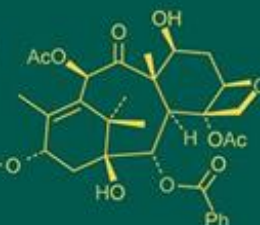
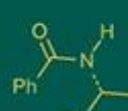
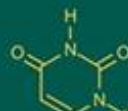
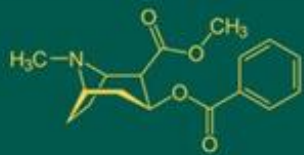


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Genetic variability studies in leafy amaranthus (*Amaranthus tricolor*)

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Abstract

The present investigation was conducted during the summer season of the academic year 2025-26 at the Instructional-cum-Research Farm, Horticulture Section, Rajarshree Chhatrapati Shahu Maharaj Government College of Agriculture, Kolhapur. The experiment was laid out in a Randomized Block Design (RBD) comprising 29 leafy amaranthus genotypes with two replications. The recorded observations were subjected to statistical analysis to estimate the extent of genetic variability, heritability and genetic advance among the evaluated genotypes. High GCV and PCV were observed for fresh weight per plant (g), leaf area (cm²), leaf/stem ratio, average leaf weight (g), number of leaves per plant, number of branches per plant and stem girth (mm), indicating the presence of considerable genetic variability and good scope for improvement through selection. Moderate variability was recorded for petiole length (cm), yield per plot (kg), yield per hectare (q), days to germination, plant height (cm), days to harvest and nitrogen content (%). High heritability was recorded for fresh weight per plant (g), number of leaves per plant, leaf area (cm²), potassium content (%), average leaf weight (g), leaf/stem ratio, nitrogen content (%), stem girth (mm), petiole length (cm), phosphorus content (%), number of branches per plant, yield per plot (kg) and yield per hectare (q). Moderate heritability was observed for plant height (cm). Overall, high genetic advance coupled with high heritability for fresh weight per plant (g), leaf area (cm²), leaf/stem ratio, average leaf weight (g), number of leaves per plant and related traits indicates the predominance of additive gene action, making these characters suitable for improvement through simple selection. In contrast, the low genetic advance observed for moisture content suggests limited scope for improvement through direct selection. Genotype ACKLA-17 recorded superior performance for several important growth and yield traits was identified as the most promising genotype. ACKLA-28, ACKLA-23, ACKLA-14 and ACKLA-20 were also recognized as desirable genotypes for utilization in future breeding programmes.

Keywords: Leafy amaranthus, variability, heritability, genetic advance

Introduction

Amaranthus (*Amaranthus* spp. L) is an important leafy vegetable belonging to the family Amaranthaceae. The name *Amaranthus* is derived from the Greek word meaning “everlasting” or “never fading.” The genus exhibits considerable morphological variation and the vegetable types have a chromosome number of $2n = 34$ (Anjali *et al.* 2013) [1]. It is popularly known as 'Math' in Marathi and 'Chaulai' in Hindi. *Amaranthus tricolor*, popularly known as the “poor man’s vegetable,” is an important leafy vegetable widely consumed in India. Its high nutritional value, affordability, short crop duration and adaptability to diverse climatic conditions have made it a staple in the daily diet of many households, particularly in southern India (Varalakshmi, 2004) [2]. *Amaranthus* is a highly nutritious leafy vegetable, rich in lysine, sulfur-containing amino acids, vitamins, minerals, dietary fiber, and high-quality protein (Panda *et al.* 2017) [3]. The leaves and stems are excellent sources of calcium, iron, vitamins A and C, protein and carbohydrates according to Kelly and Martin (1983) [4], (Bose *et al.* 1993; Kachiguma *et al.* 2015) [5,6]. The seeds contain 15-18% protein, exceeding that of wheat and provide essential amino acids comparable to whole egg protein (Dodok *et al.* 1996; Drzewiecki *et al.* 2003) [7,8]. Regular consumption reduces blood pressure and cholesterol levels, while improving antioxidant status and some immunological parameters (Gonor *et al.* 2006) [9]. *Amaranthus* supplies an important alternative source of food for vegetarian communities, where the availability of protein-rich foods is limited (Malaghan *et al.* 2018) [10].

