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EXPLORING YIELD AND YIELD-ATTRIBUTING TRAITS IN SESAME (*SESAMUM INDICUM* L.): A CHARACTER ASSOCIATION AND PATH COEFFICIENT ANALYSIS

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ABSTRACT

Sesame (*Sesamum indicum*) is an important oil seed crop that plays a vital role in the global agricultural industry. Understanding the relationships between various agronomic and biochemical traits and identifying key factors influencing sesame production are essential for optimizing crop yields and enhancing breeding programs. The current investigation was aimed to study the genetic association of seed yield and its components in thirty sesame accessions based on total nineteen morphological and biochemical traits. The genotypes were evaluated in Randomized Block design at the Tirhut College of Agriculture's Instructional Farm in Dholi, Muzaffarpur, Bihar, India.Correlation studies revealed a significant positive relationship between seed yield per plant and plant height, days to first flowering, days to 50% flowering, days to maturity, number of seeds per capsule, biological yield per plant, oil yield per plant, and among themselves at the phenotypic and genotypic levels in both environments. As a result, selecting for any of these characters would result in simultaneous improvement of other characters and, ultimately, an increase in seed production (kg/ha). Path coefficient study showed that the highest positive effect was exerted by oil output per plant on seed yield, days to first flowering, and plant height. Therefore, present investigation could be helpful in a reliable selection of parental lines basedon the above given traits as well as for the development of high yielding varieties for further breedingprograms.

***Keywords*:** Correlation coefficient; path coefficient analysis; phenotypic path coefficient; genotypic path coefficient analysis.

Introduction

In a world where the quest for sustainable and nutritious food sources is becoming increasingly vital, sesame (*Sesamum indicum*) stands as a remarkable, yet often overlooked, gem. Sesame, renowned for its versatile applications, has been an integral part of human history, culture, and diet for millennia. Sesame has deep historical roots, dating back to ancient civilizations such as the Egyptians, Babylonians, and Assyrians, where it was considered a symbol of prosperity and longevity. Its wide cultivation and trade routes facilitated its spread across continents, transcending borders and cultures. Investigating the historical significance of sesame provides insights into its enduring presence in art, mythology, religious rituals, and traditional practices of various civilizations. India and China are the world's essential sesame producers, followed by Myanmar. Asia accounts for over 70% of global production. According to Abou-Gharbia *et al.* (2000), 26% and 4% of the

world's sesame crop, respectively, are grown in Africa and Latin America. India holds a premier position in the globaloilseeds scenario accounting for 29 percent of the total area and 26 per cent of production. Globally, China and India are the majorsesame producers. Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, West Bengal and Tamil Nadu put together constitutes nearly 72 percent of total area and 58 percent of total production of sesame in the country (Mohanty *et al*., 2020).

It is known as the "Queen of Oil Seeds" because of the outstanding quality of its seed, oil and meal. Sesame is abundant in nutrients (oil 50%, protein 25%) and its oil consists of sesamol, an antioxidant that provides great resistance to oxidative rancidity. Due to its excellent nutritional content, it is also used as an industrial food crop (Mohanty *et al.,* 2020). However, raised crop yield is essential. Yield of any crop is a complicated trait that is determined by a number of independent contributing factors. Knowledge of the amount and kind of relationship between yield and its components substantially aids in analysing the contribution of various components to yield. Yield, being a polygenic trait, is heavily impacted by fluctuations inenvironment. Hence, selection of plants based directly on yield would not be very reliable (Mahajan *et al*., 2011).

Yield is the final outcome of the multiplicative interaction of numerous yield components, which needs a full grasp of character association and the direct and indirect impacts produced by each character on grain yield before commencing any breeding programme. The measure of the mutual relationship between two variables is correlation. The study of correlation may assist plant breeders in understanding how improving a particular trait will result in simultaneous improvements in other traits. Knowledge of the relationship between grain yield and other characteristics is useful in selecting an appropriate plant type. Because correlation does not represent the real contribution of the characteristics to yield, the genotypic and phenotypic correlation coefficients should be categorised into direct and indirect effects using path coefficient analysis. Path coefficient analysis is a type of regression coefficient that assesses the direct effect of one variable on another. It enables the separation of both direct and indirect effects via other variables by allocating correlations for a more apparent evaluation of the cause-and-effect interaction, Wright (1921).

Materials and Methods

A total of thirty sesame germplasm lines were examined at the Tirhut College of Agriculture's Instructional Farm in Dholi, Muzaffarpur, Bihar, India. Agro climatically Instructional Farm is located at 51.8m above mean sea level, between 25.980 N latitude and 85.670 E longitudes. Experiment material obtained from All India Coordinated Research Project on Sesame & Niger (ICAR), JNKVV Campus, Jabalpur, Madhya Pradesh. The experiment was laid out in Randomised Block Design with three replications. Each genotype in each replication was sown in three row plots of 4.0m length, adopting a spacing of 30 cm between rows and 20 cm between the hills. Sowing was done by dibbling and all necessary precautions were taken to maintain uniform plant population in each treatment per replication. Also, all the recommended package of practices was followed to raise a healthy crop and necessary prophylactic measures were adopted against pests and diseases.

