*Plant Archives* Vol. 25, Supplement 1, 2025 pp.2430-2435 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.333

# GENETIC VARIABILITY STUDIES IN KODO MILLET (*PASPALUM SCROBICULATUM*)

**Nireekshitha M.K.[1*], M.S. Kamble[2], P.N. Gajbhiye [3], S.J. Waghmare [4], O.N. Ragade[1] and Wagh K.A.[5]**
[1]Department of Genetics and Plant Breeding, RCSM College of Agriculture, Kolhapur (Maharashtra), India.
[2]Department of Agriculture Botany, RCSM College of Agriculture, Kolhapur (Maharashtra), India.
[3]Department of Soil Science, RCSM College of Agriculture, Kolhapur (Maharashtra), India.
[4]Department of Plant Pathology, RCSM College of Agriculture, Kolhapur (Maharashtra), India.
[5]Department of Genetics and Plant breeding, Post graduate institute, MPKV, Rahuri, (Maharashtra), India.
*Corresponding author E-mail: nireekshithakumar55@gmail.com
(Date of Receiving : 09-10-2024; Date of Acceptance : 29-12-2024)

**ABSTRACT**

Kodo millet is an important drought tolerant and hardy crop that can be grown on marginal lands. It is a naturally biofortified crop with higher nutrients, vitamins, minerals, proteins and fiber contents than the other major cereals. In this experiment, thirty-seven genotypes of kodo millet along with one check RK 390-25 were evaluated for yield and yield contributing traits to study the genetic variability parameters. Analysis of variance indicated that the mean sum of squares attributed to genotypes was extremely significant, suggesting a higher degree of genotypic variability present among thirty-eight genotypes of kodo millet. The PCV values were higher than the GCV values for all the characters. This showed that, the environment did have a masking effect on the manifestation of genetic diversity of all the characters under study. High PCV and GCV were observed for grain yield per earhead, plant height and fodder weight per plot. This suggested that these features might be beneficial for selection. High heritability was observed for days to 50 per cent flowering. High genetic advance was observed for fodder weight per plot.
***Keywords*:** Kodo millet, GCV, PCV, Heritability, Genetic advance.

## Introduction

Kodo millet thought to have been domesticated some 3000 years ago in southern Rajasthan and Maharashtra. Approximately 3000 years ago, it was gathered as a wild cereal in West Africa and India (Ravikesan, 2023). These days, Tamil Nadu, Kerala and Karnataka grow it in the South and Uttar Pradesh in the north. Kodo millet is an annual grass that grows up to four feet tall and is a monocot. The chromosome number is 2n=4x=40, which is tetraploid. Its inflorescence yields four to six racemes, each measuring four to nine centimeters. Its thin, light-green leaves can reach a maximum length of 20 to 40 cm. The weight of 1000 kernels of Kodo millet are 6.7 g. Approximately 37 per cent of the grain is made up of husk and bran (Malleshi and Hadimani, 1994). Large and polygonal starch granules are present. While, some small polygonal forms are also present (Kumari and Thayumanavan, 1998). Mostly kodo millet is grown in warm and dry climates. Because of its extreme drought tolerance, it can be grown in regions with inconsistent and little rainfall. It does well in regions with a yearly rainfall of only 40 to 50 centimeters. Kodo millet thrives in a range of soil types, from poor, rocky, gravelly upland soils to loam soils. For adequate growth, deep, loamy, fertile soils with lots of organic matter are ideal. This crop needs well-drained soils with a sufficient amount of moisture to grow continuously. According to the morphology of the panicles, Kodo millet is classified into three races: Variabilis, Irregularis and Regularis (de Wet *et al.*, 1983b). There are recognized small-seeded and large-seeded variants in southern India; these are frequently

grown in the same field together (de Wet *et al.,* 1983b). There is significant variation observed in numerous phenotypic indices, including yield, tiller number and time until flowering, indicating a high degree of general morphological variability. Systematic breeding efforts in this crop have largely been overlooked so far. To initiate any crop improvement program, it is essential to have knowledge of the genetic diversity present within the population. A wide range of variability in the crop's germplasm provides significant potential for its enhancement (Subramanian *et al*., 2010). Consequently, an effort was made to evaluate the variation in yield-related traits across germplasm accessions by examining PCV, GCV, heritability, genetic advance which can provide effective selection criteria for crop improvement.