The genetic improvement of any crop largely relies on the available genetic variability for quantitative traits and its effective utilization through suitable breeding strategies. India, being the center of origin of *Amaranthus* species, possesses a wide range of genetic variability that can be harnessed to develop high-yielding varieties. This variability can be dissected into heritable and non-heritable components using genetic parameters such as the genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability and genetic advance (Diwan *et al.* 2017) ^[11].

Materials and Methods

A field experiment was conducted during the summer season of 2025 at the Instructionalcum-Research Farm, Horticulture Section, Rajarshee Chhatrapati Shahu Maharaj Government College of Agriculture, Kolhapur. The study included 29 genotypes of leafy amaranthus laid out in a Randomized Block Design (RBD) with two replications. Seeds were sown by the line sowing method and observations on 17 characters were recorded from five randomly selected plants in each treatment.

Table 1: Detail of genotypes and check cultivar used in the experiment

Sr. No	Genotype No.	Source	Sr. No	Genotype No.	Source
1	Konkan Durangi (C)	BSKVV, Dapoli (MH)	16	ACKLA-16	Miraj Local Red (MH)
2	ACKLA-2	Dharwad Local (KA)	17	ACKLA-17	Kerala Local (KL)
3	ACKLA-3	Wai Local (MH)	18	ACKLA-18	Mysore Local (KA)
4	ACKLA-4	Hubbali Local (KA)	19	ACKLA-19	Palus Local (MH)
5	ACKLA-5	Thrissur Local (KL)	20	ACKLA-20	U.Kannada Local (KA)
6	ACKLA-6	Kolar Local (KA)	21	ACKLA-21	Miraj Local (MH)
7	ACKLA-7	Bidar Local (KA)	22	ACKLA-22	Kadegaon Local (MH)
8	ACKLA-8	Thaickal Local (KL)	23	ACKLA-23	Trivandrum Local (KL)
9	ACKLA-9	Kagal Local Red (MH)	24	ACKLA-24	Wayanad Local (KL)
10	ACKLA-10	Solapur Local (MH)	25	ACKLA-25	Kagal Local Green (MH)
11	ACKLA-11	Vlathankara Local (KL)	26	ACKLA-26	Salgare Red Local (MH)
12	ACKLA-12	Salgare Local (MH)	27	ACKLA-27	Pandharpur Local (MH)
13	ACKLA-13	Tumkaru Local (KL)	28	ACKLA-28	Allappuzha Local (KL)
14	ACKLA-14	Ernakulam Local (KL)	29	ACKLA-29	Palkkad Local (KL)
15	ACKLA-15	Satara Local (MH)	-	-	-

(MH- Maharashtra, KA- Karnataka, KL- Keralam)

Result and Discussion

The results of the present experiment carried out with 29 genotypes of leafy amaranthus (*Amaranthus tricolor*) to assess the genetic variability among yield and its component traits are presented under the following headings.

Analysis of Variance: The significance of variation was tested using the F-test. The results of the ANOVA, including mean sum of squares due to replication, treatment and error for all 17 characters, are presented in Table 2. The analysis of variance

(ANOVA) showed highly significant variation amongst the 29 genotypes of the leafy amaranthus on all characters evaluated. There was highly significant variation for characters like leaf area (659.86), fresh weight per plant (178.42), yield per ha (149.31), number of leaves per plant (49.70), days to harvest (30.25), plant height (26.37), number of branches per plant (4.90), stem girth (4.68), days to germination (1.77), petiole length (1.49), leaf/stem ratio (0.91), potassium (0.40), nitrogen (0.33), yield per plot (0.24) and phosphorus (0.0035). This suggests that there is quite some genetic variability present in the studied material.

