

## Variability Studies in Foxtail Millet [*Setaria italica* (L.) P. Beauv]

P. Kavya<sup>1\*</sup>, M. Sujatha<sup>1</sup>, S.R. Pandravada<sup>2</sup> and T.V. Hymavathi<sup>3</sup>

<sup>1</sup>Department of Genetics and Plant Breeding, College of Agriculture, PJTSAU, Rajendranagar, Hyderabad- 500030, Telangana, India

<sup>2</sup>National Bureau of Plant Genetic Resources, Regional Station, Rajendranagar, Hyderabad- 500030, Telangana, India

<sup>3</sup>Department of Food and Nutrition, PJTSAU, Rajendranagar, Hyderabad-500030, Telangana, India

\*Corresponding author

### ABSTRACT

The present investigation was carried out in foxtail millet to measure the variability, heritability and genetic advance using 40 genotypes. The experiment was laid out in a randomized complete block design with three replications at National Bureau of Plant Genetic Resources, Regional Station, Rajendranagar, Hyderabad during *Kharif*, 2015. Coefficients of variation studies indicated that the estimates of PCV were slightly higher than the corresponding GCV estimates for all the characters, indicating that the characters were less influenced by the environment. In the present investigation, high heritability coupled with high genetic advance as percent of mean was observed for no. of basal tillers, no. of culm branches, panicle exertion, ear length, ear width, 1000 seed weight, seed yield/plant, straw yield/plant, protein content. Thus, these traits are predominantly under the control of additive gene action and hence these characters can be improved by selection. Moderate heritability with moderate genetic advance was recorded for plant height, flag leaf length, flag leaf width, days to 50% flowering, carbohydrate content. These traits appear to be under the control of both additive and non-additive gene actions.

#### Keywords

Foxtail millet,  
Variability,  
Heritability,  
Genetic advance.

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### Introduction

The area of cultivation of millets is being declined and occupied by cereal crops and cash crops due to effect of green revolution which turned them as orphan crops and in the present scenario emphasis is being laid on improving the production of millets due to its nutritional benefits for the diabetic patients. Among the orphan crops foxtail millet is one among them which is having nutraceutical benefits, tolerant to pests and diseases and drought which is used for Human

consumption in African and Asian countries, as cage feed in American countries. The present investigation was carried out to know the gene action governing the yield and its attributing traits which aids in improvement of the yields.

### Materials and Methods

The present study was carried out on 40 genotypes of foxtail millet having indigenous

and exotic collections. The experiment was laid out in a randomized complete block design with three replications at National Bureau of Plant Genetic Resources, Regional Station, Rajendranagar, Hyderabad during *Khari*, 2015. The design adopted was Randomised Block Design (RBD) with three replications. Each entry in each replication was sown in 2 rows of 3 metres each spaced at 60cm apart and plant to plant distance of 15cm was followed. Sowings were done in the last week of July, and when required one irrigation was provided to obtain uniform plant standards. Required cultural practices were done accordingly. Data were collected on plant height (cm), no. of basal tillers, no. of culm branches, flag leaf length (cm), flag leaf width (cm), peduncle length (cm), panicle exertion (cm), ear length (cm), ear width (cm), 1000 seed weight (gm), seed yield/plant (gm), straw yield/plant (gm), days to 50% flowering, protein content (%), carbohydrate content (%).

## **Results and Discussion**

The knowledge of genetic variability present in a given crop species for the character under improvement is of paramount importance for the success of any plant breeding programme. Information on coefficient of variation is useful in measuring the range of variability present in the characters. Coefficients of variation studies indicated that the estimates of PCV were slightly higher than the corresponding GCV estimates for all the characters, indicating that the characters were less influenced by the environment (Prasanna *et al.*, 2013). Therefore, Selection on the basis of phenotype alone can be effective for the improvement of these traits.