## Material and Methods

The experimental material for the variability studies comprised of 37 genotypes of kodo millet along with 1 check named RK 390-25 as presented in Table1. The experimental material has been obtained from AICRP on Small Millet, Zonal Agricultural Research Station, Shenda Park, Kolhapur. Field study was conducted at RSJRS, Kolhapur Centre during Summer, 2024. The experiment was laid out in a randomized block design with three replications. Analysis of variance for each character was done as per the standard statistical procedure, given by Panse and Sukhatme (1985). The heritability in broad sense, phenotypic and genotypic coefficient of variation were calculated by using the formula given by Burton and Devane (1952). The genetic advance and genetic advance expressed as per cent of mean was calculated by the method suggested by Johnson *et al.,* (1955).

## Results and Discussion

The results of the analysis of variance for various quantitative characters for thirty-eight genotypes of kodo millet is presented in the Table 2. The results indicated that there is highly significant differences among genotypes for all the characters *viz*., days to 50 per cent flowering, days to physiological maturity, plant height (cm), panicle length (cm), flag leaf blade length (cm), flag leaf blade width (cm), basal tiller number, fodder weight per plot (g), test weight (g) and grain yield per earhead (g) demonstrated that there is sufficient variation for future development. Mean performance of genotypes for these characters presented in Table 3.

### (A) GCV and PCV

Parameters of genetic variability *viz*., genotypic coefficient of variation, phenotypic coefficient of variation, heritability in broad sense, genetic advance and genetic advance as per cent of mean were estimated for yield and yield attributing traits. All the 10 characters studied are presented in the Table 4. The PCV values were higher than the GCV values for all the characters. This showed that, the environment did have a masking effect on the manifestation of genetic diversity of all the characters under study. The traits days to 50 per cent flowering (10.39, 10.74), flag leaf blade length (12.16, 13.59) and basal tiller number (15.22, 17.83) estimated moderate GCV and also PCV (10.1 to 20) revealed less room for improvement under direct selection for these traits due to reduced variation. Nirubana *et al.,* (2017) and Dalsaniya *et al.,* (2024) research findings revealed that the test weight had moderate PCV and GCV. Nirubana *et al.,* (2017) obtained similar results for days to 50 per cent flowering, flag leaf blade length, flag leaf blade width and test weight. The findings of Thakur *et al.,* (2018) was matched for days to physiological maturity. Lekha *et al.,* (2023) noticed moderate PCV and GCV for basal tiller number. The characters plant height (25.04, 27.32), fodder weight per plot (23.86, 25.96) and grain yield per earhead (28.81, 31.18) exhibited high GCV in addition to high PCV (>20) showed that the differences seen in these characteristics had a significant impact on overall variability. The results of Sao *et al.,* (2017) and Suthediya *et al.,* (2021) were consistent with these high PCV and GCV values for grain yield per earhead and fodder weight per plot. Jeeva *et al.,* (2022) found out that the character plant height exhibits high PCV and high GCV values.

### (B) Heritability

The estimates of heritability (b.s.) were ranged from 93.73 to 23.65 per cent. Days to 50 per cent flowering recorded high heritability (93.73%) followed by days to physiological maturity (92.58%), grain yield per earhead (85.40%), fodder weight per plot (84.50%), plant height (84.01%), flag leaf blade width (83.33%), flag leaf blade length (80.10%) and basal tiller number (72.81%) suggests that unlike environmental influences, genetic factors account for a large portion of the observed variances in these traits among individuals in the population. Moderate heritability recorded in test weight (46.43%). Whereas, low heritability was expressed by panicle length (27.33%). This suggested that environmental variables had an impact on these characters. These results corroborate those of Sao *et al.,* (2017) and Lekha *et al.,* (2023) for number of days to 50 per cent flowering, number of days to physiological maturity and grain yield per earhead. Thakur *et al.,* (2018) and Dalsaniya *et al.,* (2024) noticed same for fodder weight per plot. Nirubana *et al.,* (2017) and Dalsaniya *et al.,* (2024)

obtained similar results for basal tiller number, flag leaf blade width and plant height. Choubey *et al.,* (2024) and Jeeva *et al.,* (2022) provided explanations for similar test weight findings as well as for flag leaf blade length and plant height.