Table 2: Analysis of variance for different parameters in Leafy Amaranthus genotypes

Sr. No.	Parameters	Mean sum of square		
		Replication df=1	Treatment df=28	Error df=28
1	Days to germination	0.16	1.77**	0.23
2	Plant height (cm)	15.70	26.37**	7.61
3	Stem girth (mm)	0.011	4.68**	0.38
4	Leaf area (cm ²)	8.64	659.86**	14.33
5	Number of branches per plant	0.33	4.90**	0.45
6	Number of leaves per plant	3.48	49.70**	1.01
7	Petiole length (cm)	0.15	1.49**	0.12
8	Leaf/Stem ratio	0.021	0.91**	0.023
9	Days to harvest	21.12	30.25**	4.01
10	Average leaf weight (g)	0.0013	0.19	0.0047
11	Fresh weight per plant (g)	4.62	178.40**	3.33
12	Yield per plot (kg)	0.039	0.24**	0.025
13	Yield per ha (q)	24.43	149.31**	15.31
14	Nitrogen (%)	0.000	0.33**	0.018
15	Phosphorus (%)	0.000058	0.0035**	0.00031
16	Potassium (%)	0.0013	0.40**	0.0095
17	Moisture (%)	4.76	8.54	4.71

* Significant at 5% level ($p \leq 0.05$)

** Highly significant at 1% level ($p \leq 0.01$)

Parameters of Genetic Variability

Various genetic variability parameters, including the range of variation, variance components, estimates of genotypic coefficients of variation (GCV) and phenotypic coefficients of variation (PCV), broad-sense heritability, genetic advance (GA) and expected genetic advance as a percentage of the mean, were estimated and are summarized in Table 3. Assessment of variability forms the basis of a successful breeding programme aimed at improving yield and quality attributes. Hence, estimation of genotypic and phenotypic coefficients of variation is necessary to understand the nature and magnitude of variation.

Coefficients of Variation

Genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) are important measures used to assess the magnitude of variability present in a population. Estimates of PCV, GCV and heritability help predict the effectiveness of selection and the expected genetic improvement in a trait.

High estimates of both genotypic and phenotypic coefficients of variation were recorded for seven characters viz Fresh weight per plant (GCV=58.02% and PCV=59.12%), Leaf area (GCV=51.46% and PCV=52.59%), Leaf / stem ratio (GCV=47.44% and PCV=48.67%), Average leaf weight (GCV=46.05% and PCV=47.19%), Number of leaves per plant (GCV=32.50% and PCV=33.17%), Number of branches per plant (GCV=26.00% and PCV=28.50%) and Stem girth (GCV=23.20% and PCV=25.15%). The present findings are in agreement with those of Annapoorna *et al.* (2021) [12] for leaf area, Chattopadhyay *et al.* (2013) [13] for number of leaves per plant and green yield per plant and Mobina *et al.* (2014) [14] for fresh weight per plant and number of leaves per plant. Similar results were also reported by Sravanthi *et al.* (2012) [15] for leaf area, stem girth, number of branches per plant and leaf/stem ratio, while Tejaswini *et al.* (2017) [16] observed comparable trends for stem diameter, number of branches per plant, number of leaves per plant, leaf weight per plant and leaf/stem ratio.

Moderate estimates of both GCV and PCV were observed for Petiole length (GCV=17.27% and PCV=18.76%), Yield per plot (GCV=13.40% and PCV=14.86%), Yield per hectare (GCV=13.40% and PCV=14.86%), Days to germination (GCV=13.09% and PCV=14.89%), Plant height (GCV=12.81% and PCV=17.24%), Days to harvest (GCV=10.95% and PCV=12.51%) and Nitrogen content (GCV=10.81% and PCV=11.42%) indicating the presence of moderate variability for these traits. The present findings are in accordance with those of Diwan *et al.* (2017) [11] for petiole length and leaf yield

per plot. Similar results for plant height were reported by Panda *et al.* (2017) [3] and Ramesh *et al.* (2013) [17]. Comparable findings for petiole length, leaf yield per plot and leaf yield per hectare were also reported by Annapoorna *et al.* (2021) [12], while Sumanth *et al.* (2024) [18] observed similar results for days to harvest. Low estimates of both GCV and PCV were observed for potassium content (9.62% and 9.84%), phosphorus content (7.82% and 8.56%), and moisture content (1.56% and 2.90%), indicating relatively low variability for these traits among the genotypes studied. These results corroborate the findings of Kumar *et al.* (2021) [19] with respect to moisture content.

