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Assessment of genetic variability and character association among agromorphological and nutritional quality traits of sesame (*Sesamum indicum* L.) genotypes

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Abstract
An investigation was carried out with fifty sesame genotypes to study genetic variability, broad sense heritability, genetic advance as percent of mean and extent of association among fifteen quantitative traits. Adequate variability was found among all the characters studied. High heritability along with high genetic advance as percent of mean was observed for plant height, number of branches per plant, number of capsules per plant, seed yield per plant and linolenic acid content. Number of capsules per plant showed positive significant correlation and high positive direct effect on seed yield per plant. The other yield components showed negligible direct effect but positive significant association with seed yield per plant except 1000 seed weight. Oil content had positive significant correlation with palmitic acid content and oleic acid showed positive significant association with linolenic acid. Linoleic acid showed inverse relationship with oleic acid. Superior genotypes were identified for higher seed yield per plant, oil content, protein content, and fatty acid composition based on per se performance.

Keywords: Correlation, genetic advance, oil content, protein content

Introduction
Sesame (*Sesamum indicum* L.) is one of the oldest oilseed crops with the longest history of its cultivation in India. Globally, it is highly valuable oilseed crop which is commonly known as "queen of oilseeds". Sesame seed is a principal source of oil (44-58%), protein (18-25%), carbohydrates (13.5%) and ash (5%), which is used in baking, candy making and other food industries (Uzun *et al*., 2002; Were *et al*., 2006 and Elleuch *et al*., 2007) [15, 18, 4]. Sesame oil contains oleic acid (35 to 54%), linoleic acid (39 to 59%), about 10% of palmitic acid and around 5% of stearic acid (Wacal *et al*., 2019) [17]. Some of the quality traits like oil content, protein content and fatty acid composition in sesame are the most important characters for both oil and confectionary purposes. Oleic acid and linoleic acid are two essential fatty acids that play a crucial role in maintaining human health. Foods that are deep-fried using sesame oil exhibit prolonged durability as the oil contains protective antioxidants known as lignans, sesamol, and sesaminol.

The development of cultivars in sesame varies with the purpose for which they are put to use. As sesame seeds can be used for both oil and confectionary purposes, the cultivars having good yield, high oil content with high protein and good fatty acid composition are needed to be developed. For making desired progress in breeding for increased yield, oil, protein and fatty acid composition, the available genetic variability in the cultivated sesame should be enlarged and the donors with improved desired characters in the breeding programme should be selected. Genetic variability is the main criteria for initiating an effective and successful breeding programme. Before beginning any crop improvement plan, it is necessary to critically analyse and estimate the genetic variability that exists in a crop's germplasm. Heritability estimates in combination with genetic advance are typically more accurate at estimating the genetic gain that will be subject to selection than heritability estimates alone.

Before planning suitable strategies to breed varieties for better yield and quality traits, understanding the relationship among the quality traits is also paramount importance.

Association between different characters is an important feature required for better planning of selection programme. Path coefficient analysis helps to identify which traits have a direct impact on yield and which traits have only indirect effects. This information is crucial for selecting the most promising traits for breeding programs. The present study was undertaken using fifty genotypes of sesame with an objective to determine the variability and extent of association among oil content, protein content, fatty acid composition and yield components to identify the promising genotypes which can be used as parents for future breeding programmes.

Materials and Methods

The investigation was carried out at Regional Agricultural Research Station, Polasa, Jagtial, during late *kharif*, 2022. The experiment was laid out in Randomized Block Design (RBD) and 50 genotypes were sown in two replications with inter-row spacing of 30 cm and intra-row spacing of 15 cm with plot size of 2 rows of each 3m length. All the standard package of practices were followed during the crop growth period. Observations on agronomic traits, namely, plant height (cm), number of branches per plant, number of capsules per plant, number of seeds per capsule, 1000 seed weight (g) and seed yield per plant (g) were recorded considering five randomly selected plants. For recording days to 50% flowering, number of days from the date of sowing to the day on which 50% of the plants had atleast one flower were noted. For recording days to maturity, number of days taken to maturity in each genotype was calculated from date of sowing.