**(C) Genetic Advance**

The high genetic advance recorded for the character fodder weight per plot (74.24), plant height (43.86), days to physiological maturity (26.57), days to 50 per cent flowering (19.67), flag leaf blade length (8.21) and basal tiller number (5.10) showed that choosing these features will result in a major improvement in next hybridization programs. While, less genetic gain was noticed in grain yield per earhead (1.13), panicle length (0.80), test weight (0.66) and flag leaf blade width (0.36). Similar findings were reported by Nirubana *et al.,* (2017) for basal tiller number, flag leaf blade width and test weight. Kadam *et al.,* (2009) unveiled same findings for days to 50 per cent flowering in finger millet. Plant height outcomes coincided with the findings of Singh *et al.,* (2014). Anuradha *et al.,* (2020) come up with same findings for panicle length and grain yield per earhead. Jeeva *et al.,* (2022) agreed with results of flag leaf blade length. Thakur *et al.,* (2018) observed same for days to physiological maturity and Singh *et al.,* (2014) recorded same for fodder weight per plot.

**(D) Genetic advance as percent of mean**

The high genetic advance as per cent of mean was noticed for grain yield per earhead (70.29%) succeeded by plant height (60.58%), fodder weight per plot (57.90%), flag leaf blade width (44.53%), basal tiller number (34.28%), flag leaf blade length (28.73%), days to 50 per cent flowering (26.57%), days to physiological maturity (25.11%) suggested that additive genes control these qualities and selection will be favourable for improving them. Whereas, genetic advance as per cent mean was moderate for test weight (16.69%) demonstrated that non-additive genes control these traits and it was low for, panicle length (9.50%). Similar findings were unveiled by Nirubana *et al.,* (2017), Lekha *et al.,* (2023) and Choubey *et al.,* (2024) for basal tiller number and test weight. Kiranmayi *et al.,* (2022) noticed same for flag leaf blade width in finger millet. Keerthana *et al.,* (2019) aligned with same findings for days to 50 per cent flowering, flag leaf blade length, fodder weight per plot and grain yield per earhead in finger millet. Anuradha *et al.,* (2020) reported same findings for days to physiological maturity and panicle length.

**Table 1:** List of kodo millet genotypes included in the study:

| Sr No. | GENOTYPE | Sr No. | GENOTYPE |
|---|---|---|---|
| **1.** | KOP-KM-23-01 | **20.** | KOP-KM-23-24 |
| **2.** | KOP-KM-23-02 | **21.** | KOP-KM-23-25 |
| **3.** | KOP-KM-23-03 | **22.** | KOP-KM-23-31 |
| **4.** | KOP-KM-23-04 | **23.** | KOP-KM-23-32 |
| **5.** | KOP-KM-23-07 | **24.** | KOP-KM-23-33 |
| **6.** | KOP-KM-23-08 | **25.** | KOP-KM-23-35 |
| **7.** | KOP-KM-23-09 | **26.** | KOP-KM-23-36 |
| **8.** | KOP-KM-23-10 | **27.** | KOP-KM-23-38 |
| **9.** | KOP-KM-23-11 | **28.** | KOP-KM-23-39 |
| **10.** | KOP-KM-23-12 | **29.** | KOP-KM-23-40 |
| **11.** | KOP-KM-23-13 | **30.** | KOP-KM-23-43 |
| **12.** | KOP-KM-23-14 | **31.** | KOP-KM-23-44 |
| **13.** | KOP-KM-23-15 | **32.** | KOP-KM-23-45 |
| **14.** | KOP-KM-23-16 | **33.** | KOP-KM-23-46 |
| **15.** | KOP-KM-23-17 | **34.** | KOP-KM-23-47 |
| **16.** | KOP-KM-23-18 | **35.** | KOP-KM-23-48 |
| **17.** | KOP-KM-23-21 | **36.** | KOP-KM-23-49 |
| **18.** | KOP-KM-23-22 | **37.** | KOP-KM-23-50 |
| **19.** | KOP-KM-23-23 | **38.** | RK 390-25 |