In the present investigation, PCV values were higher than the corresponding GCV values for all the traits studied, indicating the influence of both genetic and environmental factors on trait expression. The present results are in agreement with the findings of Ramesh *et al.* (2013) [17], Sravanthi *et al.* (2012) [15] and Venkatesh (2012) [20] in amaranthus. However, the relatively narrow difference between GCV and PCV suggested a limited environmental effect. High estimates of both GCV and PCV were observed for fresh weight per plant, leaf area, leaf/stem ratio, average leaf weight, number of leaves per plant, number of branches per plant and stem girth, indicating the presence of substantial genetic variability and greater scope for effective selection.

Heritability (Broad Sense)

The coefficient of variation indicates the extent of variability among genotypes, whereas heritability assesses the effectiveness of selection. When considered together with genetic advance, heritability provides a reliable estimate of the potential for genetic improvement through selection. Broad-sense heritability is particularly useful for identifying superior genotypes in breeding programmes. According to Robinson *et al.* (1949) [21], heritability is classified as low (<30%), moderate (30-60%) and high (>60%).

High broad-sense heritability was recorded for fresh weight per plant (96.34%), number of leaves per plant (96.02%), leaf area (95.70%), potassium content (95.41%), average leaf weight (95.23%), leaf/stem ratio (95.02%), nitrogen content (89.63%), stem girth (85.07%), petiole length (84.66%), phosphorus content (83.51%), number of branches per plant (83.20%), yield per plot (81.39%) and yield per hectare (81.39%). The narrow difference between GCV and PCV values for these traits resulted in high heritability estimates, indicating a predominance of genetic factors over environmental influences. Hence, direct selection for these characters would be effective. Moderate heritability was observed for plant height (55.20%), while moisture content exhibited low heritability (28.94%).

Table 3: Different Parameters of Variability in Leafy Amaranthus

Sr. No	Characters	Mean	Range		GCV (%)	PCV (%)	Heritability (B. S.)%	Genetic advance	Genetic advance as % of mean
			Min	Max					
1	Days to Germination	6.71	5.50	9.00	13.09	14.89	77.28	1.59	23.71
2	Plant Height (cm)	23.91	16.40	29.88	12.81	17.24	55.20	4.69	19.60
3	Stem Girth (mm)	6.32	3.50	9.60	23.20	25.15	85.07	2.79	44.08
4	Leaf Area (cm ²)	34.91	5.90	66.10	51.46	52.59	95.70	36.21	103.72
5	Number of Branches / Plant	5.74	0.00	8.60	26.00	28.50	83.20	2.80	48.84
6	Number of Leaves / Plant	15.18	7.70	24.80	32.50	33.17	96.02	9.96	65.60
7	Petiole Length (cm)	4.79	2.54	6.50	17.27	18.76	84.66	1.57	32.72
8	Leaf / Stem Ratio	1.40	0.51	3.69	47.44	48.67	95.02	1.34	95.26
9	Days to Harvest	33.09	26.50	38.00	10.95	12.51	76.57	6.53	19.73
10	Average Leaf Weight (g)	0.66	0.13	1.41	46.05	47.19	95.23	0.62	92.57

11	Fresh Weight / Plant (g)	16.13	4.88	48.78	58.02	59.12	96.34	18.92	117.32
12	Yield / Plot (kg)	2.44	1.87	2.95	13.40	14.86	81.39	0.61	24.91
13	Yield / Hectare (q)	61.07	46.70	73.63	13.40	14.86	81.39	15.21	24.91
14	Nitrogen (%)	3.67	2.80	4.41	10.81	11.42	89.63	0.77	21.08
15	Phosphorus (%)	0.51	0.42	0.58	7.82	8.56	83.51	0.08	14.72
16	Potassium (%)	4.62	3.82	5.45	9.62	9.84	95.41	0.89	19.35
17	Moisture (%)	88.81	83.75	91.28	1.56	2.90	28.94	1.53	1.73