### **Plant height (cm)**

The genotypic and phenotypic coefficients of variation estimates observed for this trait were

moderate *i.e.*, 10.15% and 12.07% respectively. The observed heritability estimate for this character was high 70.7% with moderate 17.56% GA as % of mean. Similar results were reported by Salini *et al.*, (2010) for moderate GCV, PCV, high heritability, Prasanna *et al.*, (2013) reported for high heritability with moderate genetic advance as % of mean.

### **No. of basal tillers**

The GCV 54.64% and PCV 67.60% for this trait were high. The observed heritability estimates for this character was high 65.3% with high GA as % of mean 90.97%. These results are in accordance with the findings by Nirmalakumari *et al.*, (2008) for high PCV, GCV, heritability and high GA as % of mean.

### **No. of culm branches**

The GCV and PCV for this trait were high 75.08% and 86.24% respectively. The observed heritability estimates for this trait was high 75.8% and with high GA as % of mean 134.63%.

### **Flag leaf length (cm)**

This character has recorded low PCV 7.23% and GCV 8.80%. The heritability estimates for this trait was high 66.4% coupled with moderate GA as % of mean 12.12%. These results are in conformity with the findings by Tyagi *et al.*, (2011) for high heritability.

### **Flag leaf width (cm)**

A moderate GCV 15.42% and high PCV 24.77% was observed for this trait. Moderate heritability 38.8%, moderate GA as % of mean 19.79% was recorded. Similar results were reported by Nirmalakumari *et al.*, (2008) for moderate GCV, PCV and moderate GA as % of mean by Tyagi *et al.*, (2011) (Table 1).

**Table.1** Estimation of variability, heritability and genetic advance as percent of mean for 15 characters in 40 Italian millet germplasm accessions

S. No.	Character	Genotypic variance	Phenotypic variance	GCV (%)	PCV (%)	h <sup>2</sup> (%)	GA	GA as% of mean (5 %)
1.	Plant height (cm)	218.498	309.234	10.150	12.075	70.7	25.596	17.576
2.	No of basal tillers	16.350	25.029	54.642	67.607	65.3	6.732	90.977
3.	No of culm branches	0.767	1.012	75.082	86.244	75.8	1.571	134.653
4.	Flag leaf length (cm)	5.126	7.716	7.237	8.880	66.4	3.801	12.152
5.	Flag leaf width (cm)	0.117	0.301	15.427	24.774	38.8	0.438	19.790
6.	Peduncle length (cm)	16.574	30.351	12.867	17.411	54.6	6.197	19.587
7.	Panicle exertion (cm)	16.934	23.847	24.831	29.467	71.0	7.143	43.103
8.	Ear length (cm)	12.625	15.694	19.029	21.216	80.4	6.565	35.159
9.	Ear width (cm)	0.080	0.156	15.386	21.578	50.8	0.414	22.599
10.	1000 seed weight (gm)	0.359	0.497	21.486	25.302	72.1	1.048	37.586
11.	Seed yield/plant (gm)	225.458	249.689	46.221	48.641	90.3	29.392	90.476
12.	Straw yield/plant (gm)	161.712	184.977	41.418	42.117	96.7	33.401	83.904
13.	Days to 50%flowering	28.970	30.688	9.823	10.110	94.4	10.773	19.661
14.	Protein content %	1.733	1.757	12.316	12.401	98.6	2.693	25.197
15.	Carbohydrate content %	31.382	32.140	8.293	8.393	97.6	11.403	16.881

### **Peduncle length (cm)**

The GCV 12.86% and PCV 17.41% for this trait was moderate. The observed heritability estimate was moderate 54.60% and with moderate GA as % of mean (19.58%).

### **Panicle exertion (cm)**

The GCV and PCV for this trait are high 24.83% and 29.46% respectively. The heritability estimate was high 71.0% coupled with high GA as % of mean 43.10%. The results are in accordance with results reported by Nirmalakumari *et al.*, (2008) for high PCV, GCV, heritability and high GA as % of mean.