**Table 2 :** Analysis of variance for ten characters in kodo millet

| Sr. No. | Characters | Mean sum of squares (MSS) | | |
|---|---|---|---|---|
| | | Replications df=2 | Treatments df=37 | Error df= 74 |
| 1 | Days to 50 per cent flowering | 5.95 | 181.74** | 3.96 |
| 2 | Days to physiological maturity | 9.51 | 337.24** | 8.78 |
| 3 | Plant height(cm) | 8.49 | 1048.58** | 62.57 |
| 4 | Panicle length(cm) | 0.97 | 1.88** | 0.88 |
| 5 | Flag leaf blade length(cm) | 3.28 | 39.26** | 3.00 |
| 6 | Flag leaf blade width(cm) | 0.0050 | 0.0699** | 0.0044 |
| 7 | Basal tiller number | 2.42 | 17.32** | 1.92 |
| 8 | Fodder weight per plot(g) | 131.48 | 2979.03** | 171.61 |
| 9 | Test weight(g) | 0.02 | 0.57** | 0.16 |
| 10 | Grain yield per earhead(g) | 0.036 | 0.69** | 0.037 |

*, ** significant at 5 and 1 per cent, respectively.

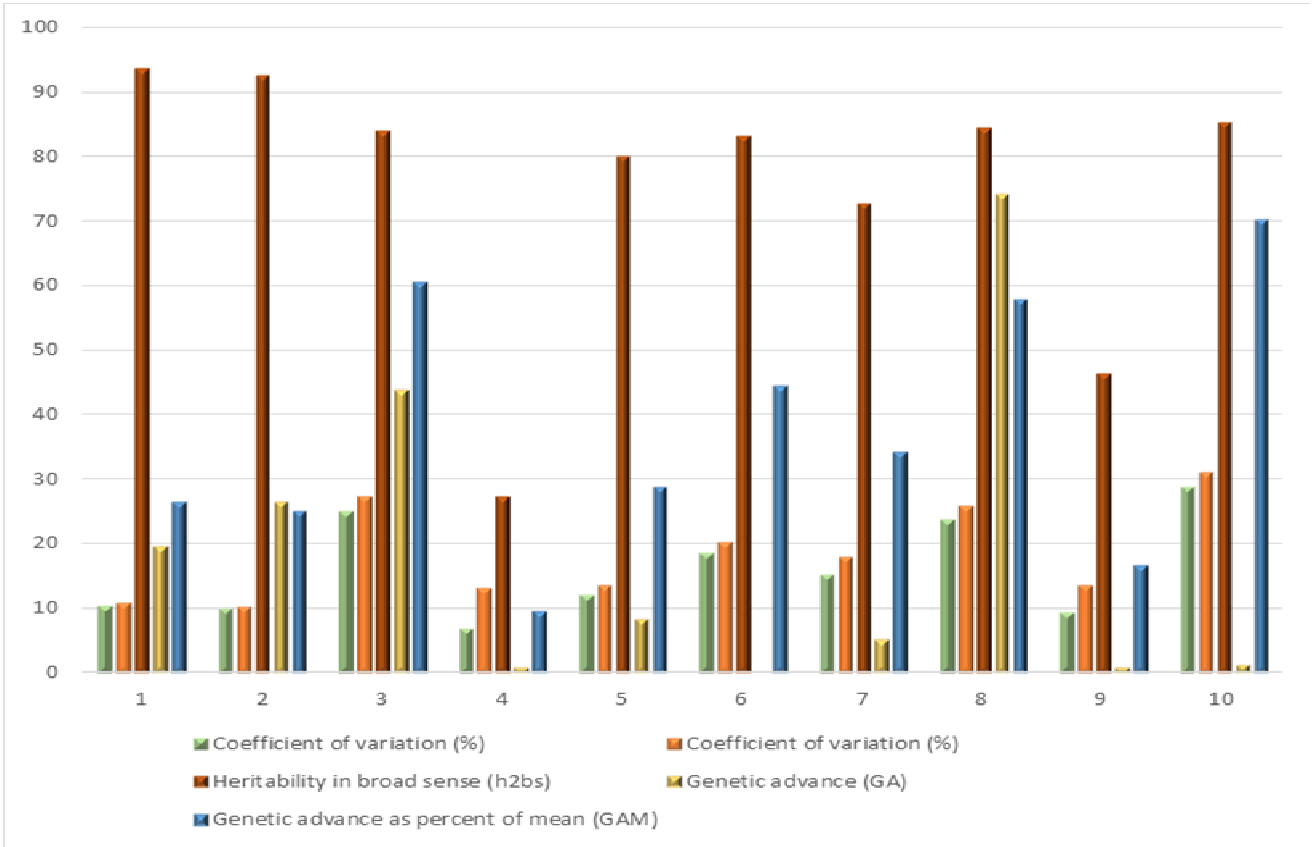
**Table 3 :** Mean performance of 38 genotypes of kodo millet for ten characters.