The present findings are in agreement with those of [Sumanth et al. \(2024\)](#) ^[18] for plant height, days to maturity, number of leaves per plant, leaf:stem ratio, herbage yield per plant and herbage yield per hectare. [Yogendra et al. \(2018\)](#) ^[22] for stem girth, leaf yield per plot, petiole length, number of branches per plant, plant height. [Tejaswini et al. \(2017\)](#) ^[16] for plant height, stem diameter, number of branches per plant, number of leaves per plant, leaf weight per plant, leaf:stem ratio, foliage yield per plant. [Dhangra et al. \(2015\)](#) ^[23] for leaf number, leaf fresh weight, leaf:stem ratio, marketable maturity and green yield per hectare. [Yadav et al. \(2014\)](#) ^[24] for plant height and petiole length, [Mobina et al. \(2014\)](#) ^[14] for petiole length, number of branches per plant and green yield per plant. [Hasan et al. \(2013\)](#) ^[25] for number of leaf, leaf weight and marketable yield. [Chattopadhyay et al. \(2013\)](#) ^[13] for plant height, number of leaves per plant, stem diameter and green yield per plant characters. [Akaneme and Ani \(2013\)](#) ^[26] for plant height and stem diameter, [Anuja and Mohideen \(2007\)](#) ^[27] for number of leaves and leaf weight. [Kusuma et al. \(2007\)](#) ^[28] for plant height, maturity, stem girth and yield. These authors also reported low to high estimates of heritability in amaranthus.

Genetic Advance as Per cent of mean

Genetic advance represents the expected improvement in the mean performance of a population following selection. While heritability indicates the proportion of variation attributable to genetic factors, it alone does not predict the magnitude of genetic gain. Therefore, heritability, when considered along with genetic advance, provides a more reliable measure of the effectiveness of selection. Estimation of genetic advance helps in assessing the potential improvement achievable for different traits. According to [Johnson et al. \(1955\)](#) ^[29], genetic advance as per cent of mean is classified as low (below 10%), moderate (10-20%) and high (above 20%).

Genetic advance as per cent of mean ranged in low to high range from 1.73% moisture content to 117.32% fresh weight per

plant. High estimates of genetic advance as per cent of mean were recorded for fresh weight per plant (117.32%), leaf area (103.72%), leaf:stem ratio (95.26%), average leaf weight (92.57%), number of leaves per plant (65.60%), number of branches per plant (48.84%), stem girth (44.08%), petiole length (32.72%), yield per plot (24.91%), yield per hectare (24.91%), days to germination (23.71%) and nitrogen content (21.08%). The high genetic advance observed for these traits suggests the predominance of additive gene action and indicates ample scope for improvement through simple selection.

The findings of the present study are in agreement with earlier reports. Similar trends for number of leaves per plant, leaf:stem ratio, leaf area, herbage yield per plant and herbage yield per hectare, aligning with the results of [Sumanth et al. \(2024\)](#) ^[18]. Consistency with findings presented by [Yogendra et al. \(2018\)](#) ^[22] for traits like petiole length, number of leaves per plant and stem girth. The finding regarding number of branches per plant and yield are supported by the work of [Malaghan et al. \(2018\)](#) ^[10]. Comparable results were reported by [Tejaswini et al. \(2017\)](#) ^[16] for stem diameter, number of branches per plant, number of leaves per plant, leaf weight per plant, leaf:stem ratio and foliage yield per plant. Similarly, [Mobina et al. \(2014\)](#) ^[14] observed analogous findings for petiole length, number of branches per plant and green yield per plant.

The moderate estimates of genetic advance as per cent of mean were also recorded in characters such as days to harvest (19.73%), plant height (19.60%), potassium content (19.35%), phosphorus content (14.72%). The present findings are in conformity with the reports of [Dhangra et al. \(2015\)](#) ^[23] and [Venkatesh et al. \(2014\)](#) ^[30] for days to harvest and [Annapoorna et al. \(2021\)](#) ^[12] and [Ramesh et al. \(2013\)](#) ^[17] for plant height. The low genetic advance as per cent of mean observed for moisture content (1.73%) suggests a limited response to selection for this trait. Similar observations were documented by [Kumar et al. \(2021\)](#) ^[19] for moisture content.