Observations were recorded for nineteen traits *viz.*, plant height (cm), days to first flowering, days to 50% flowering, days to maturity, number of productive branches per plant, height of 1st capsule (cm), number of productive capsules per plant, number of seeds per capsule, biological yield per plant (g), harvest index (%), 1000 seed weight (g), stearic acid (%), linolenic acid (%), linoleic acid (%), oleic acid (%), palmitic acid (%), oil content (%), oil yield per plant (g) and seed yield per plant (g). For the oil content (%) thirty-gram seed sample taken from clean seeds with 10-12 percent moisture of each genotype. The oil was extracted from whole seeds of each sample by Nuclear Magnetic Resources (N.M.R) at IIOR Rajendranagar, Hyderabad, India and expressed in percentage. Fatty acid profile was observed with the help of standard equipment Gas liquid chromotograph at IIOR Rajendranagar, Hyderabad, India. Observations were recorded for yield, yield attributing characters on five randomly selected competitive plants for each entry in each replication. The mean data obtained at each location was considered for final statistical analysis. Days to 50% flowering was recorded on plot basis. The data recorded on different characters were statistically analyzed using software WINDOSTAT version 7.0 developed by Indostat Services Ltd., Hyderabad, India. The phenotypic (rp), genotypic (rg) and environmental (re) correlation coefficients for various characters were calculated by the method suggested by Panse and Sukhatme (1985). To establish a cause-and-effect relationship the first partition genotypic and phenotypic correlation coefficient into direct and

indirect effects by path analysis as suggested Dewey and Lu (1959) and developed by Wright (1921).

Results and Discussion

Correlation Analysis

An essential strategy in a breeding effort is association analysis. It provides an understanding of the relationships between the numerous traits and identifies the component characters on which selection may be based for genetic improvement in seed production. The degree of association also has an impact on the success of the selecting process. The correlation coefficient analysis is a measure of the relationship between two variables. In general, the magnitudes of the genotypic correlation coefficients were bigger than those of the corresponding phenotypic correlation coefficients, indicating that environment influences the genotypic expression of the features under study. A positive correlation between desired characteristics is advantageous to plant breeders since it allows for the simultaneous enhancement of both qualities.

From the perusal of correlation at phenotypic and genotypic level (Table-2 and Table-3) it was evident that Plant height exhibited high positive association with height of 1st capsule (0.576**, 0.677), biological yield per plant (0.493**, 0.550) and seed yield per plant (0.422*, 0.512). Days to first flowering showed high significant positive association with days to 50% flowering (0.889**, 0.905) followed by seed yield per plant (0.527**, 0.562) oil yield per plant (0.500**, 0.533), number of seeds per capsule (0.408*, 0.550). Positive correlation of days to 50% flowering observed with seed yield per plant (0.473**, 0.505), palmitic acid (0.449**, 0.483), oil yield per plant (0.434**, 0.464) and number of seeds per capsule (0.309*, 0.411). Days to maturity showed positive association with seed yield per plant (0.383*, 0.567), oil yield per plant (0.368*, 0.541) 1000 seed weight (0.347*, 0.621) and number of seeds per capsule (0.344*, 0.572).

Number of productive branches per plant exhibited significant positive association with number of productive capsules per plant (0.378*, 0.401) and biological yield per plant (0.340*, 0.364). High positive association exhibited on height of 1st capsule with biological yield per plant (0.540**, 0.584), palmitic acid (0.405*, 0.458), and seed yield per plant (0.330*, 0.396). Number of productive capsules per plant showed positive association with biological yield per plant (0.578**, 0.587) and 1000 seed weight (0.385*, 0.487). Number of seeds per capsule showed a positive association with seed yield per plant (0.409*, 0.599), oil yield per plant (0.384*, 0.560), palmitic acid (0.379*, 0.497) and biological yield per plant (0.366*, 0.460). Biological yield exhibited positive association with seed yield per plant (0.473**, 0.499) and palmitic acid (0.316*, 0.339). Harvest index showed positive association with oil yield per plant (0.324*, 0.297). 1000 seed weight exhibited high positive association with stearic acid (0.347*, 0.450). Stearic acid showed high negative association with linoleic acid (-0.315*, -0.373), Linolenic acid exhibited high negative association with oil content (-0.461**, -0.466) and oil yield per plant (-0.338, -0.361). Linoleic acid showed significant positive association with palmitic acid (0.347*, 0.368) and highly significant negative association with oleic acid (-0.829**, -0.959). Oleic acid exhibited highly negative association with palmitic acid (-0.595**, -0.657). Palmitic acid showed positive association with oil yield plant (0.312*, 0.344), Oil content exhibited high positive association with oil yield plant (0.421**, 0.344). Oil yield per plant showed high significant positive association with seed yield plant (0.873**, 0.861). Similar finding was in accordance with earlier report of Thirumala rao *et al*. (2013), Baraki *et al*. (2015), Saxena *et al*. (2016), Fazal *et al*. (2015), Bharathi *et al*. (2015), Abate and Mekbib (2015), Sasipriya *et al*. (2018), Yingzhong and Yishou (2002), Ibrahim and Khidir (2012).