| Sr. No. | Genotypes | Days to 50 per cent flowering | Days to physiological maturity | Plant height (cm) | Panicle length (cm) | Flag leaf blade length (cm) | Flag leaf blade width (cm) | Basal tiller number | Fodder weight per plot(g) | Test weight (g) | Grain yield per earhead (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | KOP-KM-23-01 | 89 | 123 | 90.9 | 9.77 | 36.7 | 1.17 | 20.23 | 175.6 | 4.90 | 2.43 |
| 2 | KOP-KM-23-02 | 65 | 98 | 85.2 | 8.50 | 33.1 | 0.60 | 12.47 | 121.3 | 3.83 | 1.30 |
| 3 | KOP-KM-23-03 | 73 | 101 | 88.8 | 7.77 | 31.1 | 0.87 | 12.53 | 173.0 | 4.17 | 2.63 |
| 4 | KOP-KM-23-04 | 77 | 96 | 89.5 | 7.33 | 26.2 | 0.87 | 14.13 | 103.1 | 4.03 | 1.17 |
| 5 | KOP-KM-23-07 | 67 | 95 | 72.3 | 8.50 | 31.8 | 0.73 | 12.87 | 116.2 | 3.47 | 1.50 |
| 6 | KOP-KM-23-08 | 74 | 105 | 44.5 | 7.23 | 29.3 | 0.77 | 13.63 | 130.0 | 4.40 | 1.43 |
| 7 | KOP-KM-23-09 | 66 | 96 | 73.6 | 6.67 | 27.8 | 0.73 | 15.77 | 95.1 | 4.13 | 1.27 |
| 8 | KOP-KM-23-10 | 65 | 97 | 74.4 | 7.27 | 27.0 | 0.73 | 15.30 | 102.4 | 4.07 | 1.17 |
| 9 | KOP-KM-23-11 | 66 | 96 | 76.6 | 9.27 | 31.5 | 0.60 | 15.47 | 103.8 | 4.50 | 1.27 |
| 10 | KOP-KM-23-12 | 65 | 94 | 60.4 | 9.27 | 27.9 | 0.63 | 16.77 | 126.3 | 4.03 | 1.17 |
| 11 | KOP-KM-23-13 | 65 | 93 | 44.5 | 7.40 | 23.3 | 0.70 | 13.00 | 68.7 | 3.20 | 1.33 |
| 12 | KOP-KM-23-14 | 75 | 98 | 65.1 | 7.90 | 25.3 | 0.70 | 19.50 | 93.6 | 4.40 | 1.13 |
| 13 | KOP-KM-23-15 | 80 | 108 | 75.1 | 8.23 | 22.0 | 0.77 | 19.07 | 100.3 | 4.23 | 1.37 |
| 14 | KOP-KM-23-16 | 67 | 114 | 65.3 | 8.43 | 27.6 | 0.80 | 19.43 | 84.9 | 2.93 | 1.30 |
| 15 | KOP-KM-23-17 | 72 | 99 | 67.7 | 8.57 | 28.3 | 0.70 | 19.07 | 99.3 | 4.13 | 1.20 |
| 16 | KOP-KM-23-18 | 65 | 102 | 57.5 | 8.30 | 26.0 | 0.83 | 18.17 | 147.8 | 4.10 | 1.33 |
| 17 | KOP-KM-23-21 | 74 | 93 | 44.5 | 7.13 | 23.1 | 0.67 | 12.13 | 75.6 | 3.40 | 1.30 |
| 18 | KOP-KM-23-22 | 78 | 104 | 88.2 | 9.33 | 21.1 | 0.73 | 14.80 | 124.7 | 3.83 | 1.37 |
| 19 | KOP-KM-23-23 | 74 | 116 | 47.7 | 8.00 | 31.8 | 0.90 | 16.30 | 150.3 | 3.60 | 1.20 |
| 20 | KOP-KM-23-24 | 88 | 104 | 45.1 | 8.57 | 27.0 | 0.90 | 14.67 | 148.5 | 3.87 | 1.23 |
| 21 | KOP-KM-23-25 | 82 | 121 | 62.7 | 9.13 | 27.3 | 0.63 | 16.63 | 101.9 | 4.50 | 1.77 |