The quality parameters of seed harvested from these entries were assessed at Biochemistry laboratory of Indian Institute of Oilseeds Research (IIOR), Hyderabad. Oil content of sesame genotypes was estimated by using nuclear magnetic resonance (NMR)—Oxford-MQC-5 analyser (London, UK). Protein content was determined by micro-Kjeldahl method (Markham, 1942). Fatty acid composition viz., palmitic acid content (C16:0), stearic acid content (C18:0), oleic acid content (C18:1), linoleic acid content (C18:2), and linolenic acid content (C18:3) were determined by using an Agilent 7890B gas chromatograph (Santa Clara, California, USA) equipped with a flame ionization detector (FID) and an auto sampler. The replicated data for all the fifteen traits were subjected for statistical analysis using Windostat software for estimation of variability, correlation and path coefficient studies.

Results and Discussion

The analysis of variance for all the characters showed highly significant differences among all the fifty genotypes for all the observations. It indicated that sufficient amount of variability was found among the characters studied.

Mean performance of sesame genotypes for yield components and quality traits are presented in Table 1. The data revealed that ES 3196 was found significantly superior over other genotypes for number of branches per plant, number of capsules per plant, and seed yield per plant. TKG 306, TKG 22, JTS 8, EC 182835, TKG 21, JCS RF2 and ES 28 were found superior over other genotypes for oil content (50.51%), protein content (32.42%), palmitic acid (9.91%), stearic acid (6.55%), oleic acid (42.85%), linoleic acid (54.11%) and linolenic acid content (0.96%) respectively.

Table 1: Mean performance of sesame genotypes for yield components and quality traits