Path Coefficient Analysis

The path analysis reveals whether the association of these characters with yield is due to their direct effect on yield or is a consequence of their indirect effects *via* other component characters. In other words, it measures the cause of association between two variables (or traits). The direct and indirect effects of different component characters with grain yield at phenotypic and genotypic level were tabulated in Table-4 and Table-5, respectively. Fig.1 shows phenotypic path diagram and Fig.2 depicts genotypic path diagram. In this experiment both the Phenotypic (0.0985) and Genotypic (0.0571) path coefficient residual effects are negligible and it indicates that the model adequately explains the relationships between variables, and there are no significant unexplained variances in the dependent variable after considering the direct and indirect effect of the predictor variables.

Phenotypic path coefficient (Table-4)

The positive direct effect on grain yield was showed by oil yield per plant (1.0526), days to 50% of, flowering (0.1049), oleic acid (0.0319), number of productive capsules per plant (0.0230), height of 1st capsule (0.0247), number of productive branches per plant (0.0254), 1000 seed weight (0.0115), days of

maturity (0.0100), plant height (0.0091) and biological yield per plant (0.0029). Positive and high indirect effected exhibited *via* oil yield per plant on the traits of plant height (0.2960), days to 1st flowering (0.5263), Days to 50% flowering (0.4569), days to maturity (0.3877), height of 1st capsule (0.2463), number of seeds per capsule (0.4042), biological yield (0.3161), harvest index (0.3408) 1000 seed weight (0.1527) on seed yield per plant. Positive and high indirect effect of number of productive branches per plant exhibited on seed yield *via* oil content (0.1053). Number of productive capsules recorded high and positive indirect effect (0.1843) *via* oil content on seed yield. Stearic acid having negative and direct effect (-0.0131) on seed yield. Linolenic acid exhibited negative and non significant correlation with seed yield per plant having their negative and direct effect (-0.0587) as well as high and negative indirect effect (-0.3556) *via* oil yield per plant Linoleic acid showed negative and non significant correlation with seed yield per plant having their negative and direct effect (-0.0148) owing to the low and positive indirect effect (0.0904) *via* oil content. Oleic acid showed positive indirect effect *via* oil yield per plant (0.0533), linolenic acid (0.0156), linoleic acid (0.0122), palmitic acid (0.0074), number of productive branches per plant (0.0033), 1000 seed weight (0.0033), days to first flowering (0.0016), number of productive capsules per plant (0.0012), number of seeds per capsule (0.0009), plant height (0.0002), days to maturity (0.0002) and stearic acid (0.0001). Palmitic acid showed negative and direct effect (-0.0124) as well as the high and positive indirect effect (0.3288) *via* oil yield per plant. Oil content showed negative and high direct effect (-0.5030) with seed yield per plant owing to the high and positive indirect effect (0.4430) *via* oil yield per plant. Oil yield per plant showed positive and significant correlation (0.8733**) with seed yield per plant comprising its high and positive direct effect (1.0526). Whereas, *via* days to 50% flowering (0.0455), linolenic acid (0.0198), height of 1st capsule (0.0058), days to maturity (0.0037) and plant height (0.0026), Similar findings were reported earlier by Tripathy *et al.* (2016), Muhamman *et al.* (2010) and Aremu *et al*. (2011).

Genotypic path coefficient (Table-5)

Path coefficient analysis at genotypic level (Table-4) revealed that the highest positive direct effects on grain yield per plot were exhibited by oil yield plant (1.0197) and height of 1st capsule (0.2296). Number of productive capsules per plant (0.1765), harvest index (0.0630), days to first flowering (0.0357), days to 50% flowering (0.0308), days to maturity (0.0093) and biological yield (0.0093) had small but positive direct effect on grain yield, while plant height showed high negative direct effect (-0.1175) to the seed yield. All other traits recorded low or negligible negative direct effect on grain yield per plant. Plant height showing high positive indirect effect on seed yield via, oil yield per plant (0.3477), height of 1st capsule (0.1556) and oil content (0.1080). Days to first flowering were exhibited, high positive indirect effect on oil yield per plant (0.5430), Indirect effect of days to maturity on seed yield per plant via oil yield per plant (0.5518) was high and positive, while number of productive branches per plant reported high positive indirect effect through oil content (0.1180) and number of productive capsules per plant (0.0708). The positive and high indirect effect of height of 1st capsule with seed yield was also recorded through oil yield per plant (0.2872) Number of productive capsules per plant had high positive indirect effect on oil content (0.1850). Number of seeds per capsule exhibited indirect effect on oil yield per plant was high and positive (0.5706). Indirect effect of biological yield per plant via oil yield per plant (0.3184), height of 1st capsule (0.1340), number of productive capsules per plant (0.1037) was high and positive, while harvest index showed positive and high indirect effect through oil yield per plant (0.3032). 1000 seed weight reported high positive indirect effect on seed yield *via* oil yield per plant (0.1970). Stearic acid showed positive indirect effect via height of 1st capsule (0.0511), number of productive capsules per plant (0.0416), oil yield per plant (0.0246), linoleic acid (0.0047), days to maturity (0.0021), oil content (0.0020), biological yield per plant (0.0019), number of seeds per capsule (0.0012) and oleic acid (0.0001). Linolenic acid exhibited high positive indirect effect on oil content (0.2264) and height of 1st capsule (0.0599. Linoleic acid showed low positive indirect effect on oil content (0.0637). Also, oil yield per plant (-0.1623) reported high negative indirect effect on seed yield per plant. Low positive indirect effect of seed yield showed on oleic acid via oil yield per plant (0.0672). Palmitic acid reported high positive indirect effect on oil yield per plant (0.3511) and height of 1st capsule (0.1052). Oil content showed the positive and high indirect effect through oil yield per plant (0.4506) on seed yield. Oil yield per plant exhibited negligible positive indirect effect via linolenic acid (0.0219), days to first flowering (0.0190), harvest index (0.0187), days to 50% flowering (0.0143), days to maturity (0.0050), number of productive capsules per plant (0.0042), biological yield (0.0029) and linoleic acid (0.0020). These results are in conformity with the finding of Thiyagu *et al.* (2007), Singh *et al*. (2020) and Bamrotiya *et al.* (2016).