| 22 | KOP-KM-23-31 | 80 | 114 | 55.7 | 8.97 | 24.8 | 0.77 | 11.90 | 105.8 | 3.27 | 1.23 |
| 23 | KOP-KM-23-32 | 76 | 112 | 55.2 | 8.90 | 28.3 | 0.73 | 16.67 | 107.6 | 3.57 | 1.80 |
| 24 | KOP-KM-23-33 | 77 | 115 | 50.0 | 8.47 | 27.2 | 0.87 | 16.20 | 147.1 | 3.80 | 1.83 |
| 25 | KOP-KM-23-35 | 80 | 115 | 50.5 | 8.33 | 25.9 | 0.63 | 16.53 | 125.5 | 3.53 | 2.10 |
| 26 | KOP-KM-23-36 | 68 | 114 | 54.0 | 7.67 | 27.6 | 0.70 | 12.23 | 126.0 | 3.50 | 2.27 |
| 27 | KOP-KM-23-38 | 77 | 96 | 90.0 | 8.67 | 24.7 | 0.77 | 12.90 | 90.4 | 4.23 | 1.13 |
| 28 | KOP-KM-23-39 | 72 | 110 | 65.1 | 7.17 | 29.6 | 0.60 | 13.07 | 146.0 | 4.43 | 1.17 |
| 29 | KOP-KM-23-40 | 68 | 97 | 83.0 | 8.10 | 27.0 | 0.90 | 13.20 | 153.2 | 4.03 | 1.23 |
| 30 | KOP-KM-23-43 | 66 | 95 | 75.4 | 8.40 | 26.4 | 0.83 | 15.10 | 165.5 | 3.77 | 1.37 |
| 31 | KOP-KM-23-44 | 66 | 93 | 93.3 | 9.50 | 32.1 | 0.90 | 14.20 | 178.0 | 3.60 | 2.37 |
| 32 | KOP-KM-23-45 | 90 | 123 | 82.3 | 9.23 | 30.8 | 0.70 | 12.40 | 155.2 | 4.17 | 2.13 |
| 33 | KOP-KM-23-46 | 76 | 103 | 77.8 | 8.97 | 34.0 | 1.23 | 12.00 | 170.0 | 4.40 | 2.57 |
| 34 | KOP-KM-23-47 | 75 | 113 | 97.7 | 8.77 | 32.5 | 1.00 | 13.07 | 158.4 | 4.03 | 2.17 |
| 35 | KOP-KM-23-48 | 90 | 125 | 106.2 | 8.93 | 32.4 | 0.97 | 13.70 | 136.6 | 4.60 | 2.10 |
| 36 | KOP-KM-23-49 | 76 | 123 | 107.3 | 9.20 | 32.5 | 1.03 | 13.37 | 175.9 | 4.37 | 2.20 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | KOP-KM-23-50 | 87 | 125 | 108.9 | 9.33 | 33.4 | 1.03 | 13.40 | 179.7 | 4.47 | 2.23 |
| 38 | RK-390-25 (Ch) | 64 | 95 | 79.3 | 7.33 | 31.9 | 0.70 | 14.00 | 108.2 | 3.93 | 1.57 |
| | Mean | **74** | **106** | **72.40** | **8.38** | **28.59** | **0.80** | **14.89** | **128.2** | **3.99** | **1.61** |
| | Range | **64-90** | **93-125** | **44.5–108.9** | **6.67–9.77** | **21.1–36.7** | **0.60–1.23** | **11.90–20.23** | **68.7–179.7** | **2.93–4.90** | **1.13–2.63** |
| | S. Em± | 1.14 | 1.71 | 4.57 | 0.54 | 1.00 | 0.04 | 0.80 | 7.56 | 0.23 | 0.11 |
| | C.V. % | **2.69** | **2.80** | **10.93** | **11.21** | **6.06** | **8.26** | **9.30** | **10.22** | **9.97** | **11.91** |
| | C.D. (5%) | 3.24 | 4.82 | 12.87 | 1.53 | 2.82 | 0.10 | 2.25 | 21.31 | 0.64 | 0.31 |

