**Varibility studies in foxtail millet [*Setariaitalica* (L.) P. Beauv]: Genetic advances and heritability approaches**

**ABSTRACT**

The filed experiment was conducted in 300 genotypes of foxtail millet. The experiment was laid out in Augmented Design and held at Regional Agriculture Research Station (RARS), ANGRAU ,Nandyal, Andhra Pradesh, during *kharif* -2021. 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 observed in plant height, panicle length, flag leaf length and grain yield. Hence these traits shows attributed to the predominance of additive gene action, which suggests that simple selection effectively increases this feature. Moderate heritability with moderate genetic advance are observed in peduncle length, panicle weight and also in test weight.

Key words: Foxtail Millet, Genetic Advance, Variablity, Grain Yeild, Heritablity.

**Introduction:**

Millets are among the oldest cultivated cereals with significant agricultural importance. Foxtail millet is an ancient diploid, C4 cereal crop. It is widely grown around the world and is used for food, feed, and fodder in many regions of Africa and Asia. Foxtail millet grains are common because they are extremely low in glycemic index and have relatively high protein content for a cereal. Foxtail millet (*Setaria italica*), a yearly grass developed for human food, has arisen as an unmistakable harvest with noteworthy dry season resilience and the capacity to flourish in water-restricted locales. Considering the food security that is keep on mounting despite environmental change and water shortage, foxtail millet has gathered critical consideration as a likely arrangement. Foxtail millet is the second important crops among millets after pearl millet. Foxtail millet is widely cultivated in Asia, Europe, North America, Australia and North Africa for grains or forage, and an essential food for human consumption in China, India, Korea, and Japan.

**Material and method:**

The present study was carried out on 300 genotypes of foxtail millet, conducted at the Regional Agricultural Research Station, ANGRAU, Nandyal, Andhra Pradesh, India situated at coordinates 15.485° N latitude and 78.486° E. the design adopted was Augmented Design and the spacing 22.5 x 10 cm with entire plot area of 2.25 m x 3.0 m. the required cultural practices was carried out accordingly. Data was collected on days to flowering, days to maturity, plant height, panicle length, peduncle length, flag leaf length, flag leaf width, panicle weight, grain yield per plant, test weight.

**Results and discussion.**

The present study of genetic variability of foxtail millet crop genotypes shows the importance of plant in plant breeding. The variability range of the characters is measured by coefficients of variations, which helps for the selection of genotype on the basis of phenotype characters alone will be more effective for the these traits. Coefficient of variation studies reviled that the PCV is higher than GCV in all of the characters was less influenced by environment.

Table 1-Coefficient of variation

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No | **Genetic parameters** | **GCV** | **PCV** | **h2 (Broad Sesne)** | **GA** | **GAM** |
|  | **Days to flowering** | 9.033 | 10.543 | 73.41 | 7.45 | 15.94 |
|  | **Days to maturity** | 2.37 | 3.59 | 43.6 | 2.7 | 3.23 |
|  | **Plant height (cm)** | 28.95 | 29.849 | 94.07 | 54.675 | 57.841 |
|  | **Panicle length (cm)** | 38.528 | 40.29 | 91.44 | 11.167 | 75.895 |
|  | **Peduncle length (cm)** | 14.622 | 24.346 | 34.014 | 2.114 | 18.092 |
|  | **Flag leaf length (cm)** | 31.483 | 33.997 | 85.76 | 11.226 | 60.058 |
|  | **Flag leaf width (cm)** | 22.786 | 32.852 | 48.11 | 0.424 | 32.558 |
|  | **Panicle weight (g)** | 47.843 | 49.245 | 94.38 | 3.021 | 95.749 |
|  | **Grain yield per plant (g)** | 39.301 | 49.759 | 62.38 | 2.673 | 63.945 |
|  | **Test weight ( g)** | 16.113 | 16.821 | 91.76 | 0.929 | 31.797 |

**Fig 1-Genetic variability of foxtail millet crop genotypes**

**Days to flowering:**

The PCV (10.54) and GCV (9.03) estimates were low, indicating minimal variation in the days required for 50% flowering among the genotypes studied. These estimates of PCV and GCV were previously reported by [15,7,1,9,13]. The trait exhibited a high heritability of 73.41% and a modest genetic advance as a percentage of the mean (15.94).