Conclusion

A perusal of the results of both correlation and path analysis revealed that most important characters accounting for cause and effect relationship on yield are oil yield per plant, days to first flowering, plant height, days to 50% flowering, days to maturity, biological yield per plant, height of 1st capsule, number of productive capsules per plant, number of productive branches per plant, number of seeds per capsule, harvest index, 1000 seed weight and palmitic acid these traits were identified to be the major yield factors and major emphasis may begiven towards selection of these traits for improvement of grain yield in sesame. Therefore, it is suggested that preference should be given to these characters in selection programmes to isolate superior lines with genetic potentiality for high yield in sesame genotypes.

Table 1: List of the materials and their source

Sl. No.	Name of Genotypes	Sources
1.	NIC-8202	AICRP Sesame and Niger, JNKVV, Jabalpur
2.	IS-172	AICRP Sesame and Niger, JNKVV, Jabalpur
3.	IS-101	AICRP Sesame and Niger, JNKVV, Jabalpur
4.	IS-750-1-84	AICRP Sesame and Niger, JNKVV, Jabalpur
5.	SI-199-2-84	AICRP Sesame and Niger, JNKVV, Jabalpur
6.	PCU-41	AICRP Sesame and Niger, JNKVV, Jabalpur
7.	PCU-42	AICRP Sesame and Niger, JNKVV, Jabalpur
8.	PCU-43	AICRP Sesame and Niger, JNKVV, Jabalpur
9.	RJS-44	AICRP Sesame and Niger, JNKVV, Jabalpur
10.	IS-207	AICRP Sesame and Niger, JNKVV, Jabalpur
11.	S-0241	AICRP Sesame and Niger, JNKVV, Jabalpur
12.	NAC/125/11/42/5/1	AICRP Sesame and Niger, JNKVV, Jabalpur
13.	IC-204500	AICRP Sesame and Niger, JNKVV, Jabalpur
14.	NIC-13586	AICRP Sesame and Niger, JNKVV, Jabalpur
15.	MT-67-18	AICRP Sesame and Niger, JNKVV, Jabalpur
16.	IC-14146-C	AICRP Sesame and Niger, JNKVV, Jabalpur
17.	ES-78	AICRP Sesame and Niger, JNKVV, Jabalpur
18.	IC-81563	AICRP Sesame and Niger, JNKVV, Jabalpur
19.	S-0223	AICRP Sesame and Niger, JNKVV, Jabalpur
20.	IS-62-1	AICRP Sesame and Niger, JNKVV, Jabalpur
21.	EC-303423-C	AICRP Sesame and Niger, JNKVV, Jabalpur
22.	S-0403	AICRP Sesame and Niger, JNKVV, Jabalpur
23.	SI-1865-1-B	AICRP Sesame and Niger, JNKVV, Jabalpur
24.	GSM-21	AICRP Sesame and Niger, JNKVV, Jabalpur
25.	IS-346	AICRP Sesame and Niger , JNKVV, Jabalpur
26.	S-01159-C	AICRP Sesame and Niger, JNKVV, Jabalpur
27.	IS-201-S	AICRP Sesame and Niger, JNKVV, Jabalpur
28.	OMT-4	AICRP Sesame and Niger, JNKVV, Jabalpur
29.	PRAGATI	RPCAU, PUSA
30.	KRISHNA	RPCAU, PUSA

Table 2: Phenotypic correlation coefficient between pairs of 19 different quantitative characters in sesame