S. No.	Genotypes	DFF	DM	PH	NBP	NCP	NSC	TSW	SYP	OIL	PRO	PAL	STE	OLE	LIN	LNL
1	TKG 21	37	82	75.00	3.00	37.00	53.00	3.28	3.12	49.10	22.96	9.85	5.60	42.85	41.31	0.26
2	TKG 55	35	82	73.70	3.00	40.00	55.00	3.22	3.48	48.84	29.20	9.84	5.06	40.43	44.35	0.31
3	TKG 306	38	82	67.80	4.00	36.00	51.00	3.54	3.14	50.51	26.16	9.75	6.22	42.72	40.39	0.84
4	TKG 308	35	82	68.60	5.00	46.00	58.00	3.55	3.92	49.56	28.67	9.51	5.85	41.06	43.14	0.43
5	JTS 8	36	82	73.15	4.00	38.00	58.00	3.62	3.41	50.20	29.08	9.91	5.42	41.09	43.35	0.25
6	EC3349997	40	97	120.80	5.00	53.00	54.00	2.87	4.73	49.52	25.28	8.90	6.27	41.06	42.81	0.85
7	NIC 9843	40	97	124.55	4.00	55.00	50.00	3.24	5.76	46.36	23.31	8.79	5.53	41.87	43.47	0.33
8	EC3349998	38	97	121.25	5.00	60.00	55.00	3.19	6.22	49.43	28.65	9.31	5.41	39.85	45.08	0.34
9	NIC 16095-A	41	97	122.85	5.00	60.00	49.00	3.29	6.63	48.35	25.75	9.59	6.08	37.00	47.07	0.22
10	ES 3196	43	98	120.60	7.00	89.00	70.00	3.38	10.93	49.46	25.64	9.46	5.76	41.47	42.72	0.72
11	ES 81	41	98	134.65	5.00	60.00	46.00	3.27	6.32	49.08	24.74	8.92	5.79	40.18	44.20	0.91
12	FFAT 17	44	98	127.15	5.00	49.00	51.00	2.84	4.89	48.52	21.49	9.16	5.37	39.77	45.47	0.33
13	ES 28	40	98	133.75	4.00	54.00	61.00	3.56	6.12	48.62	24.66	9.09	5.86	39.25	44.79	0.96
14	Madhavi	37	98	119.75	4.00	43.00	52.00	3.02	4.75	41.74	23.44	9.33	5.40	39.75	45.29	0.31
15	EC 182833	35	86	103.80	5.00	50.00	63.00	3.00	5.04	47.78	25.31	9.23	6.42	40.17	43.74	0.30
16	FFAT 04	40	98	120.50	5.00	53.00	55.00	3.08	5.61	49.63	27.95	9.88	5.69	39.34	44.67	0.33
17	FFAT 16	40	98	128.45	4.00	54.00	62.00	3.30	5.49	48.06	24.81	8.88	5.65	33.89	51.16	0.26
18	EC 330005	40	98	131.50	3.00	56.00	50.00	3.16	5.91	43.36	26.20	8.57	4.98	36.17	50.30	0.20
19	EC 182835	42	94	118.50	4.00	47.00	56.00	3.00	4.57	40.64	26.45	9.49	6.55	37.46	46.43	0.30
20	FFAT 13	41	98	129.00	5.00	53.00	56.00	3.06	5.42	41.61	22.38	8.10	5.94	41.11	44.37	0.62
21	IS 35-1-A	43	98	113.25	4.00	38.00	60.00	3.29	3.47	40.88	25.06	9.15	6.11	37.08	47.59	0.18
22	JCS 3880	38	96	117.05	6.00	66.00	47.00	3.47	9.33	46.77	26.41	9.37	5.89	37.39	47.14	0.21
23	Swetha	45	98	134.25	5.00	48.00	60.00	3.05	5.17	48.09	26.30	9.37	5.48	34.21	50.66	0.19
24	JCS 3287	39	96	119.30	6.00	63.00	55.00	3.46	6.57	46.62	28.63	9.32	5.28	36.62	48.57	0.3
Table 1. (cont.),																
25	JCS 4047	39	84	141.55	6.00	70.00	68.00	3.26	8.29	47.98	25.84	9.13	6.08	37.59	47.21	0.17
26	JCS 4026	36	84	118.60	5.00	42.00	59.00	3.22	4.72	47.08	24.80	9.45	5.54	36.36	48.30	0.29
27	JCS 4022	38	89	128.00	5.00	52.00	54.00	3.06	5.94	49.78	25.60	9.18	6.11	33.99	50.78	0.16
28	JCS 4018	43	98	136.65	5.00	51.00	61.00	3.30	5.45	46.73	24.80	9.34	5.80	38.65	46.13	0.23
29	JCS DT 26	44	97	147.20	6.00	69.00	64.00	3.36	7.37	47.72	24.31	8.84	5.75	34.45	50.78	0.18
30	JCS 3889	41	96	139.15	5.00	63.00	62.00	3.06	7.26	46.64	23.53	8.88	5.23	36.95	48.16	0.93