**Table 4 :** Parameters of genetic variability of ten characters in 38 genotypes of kodo millet.

| Sr. No. | Characters | Range | | Mean | Coefficient of variation (%) | | Heritability in broad sense ($h^2$bs) | Genetic advance (GA) | Genetic advance as percent of mean (GAM) |
|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Max. | | Genotypic (GCV) | Phenotypic (PCV) | | | |
| 1 | Days to 50 per cent flowering | 64 | 90 | 74 | 10.39 | 10.74 | 93.73 | 19.67 | 26.57 |
| 2 | Days to physiological maturity | 93 | 125 | 106 | 9.89 | 10.27 | 92.58 | 26.57 | 25.11 |
| 3 | Plant height(cm) | 44.53 | 108.9 | 72.40 | 25.04 | 27.32 | 84.01 | 43.86 | 60.58 |
| 4 | Panicle length(cm) | 6.67 | 9.77 | 8.38 | 6.88 | 13.15 | 27.33 | 0.80 | 9.50 |
| 5 | Flag leaf blade length(cm) | 21.1 | 36.7 | 28.59 | 12.16 | 13.59 | 80.10 | 8.21 | 28.73 |
| 6 | Flag leaf blade width(cm) | 0.60 | 1.23 | 0.80 | 18.48 | 20.24 | 83.33 | 0.36 | 44.53 |
| 7 | Basal tiller number | 11.9 | 20.2 | 14.89 | 15.22 | 17.83 | 72.81 | 5.10 | 34.28 |
| 8 | Fodder weight per plot(g) | 68.7 | 179.7 | 128.2 | 23.86 | 25.96 | 84.50 | 74.24 | 57.90 |
| 9 | Test weight(g) | 2.93 | 4.90 | 3.99 | 9.28 | 13.62 | 46.43 | 0.66 | 16.69 |
| 10 | Grain yield per earhead(g) | 1.13 | 2.63 | 1.61 | 28.81 | 31.18 | 85.40 | 1.13 | 70.29 |




1 Days to 50 per cent flowering
2 Days to physiological maturity
3 Plant height (cm)
4 Panicle length (cm)
5 Flag leaf blade length (cm)
6 Flag leaf blade width (cm)
7 Basal tiller number
8 Fodder weight per plot (g)
9 Test weight (g)
10 Grain yield per earhead (g)

**Fig. 1 :** Genetic variability parameters for 12 characters in 38 genotypes of Kodo millet

## Conclusions

Numerous variables in the current study showed large mean sum of squares, indicating a high degree of genetic variability. For every feature in the research, the phenotypic coefficient of variation (PCV) was greater than the genotypic coefficient of variation (GCV). High PCV and GCV showed by grain yield per earhead, plant height and fodder weight per plot. High heritability observed by days to 50 per cent flowering and high genetic gain showed by fodder weight per plot.

**Acknowledgement**

The Authors are thankful to AICRP on Small Millet, Zonal Agricultural Research Station, Shenda Park, Kolhapur for providing kodo millet genotypes to conduct the experiment.

## References

Anuradha, N., Patro, T. S. S. K., Triveni, U., Rao, P. J., & Rajkumar, S. (2020). Trait association and genetic variability in browntop millet. *Journal of Pharmacognosy and Phytochemistry*, **9**(1), 1950-1953.

Choubey, A., Joshi, R. P., & Paliwal, S. (2024). Genetic variability, correlation and path coefficient of yield components and other agronomic of kodo millet (*Paspalum scrobiculatum* L.). *Plant cell biotechnology and molecular biology*, **25**(7-8), 36–47.

Dalsaniya, D., Das, A., & Parmar, D. J. (2024). Variability study and DUS characterization in kodo millet (*Paspalum scrobiculatum* L.). *International Journal of Plant & Soil Science*, **36**(4), 408-417.

de Wet J. M. J., Rao K. E. P., Mengesha M. H., Brink D. E. (1983b). Diversity in kodo millet, *Paspalum scrobiculatum*. *Econ. Bot*. **37**, 159–163.