### **Ear length (cm)**

A moderate GCV 19.02% and PCV 21.21 % were recorded for this trait. The heritability observed for this trait was high (80.01%). This character recorded high GA as % of mean 35.15%. Similar results were reported by Prasad Rao *et al.*, (1985) having moderate GCV, high PCV, high heritability coupled with GA as % of mean.

### **Ear width**

The GCV, PCV for this trait were moderate 15.38% and high 21.57% respectively. The heritability observed for this trait was high 50.8% coupled with high GA as % of mean 22.59%. Similar results were reported by Velzaco and Rimeri (2012) for high PCV and heritability. Sandhu *et al.*, (1974) recorded high GA % of mean.

### **Days to 50% flowering**

A low GCV (9.82%), moderate PCV (10.11%) were recorded for this trait. The observed heritability estimate for this trait was high 94.4%. This character recorded

moderate GA as % of mean 19.66%. Similar results are reported by Prasad *et al.*, (1985) having high heritability with moderate GA as % of mean, low PCV was recorded by Patil and Mohan Kumar, moderate GCV was recorded by Basheeruddin and Sahib (2004).

### **Seed yield/plant (gm)**

A high GCV 46.22% and PCV 48.64% were observed for this trait. The heritability estimate for this trait was high 90.3% with high GA as % of mean 90.47%. Similar results were in accordance with results found by Nirmalakumari *et al.*, (2008), Sirisha *et al.*, (2009), Nirmalakumari and Vetrivethan (2010), Tyagi *et al.*, (2011), Brunda *et al.*, (2014), Yogeesh *et al.*, (2015) having high GCV, PCV, heritability and GA as % of mean.

### **1000 seed weight (gm)**

A high GCV 21.48% and PCV 25.30% were recorded for this trait. A high heritability 72.1% coupled with high GA as % of mean 37.58% was observed. The results are in conformity with the findings of Sirisha *et al.*, (2009) and Prasanna *et al.*, (2013) for high GCV, PCV, heritability, GA as % of mean.

### **Straw yield/plant (gm)**

The GCV and PCV for this trait was observed as high 41.41% and 42.11% respectively. The observed heritability estimate for this trait was high 96.7% coupled with high GA as % of mean 83.9%. Similar results were reported by Prasanna *et al.*, (2013), Brunda *et al.*, (2014) having high GCV, PCV, heritability and GA as % of mean.

### **Protein content (%)**

This character has recorded moderate GCV (12.31%) and PCV (12.40%). The heritability

estimate for this trait was high (98.6%) coupled with high GA as % of mean 25.19 %. These results are in conformity with the findings of Sirisha *et al.*, (2009), Prasanna *et al.*, (2013) having moderate GCV, PCV and high heritability with high GA as % of mean.

### **Carbohydrate content (%)**

The GCV and PCV of this trait was observed as moderate viz., 8.29%, 8.39% respectively. The observed estimate for this trait was 97.6 % coupled with moderate GA as % of mean 16.88%.

Genotypic coefficient of variation (GCV) along with heritability estimates would provide a better picture of the amount of genetic advance to be expected by phenotypic selection (Burton, 1953). It is suggested that genetic gain should be considered in conjunction with heritability estimates (Johnson *et al.*, (1955). Heritability estimates along with genetic advance are normally more helpful in predicting the gain under selection than heritability estimates alone.

In the present investigation, high heritability coupled with high genetic advance as percent of mean was observed for no. of basal tillers, no. of culm branches, panicle exertion, ear length, ear width, 1000 seed weight, seed yield/plant, straw yield/plant, protein content. Thus, these traits are predominantly under the control of additive gene action and hence these characters can be improved by selection. Moderate heritability with moderate genetic advance was recorded for plant height, flag leaf length, flag leaf width, days to 50% flowering, carbohydrate content. These traits appear to be under the control of both additive and non-additive gene actions.

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