31	JCS 4020	44	98	118.30	4.00	59.00	53.00	3.17	6.05	47.76	26.15	9.50	6.29	40.71	43.36	0.22
32	JCS RF2	46	98	127.30	4.00	51.00	63.00	3.22	5.38	47.16	20.50	7.88	6.17	31.66	54.11	0.20
33	Pragathi	39	84	124.90	6.00	56.00	54.00	2.87	5.74	46.69	24.39	8.67	5.81	37.54	47.46	0.29
34	JCS RF4	48	98	133.35	5.00	58.00	61.00	3.21	6.02	46.52	25.46	8.88	5.65	35.20	49.78	0.66
35	Jagtiala Til-1 (JCS 1020)	46	97	118.20	2.00	59.00	57.00	3.40	6.86	46.55	26.30	8.68	6.18	39.38	45.24	0.44
36	JCS 4894	43	99	109.85	5.00	51.00	65.00	3.23	5.49	45.25	24.19	8.74	6.29	40.42	43.86	0.48
37	JCS 4904	46	98	108.15	4.00	46.00	58.00	3.41	4.94	43.42	24.84	8.80	5.90	38.16	46.44	0.77
38	JCS 4911	45	98	93.35	4.00	49.00	53.00	3.04	5.20	43.47	27.51	8.16	5.94	38.57	46.47	0.61
39	JCS 4917	43	98	98.10	5.00	53.00	63.00	3.54	5.51	41.02	22.84	8.88	6.36	31.25	53.14	0.36
40	TKG 22	36	84	79.65	4.00	37.00	58.00	3.07	3.44	45.08	32.42	9.33	5.61	38.75	45.80	0.62
41	JCS 3890	44	97	100.50	5.00	54.00	62.00	3.15	6.15	47.08	24.51	9.14	5.40	33.14	52.16	0.21
42	JCS 3604	43	98	118.15	4.00	49.00	49.00	3.37	5.31	46.295	32.14	8.46	5.93	38.16	47.46	0.15
43	JCS 3888	45	93	113.25	5.00	61.00	60.00	3.06	6.25	50.05	25.64	9.02	5.76	35.90	49.32	0.20
44	JCS 3758	39	94	130.80	4.00	59.00	60.00	2.75	6.02	48.29	26.57	9.38	5.50	36.60	48.29	0.22
45	JCS 3605	43	97	140.90	5.00	63.00	57.00	3.30	7.28	45.08	23.67	9.06	5.38	37.54	47.75	0.31
46	JCS 2454	43	98	129.35	4.00	55.00	66.00	3.35	6.30	49.07	25.49	8.89	5.74	37.45	46.87	0.81
47	JCS 4862	44	96	130.00	4.00	66.00	68.00	3.25	7.23	48.14	28.36	8.62	5.77	37.29	48.17	0.26
48	Telangana Til-1 (JCS 3202)	46	98	140.20	5.00	60.00	63.00	3.11	6.41	48.39	29.41	9.15	5.45	37.40	47.78	0.25
49	GT 10	41	93	107.15	6.00	56.00	54.00	3.18	5.30	42.16	23.81	8.61	6.13	37.78	47.39	0.24
Table 1. (cont.),																
50	JCS 2698	37	85	111.60	5.00	60.00	52.00	3.20	5.82	46.31	26.06	9.14	5.80	38.46	46.30	0.28
	Mean	40.82	93.57	116.86	4.63	53.85	57.43	3.22	5.71	46.85	25.75	9.09	5.78	38.02	46.73	0.39
	Minimum	35.00	82.00	67.80	2.00	36.00	46.00	2.75	3.12	40.64	20.50	7.88	4.98	31.25	40.39	0.15
	Maximum	48.00	99.00	147.20	7.00	89.00	70.00	3.62	10.93	50.51	32.42	9.91	6.55	42.85	54.11	0.96
	CV (%)	3.10	1.79	8.74	7.83	10.20	4.26	2.64	12.17	0.49	0.74	1.24	1.79	0.23	0.19	8.81
	C.D (5%)	2.55	3.38	20.53	0.73	11.14	4.92	0.17	1.38	0.46	0.38	0.22	0.2	0.17	0.18	0.06

Where, DFF-Days to 50% flowering, DM-Days to maturity, PH-Plant height (cm), NBP-Number of branches per plant, NCP-Number of capsules per plant, NSC-Number of seeds per capsule, TSW-1000 seed weight (g), SYP-Seed yield per plant (g), OIL-Oil content (%), PRO-Protein (%), PAL-Palmitic acid (%), STE-Stearic acid (%), OLE-Oleic acid (%), LIN-Linoleic acid (%), LNL-Linolenic acid (%).

Genetic variability components revealed that Phenotypic Coefficient of Variation (PCV) and Genotypic Coefficient of Variation (GCV) were high for seed yield per plant and linolenic acid content. These results were corroborated with the findings of Srikanth and Ghodke (2022) [12] and Thouseem *et al.* (2022) [14] for seed yield per plant. Results of genetic parameters for yield components and quality traits are presented in Table 2.

