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RESEARCH ARTICLE

VARIABILITY AND HERITABILITY STUDIES FOR YIELD AND YIELD COMPONENT TRAITS IN FOXTAIL MILLET

Dhruv Shukla, R. P. Joshi and Kartikey Sootrakar

Deptt. of Plant Breeding & Genetics, JNKVV, College of Agriculture, Rewa, 486001.

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Abstract

The present investigation was carried out at All India Coordinated Research project on Small Millet, at Instructional Farm, College of Agriculture, Rewa (MP) during kharif 2017. Estimates of phenotypic coefficient of variation was found higher than their corresponding genotypic coefficient of variation, but for all the characters differences was found non - significant except tillers per plant indicating that the little influence of environment on the expression these characters. The moderate magnitude of phenotypic coefficient of variation (PCV) along with genotypic coefficient of variation (GCV) was recorded for grain yield per plant, number of tillers per plant, harvest index and ear length. High heritability coupled with high genetic advance as percent of mean was observed for number of tillers per plant.

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Introduction:-

Foxtail millet (*Setaria italica* L.) is one of the oldest crops cultivated for food grain, hay and pasture. It has the longest history of cultivation among the millets, having been grown in China since sometime in the sixth millennium BC. The geographical origin of foxtail millet based on cytological studies indicated that wild ancestor of foxtail millet is *S. viridis* (Li et al. 1945). Knowledge on heritability and genetic advance of the character indicate the scope for the improvement of a trait through selection. Heritability estimates along with genetic advance are also helpful in predicting the gain under selection. Grain yield being a complex character is very difficult to improve by selecting the genotypes for yield per se, therefore identifying the characters which are closely related and have contributed to yield becomes highly essential.

Material And Methods:-

Present investigation was carried out at All India Coordinated Research project on Small Millet, at Instructional Farm, College of Agriculture Rewa (MP) during kharif 2017. The experimental materials of the present study comprised 16 (DHFT 5-6, SiA3179, DHFT77-3, PPSS-7, PKS 22, SiA 3220, TNSi 337, SiA 3212, SiA 3219 , TNSi345, DHFT35-3, DHFT2-5-3, IIMR FtM-1, SiA 326, SiA 3156 and RFM 41) genotypes of Foxtail Millet. The parents were selected on the basis of different genetic and geographical origin.

Table 1:- Analysis of variance for 12 quantitative characters in Foxtail Millet.

sov	df	Days to 50% flow	Days to maturity	Plant height	No. of Tillers/	Flag leaf length	Flag leaf width	Peduncle length	Ear length (cm)	Biological yield	Harvest Index	1000 grain weight	Grain yield
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Corresponding Author:- Dhruv Shukla

Address:- Deptt. of Plant Breeding & Genetics, JNKVV, College of Agriculture, Rewa, 486001.

		erin g		(cm)	plan t	(cm)	(cm)	h (cm)		/ plan t (g)		(g)	pla nt (g)
Replica tion	2.00	10.8 9	4.00	63.48	0.00 25	1.34	0.01	5.73	1.00	1.10	33.84	0.04	0.2 0
Treatm ent	15.00	36.5 7**	121.0 7**	448.7 **	0.10 **	21.7 **	0.08 **	9.87 **	20.94 **	5.1* *	81.72* *	0.13* *	2.2 **
Error	30.00	6.38	19.88	151.7	0.01	7.12	0.02	3.68	3.64	2.45	24.79	0.02	0.5

Result And Discussion:-

A wide range of phenotypic coefficient of variation (PCV) was observed for all the traits ranged from 7.91 to 17.77. Moderate magnitude of PCV was recorded for grain yield per plant (17.77) followed by number of tillers per plant (17.38), harvest index (16.66), ear length (14.56), biological yield (12.34), Plant height (10.70), flag leaf width (10.61), and flag leaf length (10.44), while low estimate of PCV was recorded by 1000 grain weight (9.42), days to maturity (9.03), days to 50% flowering (8.26), and peduncle length (7.91).

Genotypic coefficient of variation (GCV) ranged from 4.74 to 13.64. Moderate magnitudes of GCV were recorded for number of tillers per plant (13.64) followed by grain yield per plant (12.56), ear length (11.40), harvest index (10.97) and lower estimate of GCV were recorded for 1000 grain weight (7.50), days to maturity (7.16), flag leaf width (6.73), plant height (6.72), flag leaf length (6.65), days to 50% flowering (6.46), biological yield per plant (6.36) and for peduncle length (4.74).

High estimates of heritability in broad sense were recorded for 1000 grain weight (63%) followed by days to maturity (62%), days to 50% flowering (61%), number of tillers per plant (61%) and for ear length (61%). The high values indicate that heritability may be due to higher contribution of genotypic component. Similarly moderate ranged heritability were recorded for grain yield per plant (49%), harvest index (43%), flag leaf length (40%), flag leaf width (40%), plant height (39%), peduncle length (35%) and lowest value was recorded for biological yield per plant (26%).

A perusal of genetic advance revealed that it was high for number of tillers per plant (22.05) and moderate for ear length (18.38), grain yield per plant (18.30), harvest index (14.88), 1000 grain weight (12.32), days to maturity (11.70), and for days to 50% flowering (10.42). The lowest value of genetic advance as % of mean observed for flag leaf width (8.80), flag leaf length (8.72), plant height (8.70), biological yield (6.75) and for peduncle length (5.84).