Sl. No.	Characters	Ch-1	Ch-2	Ch-3	Ch-4	Ch-5	Ch-6	Ch-7	Ch-8	Ch-9	Ch-10	Ch-11	Ch-12	Ch-13	Ch-14	Ch-15	Ch-16	Ch-17	Ch-18
1	Plant height (cm)	1.000																	
2	Days to first flowering	0.216	1.000																
3	Days to 50% flowering	0.137	0.889**	1.000															
4	Days to maturity	-0.072	0.087	0.062	1.000														
5	No of Productive Branches per Plant	0.261	0.313*	0.298	-0.103	1.000													
6	Height of 1st capsule(cm)	0.576**	0.212	0.209	-0.020	0.100	1.000												
7	No of productive capsules per plant	0.244	-0.010	-0.002	0.228	0.378*	-0.149	1.000											
8	No of seeds per capsule	0.223	0.408*	0.309*	0.344*	-0.025	0.186	0.160	1.000										
9	Biological yield per plant (g)	0.493**	0.292	0.299	0.196	0.340*	0.540**	0.578**	0.366*	1.000									
10	Harvest index (%)	-0.209	0.151	0.099	0.065	-0.282	-0.366*	-0.377*	0.012	-0.667**	1.000								
11	1000 seed weight (g)	0.135	0.026	-0.052	0.347*	-0.072	0.003	0.385*	0.078	0.260	-0.004	1.000							
12	Stearic acid (%)	0.089	-0.061	-0.051	0.163	-0.170	0.202	0.224	-0.124	0.192	-0.192	0.347*	1.000						
13	Linolenic acid (%)	0.129	-0.119	-0.022	-0.203	0.144	0.240	0.142	-0.138	0.140	-0.323*	0.045	0.236	1.000					
14	Linoleic acid (%)	-0.094	-0.041	0.105	-0.156	-0.057	-0.119	-0.083	0.028	-0.076	-0.080	-0.361*	-0.315*	0.117	1.000				
15	Oleic acid (%)	0.018	-0.024	-0.192	0.024	0.143	-0.031	0.046	-0.097	-0.0837	0.198	0.288*	-0.008	-0.266	-0.829**	1.000			
16	Palmitic acid (%)	0.155	0.389*	0.449**	0.115	-0.159	0.405*	-0.158	0.379*	0.316*	-0.105	-0.152	0.205	0.145	0.347*	-0.595**	1.000		
17	Oil content (%)	-0.181	0.072	0.051	0.056	-0.209	-0.108	-0.366*	0.015	-0.180	0.188	-0.088	-0.005	-0.461**	-0.121	0.120	0.071	1.000	
18	Oil yield per plant (%)	0.281	0.500**	0.434**	0.368*	0.058	0.234	0.044	0.384*	0.300*	0.324*	0.145	0.027	-0.338*	-0.114	0.051	0.312*	0.421*	1.000
19	Seed yield per plant(g)	0.422*	0.527**	0.473**	0.383*	0.225	0.330*	0.278	0.409*	0.473**	0.210	0.223	0.027	-0.166	-0.104	0.042	0.272	-0.054	0.873**

*significant at P= 0.05; ** significant at P = 0.01

Ch-1: Plant Height(cm)
Ch-2: Days To First Flowering
Ch-3: Days To 50% Flowering
Ch-4: Days To Maturity
Ch-5: No Of Productive Branches/Plant
Ch-6: Height Of 1st Capsule(cm)
Ch-7: No Of Productive Capsules /Plant
Ch-8: No Of Seeds /Capsule
Ch-9: Biological Yield/Plant
Ch-10: Harvest Index (%)
Ch-11: 1000 Seed Weight(g)
Ch-12: Stearic Acid (%)
Ch-13: Linolenic Acid (%)
Ch-14: Linoleic Acid (%)
Ch-15: Oleic Acid (%)
Ch-16: Palmitic Acid (%)
Ch-17: Oil Content (%)
Ch-18: Oil yield/ plant (%)
Ch-19: Seed Yield/ Plant(g)

Table 3: Genotypic correlation coefficient between pairs of 19 different quantitative characters in sesame

SL. No.	CHARACTERS	Ch-1	Ch-2	Ch-3	Ch-4	Ch-5	Ch-6	Ch-7	Ch-8	Ch-9	Ch-10	Ch-11	Ch-12	Ch-13	Ch-14	Ch-15	Ch-16	Ch-17	Ch-18
1	Plant height (cm)	1.000																	
2	Days To First Flowering	0.242	1.000																
3	Days To 50% Flowering	0.154	0.905	1.000															
4	Days To Maturity	-0.075	0.134	0.070	1.000														
5	No Of Productive Branches/Plant	0.342	0.405	0.375	-0.043	1.000													
6	Height Of 1st Capsule(cm)	0.677	0.234	0.220	0.046	0.085	1.000												
7	No Of Productive Capsules /Plant	0.268	-0.020	-0.009	0.323	0.401	-0.143	1.000											
8	No Of Seeds /Capsule	0.222	0.550	0.411	0.572	-0.053	0.165	0.194	1.000										
9	Biological Yield/Plant	0.550	0.312	0.314	0.289	0.364	0.584	0.587	0.460	1.000									
10	Harvest Index (%)	-0.213	0.155	0.101	0.084	-0.348	-0.400	-0.407	0.061	-0.686	1.000								
11	1000 Seed Weight(g)	0.067	0.037	-0.067	0.621	-0.137	0.071	0.487	0.213	0.350	-0.001	1.000							
12	Stearic Acid (%)	0.104	-0.066	-0.062	0.228	-0.187	0.223	0.236	-0.132	0.203	-0.213	0.450	1.000						
13	Linolenic Acid (%)	0.154	-0.134	-0.026	-0.270	0.169	0.261	0.146	-0.186	0.142	-0.336	0.045	0.241	1.000					
14	Linoleic Acid (%)	-0.119	-0.063	0.126	-0.116	-0.087	-0.164	-0.079	0.079	-0.075	-0.115	-0.546	-0.373	0.130	1.000				
15	Oleic Acid (%)	0.023	-0.036	-0.218	0.065	0.149	-0.059	0.041	-0.134	-0.073	0.197	0.419	-0.006	-0.281	-0.959	1.000			
16	Palmitic Acid (%)	0.169	0.437	0.483	0.170	-0.186	0.458	-0.156	0.497	0.339	-0.123	-0.242	0.201	0.147	0.368	-0.657	1.000		
17	Oil Content (%)	-0.222	0.076	0.055	0.073	-0.243	-0.120	-0.381	0.003	-0.186	0.203	-0.111	-0.004	-0.466	-0.131	0.131	0.073	1.000	
18	Oil yield/ plant (%)	0.341	0.533	0.464	0.541	0.020	0.282	0.024	0.560	0.312	0.297	0.193	0.024	-0.361	-0.159	0.066	0.344	0.442	1.000
19	Seed Yield/ Plant (g)	0.512	0.562	0.505	0.567	0.215	0.396	0.275	0.599	0.499	0.165	0.303	0.023	-0.178	-0.146	0.053	0.302	-0.061	0.861