Table 2: Genetic parameters for yield components and quality traits in sesame

Trait	Range		Mean±SEm	Coefficient of Variation		Heritability (h^2) (%)	GAM at 5%
	Min	Max		GCV (%)	PCV (%)		
Days to 50% flowering	35.00	48.00	40.82±0.88	7.86	8.45	86.50	15.05
Days to maturity	82.00	99.00	93.57±1.17	6.06	6.32	91.90	11.98
Plant height (cm)	67.8	147.2	116.86±7.15	15.95	18.19	76.90	28.81
No. of branches per plant	2.00	7.00	4.63±0.25	19.49	21.01	86.10	37.26
No. of capsules per plant	36.00	89.00	53.85±3.88	16.95	19.83	73.04	29.84
No. of seeds per capsule	46.00	70.00	57.43±1.71	9.37	10.29	82.80	17.57
1000 seed weight (g)	2.75	3.62	3.22±0.05	5.79	6.37	82.73	10.86
Seed yield per plant (g)	3.12	10.93	5.71±0.48	24.32	27.19	80.00	44.80
Oil content (%)	40.64	50.51	46.85±0.16	5.68	5.70	99.25	11.66
Protein content (%)	20.5	32.42	25.75±0.13	9.21	9.24	99.39	18.92
Palmitic acid (%)	7.88	9.91	9.09±0.07	4.8	5.01	93.80	9.69
Stearic acid (%)	4.98	6.55	5.78±0.07	6.08	6.34	92.00	12.01
Oleic acid (%)	31.25	42.85	38.02±0.06	7.05	7.05	99.89	14.51
Linoleic acid (%)	40.39	54.11	46.73±0.06	6.40	6.40	99.91	13.18
Linolenic acid (%)	0.15	0.96	0.39±0.02	60.11	60.75	97.89	122.51

Low PCV and GCV were recorded for days to 50% flowering, days to maturity and 1000 seed weight which were in accordance with the results reported by Padmaja *et al*. (2022) [10] for 1000 seed weight and Srikanth and Ghodke (2022) [12] for days to 50% flowering and days to maturity . Other quality traits like oil content, protein content, palmitic acid content, stearic acid content, oleic acid content and linoleic acid content also recorded low values for both PCV and GCV which were corroborated with the findings of Mukri *et al.* (2014) [8] in groundnut crop. Moderate values of PCV and GCV were recorded for plant height and number of capsules per plant. Thouseem *et al.* (2022) [14] reported similar results for plant height.

High heritability coupled with high genetic advance as percent of mean was observed for plant height, number of branches per plant, number of capsules per plant, and seed yield per plant content suggesting that, these characters were least influenced by the environment, hence selection would be rewarding for improving these traits due to additive gene effect. Similar findings were reported by Takele and Abera (2023) [13] and Thouseem *et al.* (2022) [14] for seed yield per plant. High estimates of heritability with moderate genetic advance as percent of mean were observed for remaining yield attributing traits like days to 50% flowering, days to maturity, number of seeds per capsule and 1000 seed weight.

With regards to quality traits, high heritability, along with a moderate genetic advance as percent of the mean, was observed for oil content, protein content, stearic acid content, oleic acid content, and linoleic acid content. Linolenic acid content exhibited both high heritability and high genetic advance, suggesting considerable potential for trait selection. The findings align with the results reported by Thouseem *et al.* (2022) [14] in relation to oil and protein content. Similarly, Mohanty *et al.* (2020) [6] also reported comparable results concerning stearic acid, oleic acid, and linoleic acid content. The results imply that these traits were minimally impacted by environmental factors, making direct selection a possible approach due to their reliance on additive gene actions. In contrast, palmitic acid demonstrated high heritability coupled with low genetic advance, implying a contribution from non-additive gene actions. This aligns with the observations of Mohanty *et al.* (2020) [6].