Jeeva, G, R. Ravikesavan, K. Iyanar, M. Raveendran, A. Senthil and T. Chitjeshwari (2022). Analyzing the variability and correlation in M4 mutants of Kodo millet (*Paspalum scrobiculatum* L.) Grown in Southern India. *International Journal of Plant & Soil Science*. **34**(22): 1012-1019.

Johnson, H.W, Robinson, H.F. and Comstock, R.E. 1955. Estimates of genetic and environmental variability of soybeans. Agron. J., **47**: 314-318.

Kadam, D. D., Kulkarni, S. R., & Jadhav, B. S. (2009). Genetic variability, correlation and path analysis in finger millet (*Eleusine coracana* Gaertn). J. Maharashtra Agric. Univ, **34**(2), 131-134.

Keerthana, K., Chitra, S., Subramanian, A., Nithila, S., & Elangovan, M. (2019). Studies on genetic variability in finger millet (*Eleusine coracana* (L.) Gaertn) genotypes under sodic conditions. *Electronic Journal of Plant Breeding*, **10**(2), 566-569.

Kiranmayi, M. S. S., Pandey, A. P., Gaur, R. S., & Gupta, A. (1987). Estimates of variability parameters for yield and its components in finger millet (*Eleusine coracana* L.). development, 17.

Krishna Kumari, S., Thayumanavan, B. (1998). Characterization of starches of proso, foxtail, barnyard, kodo, and little millets. Plant Foods Hum Nutr 53, 47–56 (1998). https://doi.org/10.1023/A:1008083020810.

Lekha, J, S., Rajendrakumar, P., Deepika, C. & Hemalatha, V. (2023). Influence of Genetic variability parameters, character association and path analysis for grain yield and its attributing traits in Kodo millet improvement. *International Journal of Environment and Climate Change*, **13**(9), 3518–3525.

Malleshi, N.G., Hadimani, N.A., Chinnaswamy, R. et al. (1994). Physical and nutritional qualities of extruded weaning foods containing sorghum, pearl millet, or finger millet blended with mung beans and non-fat dried milk. Plant Food Hum Nutr 49, 181–189. https://doi.org/10.1007/BF01093214.

Nirubana, V., Ganesamurthy, K., Ravikesavan, R., & Chitdeshwari, T. (2017). Genetic variability studies for yield and yield components in Kodo millet (*Paspalum scrobiculatum* L.). *Electronic Journal of Plant Breeding*, **8**(2), 704-707.

Panse, V.G. and Sukhatme, P.V. (1985) Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research Publication, 87-89.

Rao, C. R. (1952). Advanced statistical methods in biometrical research, John Willey & Sons. Inc., New York, pp. 357-363.

Ravikesavan, R., Jeeva, G., Jency, J. P., Muthamilarasan, M., & Francis, N. (2023). Kodo millet (*Paspalum scrobiculatum* L.). In Neglected and Underutilized Crops (pp. 279-304). academic press.

Singh, B., Upadhyay, P. K., & Sharma, K. C. (2014). Genetic variability, correlation and path analysis in pearl millet (Pennisetum glaucum (L.) R. Br.). *Indian Research Journal of Genetics and Biotechnology*, **6**(04), 605-612.

Sao, A., Singh, P., Kumar, P., & Pradhan, A. (2017). Estimates of genetic parameters for yield and contributing traits in Kodo millet (*Paspalum scrobiculatum* L.). *Research Journal of Agricultural Sciences*, **8**(1), 120-122.

Subramanian, A., Nirmalakumari, A., and Veerabadhiran, P. (2010). Trait based selection of superior kodo millet (*Paspalum scrobiculatum* L.) genotype. Elect. J. of Plant Breeding **1**(4): 852– 855.

Suthediya, V. R., Desai, S. S., Pethe, U. B., Naik, K. V., Mahadik, S. G., & Pendyala, S. (2021). Genetic diversity studies in Kodo millet (*Paspalum scrobiculatum* L.). *Electronic Journal of Plant Breeding*, **12**(4), 1337-1344.

Thakur, J., Kanwar, R. R., Kumar, P., Salam, J. L., & Kar, S. (2018). Studies of genetic parameters for yield and yield attributing traits of Kodo millet (*Paspalum scrobiculatum* L). *Int J Curr Microbial Appl Sci*, **7**(09), 278-287.