Moderate heritability was showed by grain yield per plant followed by harvest index, flag leaf length, flag leaf width, plant height and peduncle length. Previously moderate heritability for grain yield has also been reported by Patil et al. (1989) and for plant height by velzaco et al. (2012).

Table 2:- Estimation of genetic parameters for different quantitative characters in Foxtail Millet.

S.N.	Character	Mean	Range		PCV	GCV	h ² % (bs)	GA as% of mean
			Minimum	Maximum				
1	Days to 50% flowering	49.04	42.00	54.33	8.26	6.46	61	10.42
2	Days to maturity	82.62	70.66	90.66	9.03	7.16	62	11.70
3	Plant height	147.8	128.6	167.0	10.70	6.72	39	8.70
4	No of tillers	1.26	1.0	1.6	17.38	13.64	61	22.05
5	Flag leaf length	33.13	26.03	36.20	10.44	6.65	40	8.72
6	Flag leaf width	2.09	1.63	2.33	10.61	6.73	40	8.80
7	Peduncle length	30.27	26.86	34.06	7.91	4.74	35	5.84
8	Ear length	21.06	13.26	24.06	14.56	11.40	61	18.38
9	Biological Yield	14.81	12.80	17.46	12.34	6.36	26	6.75
10	Harvest index	39.70	29.66	47.23	16.66	10.97	43	14.88
11	1000 grain weight	2.58	2.00	2.83	9.42	7.50	63	12.32

12	Grain yield per plant	5.93	4.76	8.00	17.77	12.56	49	18.30
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The estimate of genetic advance as percent of mean moderate for ear length followed by grain yield per plant, harvest index, days to maturity and days to 50% flowering. The moderate estimates of genetic advance as percentage of mean for days to 50% flowering were also reported by Patil et al.(1989).

High heritability coupled with high genetic advance as percent of mean was observed for number of tillers per plant. High values indicate that heritability may be due to higher contribution of genotypic component. The heritability estimates coupled with expected genetic advance indicate the additive mode of gene action in the expression of traits which helps in choosing an appropriate breeding methodology. Similar results were reported by Gurunadharao et al.(1984), Islam et al. (1990), prasanana et al.(2013) and Nirmalakumari et al.(2008).

Table 3:- Phenotypic and genotypic correlation between grain yield and its components in Foxtail Millet.

S. N.	Char acters		Days to 50% flowe ring	Days to mat urity	Pla nt hei ght	Num ber of tiller s per plant	Flag leaf length h	Flag leaf width h	Pedu cle length h	Ear length h	Biolo gical yield per plant	Harv est Inde x	1000 grain weig ht	Grai n yield per plant
1	Days to 50% flower ing	P	1	0.62 02 ***	0.1 767	0.617 9***	0.661 2***	0.655 7***	0.25 70	0.826 3***	0.570 6***	0.661 5***	- 0.727 7***	0.593 0***
		G	1	0.73 27	0.4 950	0.834 0	0.784 0	0.806 1	0.40 66	0.931 7	0.711 2	0.767 7	- 0.915 5	0.168 6
2	Days to maturi ty	P		1	0.0 814	0.440 1**	0.337 9*	0.518 7***	0.08 08	0.591 7***	0.472 0***	0.497 9***	- 0.364 3*	0.364 8*
		G		1	0.5 430	0.785 7	0.765 4	0.870 1	0.28 90	0.592 9	0.486 7	0.680 0	- 0.403 3	0.572 5
3	Plant height	P			1	0.297 7*	0.237 2	0.485 0***	0.31 52*	0.192 4	0.226 8	0.310 1*	- 0.280 2	0.444 2**
		G			1	0.531 3	0.518 6	0.505 1	0.70 67	0.532 9	0.625 7	0.630 4	- 0.503 8	0.542 3
4	Numb er of tillers per plant	P				1	0.605 2***	0.572 3***	0.17 39	0.560 8***	0.552 3***	0.566 7***	- 0.714 0***	0.656 3***
		G				1	0.027 8	0.677 3	0.25 93	0.912 9	0.763 3	0.745 3	- 0.813 9	0.826 4
5	Flag leaf length	P					1	0.615 2***	0.20 45	0.672 9***	0.504 7***	0.478 0***	- 0.589 9***	0.527 5***
		G					1	0.819 9	0.64 02	0.908 7	0.540 0	0.529 5	- 0.736 8	0.708 7
6	Flag leaf width	P						1	0.26 78	0.689 4***	0.409 8**	0.544 8***	- 0.502 9***	0.562 2***
		G						1	0.64 46	0.758 5	0.628 2	0.635 4	- 0.637 1	0.738 9

7	Peduncle length	P						1	0.2267	0.2902*	0.1973	-0.2182	0.2583*
		G						1	0.5576	0.3433	0.6114	-0.4522	0.5352
8	Ear length	P							1	0.4726***	0.6770***	-0.6469***	0.5566***
		G							1	0.5040	0.7568	-0.8647	0.6258
9	Biological yield per plant	P								1	0.5461***	-0.6816***	0.6519***
		G								1	0.5907	-0.7367	0.7895
10	Harvest Index	P									1	-0.6263***	0.6060***
		G									1	-0.8446	0.7745
11	1000 grain weight	P										1	-0.7145***
		G										1	-0.9104
12	Grain yield per plant	P											1
		G											1

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