(cm)	1.10	0.81-1.64	17.43	19.75	77.85	0.35	31.68
Straw weight(g)	28.54	17.78-53.47	26.95	31.28	74.21	13.59	47.82
Harvest index (%)	36.40	21.15-44.29	12.01	14.95	64.52	7.23	19.87
1000 grain weight(g)	2.27	2.05-2.69	5.33	8.28	41.48	0.16	7.07
Grain protein (%)	13.64	9.97-16.53	10.70	11.95	80.13	2.69	19.73
Chlorophyll content	42.34	26.34-60.22	20.85	22.7	84.39	16.71	39.46
Grain yield per plant(g)	15.86	11.16-24.67	16.64	23.67	49.4	3.82	24.09

The analysis of variance revealed significant differences between genotypes for fourteen characters, including days to 50% flowering, number of productive tillers per plant, plant height, days to maturity, flag leaf length, flag leaf width ear length, ear width, straw weight, 1000 grain weight, grain protein and grain yield per plant, harvest index. Analysis of variance was used to determine the estimates of the genotypic (G) and phenotypic (P) variances of each character. High PCV was observed for straw weight (31.28%) followed by grain yield per plant (23.67%) and chlorophyll content (22.7 %). Moderate PCV values were seen for ear width (19.75%), number of productive tillers per plant (19.66%), flag leaf width (15.40%), harvest index (14.95%) and plant height (12.50%), ear length (12.41%) and grain protein (11.95%) while remaining characters were having low values. As expected GCV values were lower than PCV values for respective traits. High GCV was found for straw weight (26.95%) and chlorophyll content (20.85%), moderate GCV values were seen for ear width (17.42%), grain yield per plant (16.64%), number of productive tillers per plant (15.48%), harvest index (12.01%), flag leaf width (11.17%) and grain protein (10.70%) while other remaining characters exhibited low values. High heritability estimated was seen for chlorophyll content (84.39%) followed by grain protein (80.13%), ear width (77.85%), straw weight (74.21%), harvest index (64.52%), number of productive tillers per plant (62.01%). The estimates of genetic advance as percent of mean at 5% selection intensity was high to moderate for straw weight (47.82%) followed by chlorophyll content (39.46%), ear width (31.68%), number of productive tillers per plant (25.11%) and grain yield per plant (24.09%).

High GCV and PCV for straw weight was earlier reported by Brunda *et al.* (2014), Shingane *et al.* (2016), and moderate GCV values are also seen for grain yield per plant by Priyadharshini *et al.* (2011), Ganapathy *at el* (2011). Similar results for high heritability with high genetic advance for number of productive tillers per plant was observed by Brunda *et al.* (2014), Shingane *et al.* (2016), Mahanthesha *et al.* (2017), Devaliya *et al.* (2018). The highest value of GCV and PCV observed for chlorophyll content and straw weight indicated a greater phenotypic and genotypic variability among the genotypes which suggested that response to selection would be very high for these components which may ultimately lead to yield improvement in the foxtail millet. The characters like chlorophyll content, straw weight recorded high genetic variability, high heritability in conjunction with high genetic advance as percent mean indicated the predominance of additive gene action and selection may be effective in next generations for these characters. Despite not being a adaptive crop of hot arid region, high range in grain and straw yield indicates availability of arid adaptive genetic resources. Assessing a greater number of germplasm and multiple location of the region under rainfed conditions will add more to the information generated and to have options in hand for crop diversification in the challenged agro-ecosystem of western hot arid region of India.

Acknowledgement

The authors are grateful to the Dean, College of Agriculture, Jodhpur for providing the necessary facilities.

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Printed in March 2024