Table 4: Mean Performance of different growth and yield parameters in Leafy Amaranthus

Characters Genotypes	Days to Germination	Plant Height (cm)	Stem Girth (mm)	Leaf Area (cm ²)	No. of Branches /Plant	No. of Leaves / Plant	Petiole Length (cm)	Leaf/ Stem Ratio
Konkan Durangi (C)	7.50	23.70	4.70	15.60	6.00	15.00	4.80	1.14
ACKLA-2	8.00	21.96	5.80	18.15	6.40	23.40	5.49	1.24
ACKLA-3	6.00	29.88	7.80	50.50	7.00	22.80	5.08	1.83
ACKLA-4	8.50	27.60	7.15	37.70	6.20	12.20	3.96	0.84
ACKLA-5	6.00	16.65	6.15	29.35	4.60	16.30	5.52	1.71
ACKLA-6	7.00	26.85	6.90	46.70	5.30	13.10	4.57	1.36
ACKLA-7	9.00	25.15	9.60	58.30	8.30	21.80	5.14	2.32
ACKLA-8	8.00	21.10	6.80	44.40	6.10	10.40	3.70	0.80
ACKLA-9	7.00	19.80	5.00	15.35	4.10	10.30	4.80	0.66
ACKLA-10	8.50	23.91	5.00	8.85	5.80	12.40	4.02	0.51
ACKLA-11	6.00	26.60	6.50	25.90	6.40	18.50	5.36	1.59
ACKLA-12	6.00	19.00	3.50	5.90	5.70	10.60	2.54	0.87
ACKLA-13	7.50	20.40	6.70	30.75	4.90	12.10	3.53	1.01
ACKLA-14	6.50	29.80	8.60	53.05	6.10	21.00	4.87	1.76
ACKLA-15	6.00	23.70	5.60	21.75	4.20	9.90	5.65	0.81
ACKLA-16	6.50	21.30	6.20	36.65	6.10	12.70	4.82	1.30