Ch-1: Plant Height(cm)
Ch-2: Days To First Flowering
Ch-3: Days To 50% Flowering
Ch-4: Days To Maturity
Ch-5: No Of Productive Branches/Plant
Ch-6: Height Of 1st Capsule(cm)
Ch-7: No Of Productive Capsules /Plant
Ch-8: No Of Seeds /Capsule
Ch-9: Biological Yield/Plant
Ch-10: Harvest Index(%)
Ch-11: 1000 Seed Weight(g)
Ch-12: Stearic Acid(%)
Ch-13: Linolenic Acid(%)
Ch-14: Linoleic Acid(%)
Ch-15: Oleic Acid(%)
Ch-16: Palmitic Acid(%)
Ch-17: Oil Content (%)
Ch-18: Oil yield/ plant (%)
Ch-19: Seed Yield/ Plant(g)

Table 4: Phenotypic path coefficient of 19 different quantitative characters on Seed Yield in Sesame

SL. No.	Characters	Ch-1	Ch-2	Ch-3	Ch-4	Ch-5	Ch-6	Ch-7	Ch-8	Ch-9	Ch-10	Ch-11	Ch-12	Ch-13	Ch-14	Ch-15	Ch-16	Ch-17	Ch-18
1	Plant height (cm)	**0.0091**	0.0020	0.0012	-0.0007	0.0024	0.0052	0.0022	0.0020	0.0045	-0.0019	0.0012	0.0008	0.0012	-0.0008	0.0002	0.0014	-0.0016	0.0026
2	Days to first flowering	-0.0143	**-0.0663**	-0.0589	-0.0058	-0.0208	-0.0140	0.0007	-0.0271	-0.0193	-0.0100	-0.0017	0.0040	0.0079	0.0027	0.0016	-0.0258	-0.0047	-0.0331
3	Days to 50% flowering	0.0144	0.0933	**0.1049**	0.0065	0.0313	0.0220	-0.0002	0.0324	0.0314	0.0104	-0.0054	-0.0053	-0.0023	0.0110	-0.0201	0.0471	0.0054	0.0455
4	Days to maturity	-0.0007	0.0009	0.0006	**0.0100**	-0.0010	-0.0002	0.0023	0.0035	0.0020	0.0007	0.0035	0.0016	-0.0020	-0.0016	0.0002	0.0012	0.0006	0.0037
5	No of Productive Branches per Plant	0.0060	0.0072	0.0069	-0.0024	**0.0230**	0.0023	0.0087	-0.0006	0.0078	-0.0065	-0.0017	-0.0039	0.0033	-0.0013	0.0033	-0.0037	-0.0048	0.0013
6	Height of 1st capsule(cm)	0.0142	0.0052	0.0052	-0.0005	0.0025	**0.0247**	-0.0037	0.0046	0.0133	-0.0090	0.0001	0.0050	0.0059	-0.0029	-0.0008	0.0100	-0.0027	0.0058
7	No of productive capsules per plant	0.0062	-0.0003	0.0000	0.0058	0.0096	-0.0038	**0.0254**	0.0041	0.0147	-0.0096	0.0098	0.0057	0.0036	-0.0021	0.0012	-0.0040	-0.0093	0.0011
8	No of seeds per capsule	-0.0021	-0.0038	-0.0028	-0.0032	0.0002	-0.0017	-0.0015	**-0.0092**	-0.0034	-0.0001	-0.0007	0.0011	0.0013	-0.0003	0.0009	-0.0035	-0.0001	-0.0035
9	Biological yield per plant (g)	0.0014	0.0008	0.0009	0.0006	0.0010	0.0016	0.0017	0.0011	**0.0029**	-0.0019	0.0008	0.0006	0.0004	-0.0002	-0.0002	0.0009	-0.0005	0.0009