Association between yield and its components

The genotypic correlation coefficients between yield and its component characters and inter correlation among traits are presented in Table 3. Seed yield per plant had significant and positive association with number of capsules per plant (0.95) followed by plant height (0.61), number of branches per plant (0.50), days to maturity (0.42), days to 50% flowering (0.32) and number of seeds per capsule (0.28). Vanishree *et al.* (2011) [16] also reported similar results for number of capsules per plant, plant height, number of branches per plant, days to maturity, days to 50% flowering and number of seeds per capsule. Reports of Pohekar *et al.* (2023) [11] also supported the present findings in case of number of branches per plant and number of capsules per plant. Thus yield improvement in sesame can be achieved through selection of plant type via yield contributing traits like tall plant with more number of branches, more number of capsules per plant, and more number of seeds per capsule.

Table 3: Genotypic correlation coefficients for yield and yield components in sesame genotypes

Trait	Days to 50% flowering	Days to maturity	Plant height	Number of branches per plant	Number of capsules per plant	Number of seeds per capsule	1000 seed weight	Seed yield per plant
Days to 50% flowering	1.00	0.7274**	0.4755**	0.0607	0.3352*	0.3044*	-0.0520	0.3277*
Days to maturity		1.00	0.6210**	0.1079	0.3932**	0.0499	-0.1146	0.4213**
Plant height			1.00	0.2516	0.6100**	0.1944	-0.2840*	0.6187**
No. of branches per plant				1.00	0.5385**	0.2255	-0.0603	0.5078**
Number of capsules per plant					1.00	0.2968*	0.0148	0.9513**
Number of seeds per capsule						1.00	0.0855	0.2819*
1000 seed weight							1.00	0.0855
Seed yield per plant								1.00

*-significance at 5% level **-significance at 1% level

Path coefficient analysis

Correlation gives only the relation between the two variables whereas path coefficient analysis enables the partition of correlation coefficients into direct and indirect effects of various yield attributing characters on seed yield. Direct and indirect effects of different yield components on seed yield are presented in Table 4. Number of capsules per plant (0.8764) showed high positive direct effect on seed yield per plant. This indicated that direct selection of this trait would improve the seed yield per plant . Dhandapani *et al.* (2023) [3] and Srikanth and Ghodke (2022) [12] also reported similar results for number of capsules per plant. Days to 50% flowering reported negative and negligible direct effect on seed yield per plant (-0.0616) which was on par with the results of Bhagwat Singh and Rjani Bisen (2018) [1] and Navaneetha *et al.* (2019) [9].

Correlation studies revealed that true association was observed between number of capsules per plant and seed yield per plant, as number of capsules per plant showed positive significant association and high positive direct effect on seed yield per plant. So direct selection through this trait will be effective for improvement of seed yield per plant. Days to maturity, plant height, number of branches per plant, number of seeds per capsule and 1000 seed weight showed positive significant correlation with seed yield per plant but showed negligible direct effects on seed yield which indicated that indirect effects seem to be cause of positive correlation. In this case, the indirect casual factors are to be considered for selection to ensure improvement of seed yield per plant. Days to 50% flowering showed positive correlation and negative direct effect which suggested that other indirect effects were responsible for positive correlation and these indirect effects should be considered for selection.

The residual factor was low (0.286) in the genotypes which indicated that 71.40% of the variables chosen in the present study were sufficient to explain seed yield per plant with different characters. The results revealed that the characters like number of capsules per plant, number of seeds per capsule, plant height, days to maturity and number of branches per plant were the most important yield determinants and more emphasis must be given on these traits while exercising selection to improve the yield in sesame.