ACKLA-17	6.00	25.21	9.30	66.10	8.60	24.80	6.05	3.69	
ACKLA-18	6.50	23.50	5.70	25.06	6.00	13.70	4.76	1.70	
ACKLA-19	6.00	24.60	4.20	14.60	6.10	11.00	6.50	0.62	
ACKLA-20	6.00	23.50	7.00	52.80	4.50	19.40	5.15	1.86	
ACKLA-21	6.00	16.40	4.60	27.15	4.90	7.70	5.84	1.56	
ACKLA-22	6.00	26.65	6.80	27.65	5.70	12.70	4.85	0.87	
ACKLA-23	6.00	28.40	7.20	64.35	7.70	17.20	5.49	1.74	
ACKLA-24	6.00	20.58	4.10	44.85	4.70	10.10	4.90	1.28	
ACKLA-25	6.00	22.10	4.70	11.40	0.00	9.00	4.30	0.66	
ACKLA-26	6.50	29.55	7.60	52.55	6.20	20.60	4.14	1.87	
ACKLA-27	7.00	24.25	5.30	15.80	5.40	12.60	3.33	1.04	
ACKLA-28	5.50	27.11	7.20	60.60	7.40	22.20	5.26	2.37	
ACKLA-29	7.00	24.20	7.70	50.70	6.00	16.80	4.42	1.69	
Mean	6.71	23.91	6.32	34.91	5.74	15.18	4.79	1.40	
SE(m) ±	0.34	1.95	0.43	2.68	0.47	0.71	0.25	0.11	
C.D. @5%	0.98	5.65	1.26	7.75	1.7	2.06	0.72	0.31	
C.V. (%)	7.10	11.54	9.72	10.84	11.68	6.62	7.35	10.87	
Characters Genotypes	Days to Harvest t	Average Leaf Weight (g)	Fresh Weigh t / Plant (g)	Yiel d / Plot (kg)	Yiel d / Ha (q)	N (%)	P (%)	K (%)	Moisture%
Konkan Durangi (C)	34.50	0.59	9.79	2.35	58.79	3.78	0.52	4.86	90.00
ACKLA-2	35.50	0.33	15.16	2.21	55.26	3.50	0.46	4.31	89.26
ACKLA-3	36.50	0.90	20.91	2.76	69.00	3.71	0.49	5.17	90.12
ACKLA-4	34.00	0.44	8.49	2.03	50.84	3.99	0.56	4.50	89.53
ACKLA-5	27.50	0.64	13.17	1.87	46.70	3.57	0.50	4.16	86.68
ACKLA-6	36.50	0.87	18.81	2.55	63.64	3.57	0.45	4.50	90.60
ACKLA-7	38.00	1.32	20.26	2.75	68.65	2.80	0.51	5.30	90.60
ACKLA-8	35.50	0.71	20.23	2.65	66.21	3.15	0.53	4.71	88.79
ACKLA-9	36.50	0.32	7.17	2.43	60.71	3.29	0.51	3.82	91.28
ACKLA-10	35.00	0.26	9.90	2.15	53.74	3.78	0.48	4.62	90.72
ACKLA-11	27.00	0.73	16.05	2.64	66.08	4.20	0.45	4.70	89.18
ACKLA-12	36.00	0.13	5.25	1.88	46.95	3.57	0.54	4.04	84.07
ACKLA-13	35.00	0.68	6.88	2.58	64.58	3.15	0.45	4.23	89.62
ACKLA-14	29.00	0.93	26.52	2.83	70.69	3.43	0.48	4.50	90.25
ACKLA-15	35.50	0.50	8.99	1.99	49.71	4.41	0.51	4.41	88.03
ACKLA-16	27.50	0.70	13.21	2.64	66.11	4.20	0.48	5.45	90.85
ACKLA-17	27.00	1.41	48.78	2.95	73.63	3.99	0.52	4.50	91.11
ACKLA-18	28.50	0.73	13.13	2.56	63.99	4.27	0.58	4.21	89.64
ACKLA-19	36.50	0.47	11.55	2.03	50.68	3.64	0.56	4.88	90.84
ACKLA-20	34.00	0.86	26.50	2.83	70.64	3.57	0.55	4.17	88.81
ACKLA-21	34.50	0.60	7.49	2.64	65.88	3.36	0.42	3.86	84.29
ACKLA-22	36.50	0.55	12.72	1.92	47.93	4.06	0.56	5.35	89.81
ACKLA-23	27.00	0.97	27.13	2.84	71.01	3.50	0.47	4.74	86.46
ACKLA-24	35.50	0.43	18.60	1.92	48.09	3.36	0.57	4.36	88.26
ACKLA-25	37.00	0.28	6.64	2.21	55.23	3.29	0.51	5.33	88.26
ACKLA-26	29.00	0.91	21.07	2.77	69.29	3.57	0.57	5.16	87.72
ACKLA-27	36.00	0.23	4.88	2.43	60.78	3.22	0.54	4.87	88.92
ACKLA-28	26.50	1.02	29.05	2.85	71.13	4.34	0.51	4.39	88.15
ACKLA-29	32.00	0.77	19.33	2.61	65.25	4.13	0.52	4.77	83.75
Mean	33.09	0.66	16.13	2.44	61.07	3.67	0.51	4.62	88.81
SE(m) ±	1.42	0.05	1.29	0.11	2.77	0.10	0.01	0.07	1.53
C.D. @5%	4.10	0.14	3.74	0.32	8.02	0.28	0.04	0.20	4.44
C.V. (%)	6.06	10.31	11.31	6.41	6.41	3.68	3.47	2.11	2.44

Conclusion

The present investigation revealed substantial genetic variability among the 29 leafy amaranthus genotypes evaluated, indicating considerable scope for genetic improvement through selection. Genotype ACKLA-17 exhibited superior performance for several important growth and yield attributes and emerged as the most promising genotype, while ACKLA-28, ACKLA-23, ACKLA-14 and ACKLA-20 were also identified as desirable genotypes for future breeding programmes. High variability, heritability and genetic advance observed for fresh weight per plant, leaf area, leaf/stem ratio, average leaf weight, number of leaves per plant, number of

branches per plant and stem girth suggested the effectiveness of direct selection for these traits.

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