10	Harvest index (%)	0.0080	-0.0058	-0.0038	-0.0025	0.0108	0.0139	0.0144	-0.0005	0.0255	**-0.0381**	0.0002	0.0073	0.0123	0.0030	-0.0076	0.0040	-0.0072	-0.0123
11	1000 seed weight(g)	0.0016	0.0003	-0.0006	0.0040	-0.0008	0.0000	0.0044	0.0009	0.0030	0.0000	**0.0115**	0.0040	0.0005	-0.0042	0.0033	-0.0017	-0.0010	0.0017
12	Stearic acid (%)	-0.0012	0.0008	0.0007	-0.0021	0.0022	-0.0026	-0.0029	0.0016	-0.0025	0.0025	-0.0045	**-0.0131**	-0.0031	0.0041	0.0001	-0.0027	0.0001	-0.0004
13	Linolenic acid (%)	-0.0076	0.0070	0.0013	0.0119	-0.0085	-0.0141	-0.0083	0.0081	-0.0082	0.0189	-0.0027	-0.0139	**-0.0587**	-0.0069	0.0156	-0.0085	0.0271	0.0198
14	Linoleic acid (%)	0.0014	0.0006	-0.0016	0.0023	0.0008	0.0018	0.0012	-0.0004	0.0011	0.0012	0.0053	0.0046	-0.0017	**-0.0148**	0.0122	-0.0051	0.0018	0.0017
15	Oleic acid (%)	0.0006	-0.0008	-0.0061	0.0008	0.0046	-0.0010	0.0015	-0.0031	-0.0027	0.0063	0.0092	-0.0003	-0.0085	-0.0265	**0.0319**	-0.0190	0.0038	0.0016
16	Palmitic acid (%)	-0.0019	-0.0048	-0.0056	-0.0014	0.0020	-0.0050	0.0020	-0.0047	-0.0039	0.0013	0.0019	-0.0025	-0.0018	-0.0043	0.0074	**-0.0124**	-0.0009	-0.0039
17	Oil content (%)	0.0909	-0.0360	-0.0257	-0.0282	0.1053	0.0541	0.1843	-0.0076	0.0904	-0.0944	0.0440	0.0025	0.2318	0.0609	-0.0602	-0.0355	**-0.5030**	-0.2117
18	Oil yield per plant (%)	0.2960	0.5263	0.4569	0.3877	0.0609	0.2463	0.0462	0.4042	0.3161	0.3408	0.1527	0.0288	-0.3556	-0.1195	0.0533	0.3288	0.4430	**1.0526**
19	Seed yield per plant(g)	0.4220*	0.5268**	0.4733**	0.3829*	0.2254	0.3295	0.2783	0.4093*	0.4726**	0.2104	0.2234	0.0272	-0.1655	-0.1036	0.0423	0.2715	-0.0542	0.8733**

RESIDUAL EFFECT = 0.0985

Ch-1: Plant Height(cm)
Ch-2: Days To First Flowering
Ch-3: Days To 50% Flowering
Ch-4: Days To Maturity
Ch-5: No Of Productive Branches/Plan
Ch-6: Height Of 1st Capsule(cm)
Ch-7: No Of Productive Capsules /Plant
Ch-8: No Of Seeds /Capsule
Ch-9: Biological Yield/Plant
Ch-10: Harvest Index(%)
Ch-11: 1000 Seed Weight(g)
Ch-12: Stearic Acid (%)
Ch-13: Linolenic Acid(%)
Ch-14: Linoleic Acid(%)
Ch-15: Oleic Acid(%)
Ch-16: Palmitic Acid(%)
Ch-17: Oil Content (%)
Ch-18: Oil yield/ plant (%)
Ch-19: Seed Yield/ Plant(g)

Table 5: Genotypic path coefficient analysis of eighteen different quantitative characters on Seed yield in Sesame