**Days to maturity**

The estimates of Phenotypic Coefficient of Variation (PCV) and Genotypic Coefficient of Variation (GCV) for the number of days to maturity among the genotypes studied were low, indicating low variation. Similar estimates of PCV and GCV were previously reported by [6,3,1,4,9,10,13]. The characteristic exhibited a moderate heritability of 43.6% and a low genetic advance as a percentage of the mean (3.23).

**Plant height (cm)**

The estimates of the Phenotypic Coefficient of Variation (PCV) and Genotypic Coefficient of Variation (GCV) for plant height among the genotypes studied were moderate, indicating a moderate level of variation. These estimates of PCV and GCV were previously reported by [14,11,5,8,10,2,13]. The traits exhibited a high heritability of 94.07% and a significant genetic advance as a percentage of the mean. This is likely due to the predominance of additive gene activities, suggesting that straightforward selection could effectively enhance this trait [10,14].

**Panicle length (cm)**

The estimates of PCV (40.29) and GCV (38.52) indicated moderate variation in panicle length among the genotypes studied. These estimates were previously reported by [12,5,1,4,9,13]. The trait had a high heritability of 91.44% and a high genetic advance as a percentage of the mean (75.63). This suggests that the trait is influenced mainly by additive gene action, indicating that simple selection could effectively increase this feature[1,9,14,10,8] also found comparable outcomes about solid heritability and substantial genetic progress as a percentage of the mean.

**Peduncle length (cm)**

The PCV (24.34) and GCV (14.622) estimates were moderate, indicating low variation in days in peduncle length among the genotypes studied with moderate heritability of 34.014% and moderate genetic advance as a percentage of mean 18.09 [8,11,14].

**Flag leaf length (cm)**

The PCV (33.997) and GCV (31.483) estimations were elevated, indicating a substantial variation in flag leaf length among the genotypes examined. The attribute exhibited a high heritability of 85.76% and a high genetic advance of 60.05% as a percentage of the mean. This could be attributed to the prevalence of both additive and non-additive gene activities, suggesting that simple selection may not be effective in enhancing this feature[8,14] also found comparable outcomes with a significant genetic influence.

**Flag leaf width**

The estimates of PCV (32.85) and GCV (22.78) indicated a moderate level of variation in flag leaf width among the studied genotypes. These estimates of PCV and GCV were previously reported by [2]. This trait had a high heritability of 48.11% and a low genetic advance as a percentage of the mean (32.55). This suggests that the trait is influenced mainly by additive gene action, indicating that straightforward selection methods may effectively enhance this feature [14] reported similar findings of high heritability[2].

**Panicle weight:**

The estimates of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) for panicle weight among the genotypes studied were high, with values of 49.24 and 47.84, respectively. These estimates are consistent with those reported by [8]. The characteristic showed a high heritability of 94.38% and a high genetic advance as a percentage of the mean (95.74).

**Grain yield :**

The PCV (49.24) and GCV (39.30) estimates were high, indicating a significant variation in grain yield per plant among the genotypes studied. Similar estimates of PCV and GCV were previously reported by [3,7,5,8,1,4,9,10]. The characteristic showed a high heritability of 62.38% and a high genetic advance as a percentage of the mean (63.94). [3,7,12,5,9,810] also found similar findings of high heritability and high genetic progress as a percentage of the mean.

**Test weight:**

The estimates of phenotypic coefficient of variation (PCV) 16.82 and genotypic coefficient of variation (GCV)16.11 for test weights among the genotypes studied were moderate, indicating low variation. Similar PCV and GCV values were reported by [1,9]. The trait exhibited a high heritability of 91.76%, along with poor genetic progress as a percentage of the mean (31.79). This may be attributed to the prevalence of non-additive gene activities, suggesting that simple selection may not be effective in enhancing this feature. [5,10,6,8] also reported comparable findings of significant heritability and moderate genetic advancement as a percentage of the mean.

**Conclusion**

In the present investigations, the high heritability coupled with high genetic advance is observed in plant height, panicle length, flag leaf length and grain yield. Hence these traits showsattributed to the predominance of additive gene action, which suggests that simple selection effectively increases this feature. Moderate heritability with moderate genetic advance are observed in peduncle length, panicle weight and also in test weight, this shows that both additive gene action and non additive gene action are in control.

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1.

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