Table 4: Genotypic path coefficients among yield and yield attributes in sesame genotypes

Trait	Days to 50% flowering	Days to maturity	Plant height	Number of branches per plant	Number of capsules per plant	Number of seeds per capsule	1000 seed weight	Seed yield per plant
Days to 50% flowering	-0.0616	0.0545	0.0431	0.0008	0.2938	0.0023	-0.0052	0.3277*
Days to maturity	-0.0448	0.0750	0.0563	0.0014	0.3446	0.0004	-0.0116	0.4213**
Plant height	-0.0293	0.0466	0.0906	0.0033	0.5347	0.0015	-0.0287	0.6187**
Number of branches per plant	-0.0037	0.0081	0.0228	0.0130	0.4720	0.0017	-0.0061	0.5078**
Number of capsules per plant	-0.0206	0.0295	0.0553	0.0070	0.8764	0.0023	0.0015	0.9513**
Number of seeds per capsule	-0.0187	0.0037	0.0176	0.0029	0.2601	0.0077	0.0086	0.2819*
1000 seed weight	0.0032	-0.0086	-0.0257	-0.0008	0.0130	0.0007	0.1009	0.0826

Residual effect R = 0.286*-significance at 5% level **-significance at 1% level

Character association among quality parameters

Correlation among the quality traits for fifty genotypes are presented in Table 5. Oil content exhibited positive and significant association with palmitic acid (0.41412) and positive non-significant correlation with protein content (0.22407), oleic acid content (0.20666) and linolenic acid content (0.08200). Linoleic acid (-0.24089) and stearic acid (-0.1938) showed negative non-significant correlation with oil content. Results indicated that both palmitic acid content and oil content can be improved simultaneously in sesame genotypes during future breeding programmes. These results were on par with the findings reported by Morris *et al.* (2021) [7].

Among the fatty acids, oleic acid, a major fatty acid showed positive and significant association with linolenic acid (0.35705) and palmitic acid (0.33424) suggesting that these traits may be improved simultaneously. High negative significant association of oleic acid with linoleic acid content (-0.9841) was observed. Results indicated that oleic and linoleic acid content showed inverse relationship with each other. Morris *et al.* (2021) [7] reported similar results for linoleic acid.

Protein content showed positive significant association with palmitic acid content (0.31346) indicating simultaneous improvement can be brought out for both these traits. Cholin *et al.* (2010) [2] reported similar results for palmitic acid content in groundnut crop.

The superior genotypes identified for each trait may be used as donors in crossing programme for breeding improved varieties. However, to confirm the results of present investigation, more thorough investigation of the influence of various environmental conditions in multi-location studies will be required to determine the stability of the genotypes for the traits studied. To combine yield and favourable oil quality traits, intercrossing among the selected genotypes may be followed to isolate useful segregants through pedigree breeding programme.

Table 5: Correlation coefficients among quality traits of sesame genotypes

Trait	Protein content	Palmitic acid	Stearic acid	Oleic acid	Linoleic acid	Linolenic acid	Oil content
Protein content	1	0.31346 *	-0.16488	0.17372	-0.17303	-0.08429	0.22407
Palmitic acid		1	-0.18663	0.33424 *	-0.41799 **	-0.12387	0.41412**
Stearic acid			1	0.0199	-0.12014	0.07309	-0.19380
Oleic acid				1	-0.98411 **	0.35705*	0.20666
Linoleic acid					1	-0.39773**	-0.24089
Linolenic acid						1	0.08200
Oil content							1

*-significance at 5% level **-significance at 1% level

Conclusion

The present study revealed significant genetic variability among the sesame genotypes for yield components and quality traits. High heritability coupled with high genetic advance was observed for key traits such as plant height, number of branches per plant, and seed yield, indicating the potential for effective selection through additive gene actions. Path coefficient analysis highlighted the importance of the number of capsules per plant in determining seed yield, suggesting that direct selection for this trait could improve yield. Quality traits like oil content and fatty acid composition also showed promising genetic variability, with specific genotypes exhibiting favorable profiles for breeding. Further research, including multi-location trials, is essential to confirm the stability of these traits and maximize sesame improvement.

Authors' Contribution

Conceptualization of research work and designing of experiments (M A, KJ R); Execution of field/lab experiments and data collection (MA, D. P, PY, UKB); Analysis of data and interpretation (MA, D.P); Preparation of manuscript (MA, KJR).

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