SL. No.	Characters	Ch-1	Ch-2	Ch-3	Ch-4	Ch-5	Ch-6	Ch-7	Ch-8	Ch-9	Ch-10	Ch-11	Ch-12	Ch-13	Ch-14	Ch-15	Ch-16	Ch-17	Ch-18
1	Plant height (cm)	**-0.1175**	-0.0284	-0.0181	0.0088	-0.0402	-0.0796	-0.0315	-0.0261	-0.0646	0.0250	-0.0079	-0.0122	-0.0180	0.0140	-0.0027	-0.0198	0.0261	-0.0401
2	Days to first flowering	0.0086	**0.0357**	0.0323	0.0048	0.0144	0.0083	-0.0007	0.0196	0.0112	0.0056	0.0013	-0.0024	-0.0048	-0.0022	-0.0013	0.0156	0.0027	0.0190
3	Days to 50% flowering	0.0047	0.0278	**0.0308**	0.0021	0.0115	0.0068	-0.0003	0.0126	0.0096	0.0031	-0.0021	-0.0019	-0.0008	0.0039	-0.0067	0.0149	0.0017	0.0143
4	Days to maturity	-0.0007	0.0012	0.0006	**0.0093**	-0.0004	0.0004	0.0030	0.0053	0.0027	0.0008	0.0058	0.0021	-0.0025	-0.0011	0.0006	0.0016	0.0007	0.0050
5	No of Productive Branches per Plant	0.0001	0.0001	0.0001	0.0000	**0.0002**	0.0000	0.0001	0.0000	0.0001	-0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0001	0.0000
6	Height of 1st capsule(cm)	0.1556	0.0537	0.0506	0.0105	0.0195	**0.2296**	-0.0328	0.0379	0.1340	-0.0919	0.0162	0.0511	0.0599	-0.0376	-0.0136	0.1052	-0.0276	0.0647
7	No of productive capsules per plant	0.0474	-0.0035	-0.0015	0.0570	0.0708	-0.0252	**0.1765**	0.0343	0.1037	-0.0718	0.0860	0.0416	0.0259	-0.0140	0.0072	-0.0276	-0.0672	0.0042
8	No of seeds per capsule	-0.0020	-0.0049	-0.0037	-0.0051	0.0005	-0.0015	-0.0017	**-0.0090**	-0.0041	-0.0005	-0.0019	0.0012	0.0017	-0.0007	0.0012	-0.0045	0.0000	-0.0050
9	Biological yield per plant (g)	0.0051	0.0029	0.0029	0.0027	0.0034	0.0054	0.0055	0.0043	**0.0093**	-0.0064	0.0033	0.0019	0.0013	-0.0007	-0.0007	0.0032	-0.0017	0.0029
10	Harvest index (%)	-0.0134	0.0098	0.0064	0.0053	-0.0219	-0.0252	-0.0256	0.0039	-0.0433	**0.0630**	0.0000	-0.0134	-0.0212	-0.0073	0.0124	-0.0078	0.0128	0.0187
11	1000 seed weight(g)	-0.0044	-0.0025	0.0044	-0.0410	0.0091	-0.0047	-0.0321	-0.0141	-0.0231	0.0000	**-0.0660**	-0.0297	-0.0029	0.0360	-0.0276	0.0160	0.0073	-0.0127
12	Stearic acid (%)	-0.0011	0.0007	0.0006	-0.0024	0.0020	-0.0023	-0.0025	0.0014	-0.0021	0.0022	-0.0047	**-0.0105**	-0.0025	0.0039	0.0001	-0.0021	0.0000	-0.0003
13	Linolenic acid (%)	-0.0093	0.0081	0.0016	0.0163	-0.0103	-0.0158	-0.0089	0.0113	-0.0086	0.0204	-0.0027	-0.0146	**-0.0606**	-0.0079	0.0171	-0.0089	0.0283	0.0219
14	Linoleic acid (%)	0.0015	0.0008	-0.0016	0.0014	0.0011	0.0020	0.0010	-0.0010	0.0009	0.0014	0.0068	0.0047	-0.0016	**-0.0125**	0.0120	-0.0046	0.0016	0.0020
15	Oleic acid (%)	-0.0004	0.0007	0.0042	-0.0012	-0.0029	0.0011	-0.0008	0.0026	0.0014	-0.0038	-0.0081	0.0001	0.0054	0.0185	**-0.0193**	0.0127	-0.0025	-0.0013
16	Palmitic acid (%)	-0.0181	-0.0469	-0.0519	-0.0183	0.0200	-0.0492	0.0168	-0.0534	-0.0365	0.0132	0.0260	-0.0216	-0.0158	-0.0396	0.0707	**-0.1075**	-0.0078	-0.0370
17	Oil content (%)	0.1080	-0.0367	-0.0268	-0.0354	0.1180	0.0583	0.1850	-0.0012	0.0903	-0.0984	0.0538	0.0020	0.2264	0.0637	-0.0638	-0.0355	**-0.4858**	-0.2147
18	Oil yield per plant (%)	0.3477	0.5430	0.4736	0.5518	0.0206	0.2872	0.0240	0.5706	0.3184	0.3032	0.1970	0.0246	-0.3681	-0.1623	0.0672	0.3511	0.4506	**1.0197**
19	Seed yield per plant(g)	0.5116	0.5616	0.5045	0.5667	0.2153	0.3958	0.2750	0.5990	0.4994	0.1651	0.3028	0.0229	-0.1783	-0.1459	0.0525	0.3019	-0.0611	0.8613

RESIDUAL EFFECT = 0.0571

Ch-1: Plant Height(cm)
Ch-2: Days To First Flowering
Ch-3: Days To 50% Flowering
Ch-4: Days To Maturity
Ch-5: No Of Productive Branches/Plant
Ch-6: Height Of 1st Capsule(cm)
Ch-7: No Of Productive Capsules /Plant
Ch-8: No Of Seeds /Capsule
Ch-9: Biological Yield/Plant
Ch-10: Harvest Index(%)
Ch-11: 1000 Seed Weight(g)
Ch-12: Stearic Acid(%)
Ch-13: Linolenic Acid(%)
Ch-14: Linoleic Acid(%)
Ch-15: Oleic Acid(%)
Ch-16: Palmitic Acid(%)
Ch-17: Oil Content (%)
Ch-18: Oil yield/ plant (%)
Ch-19: Seed Yield/ Plant(g)

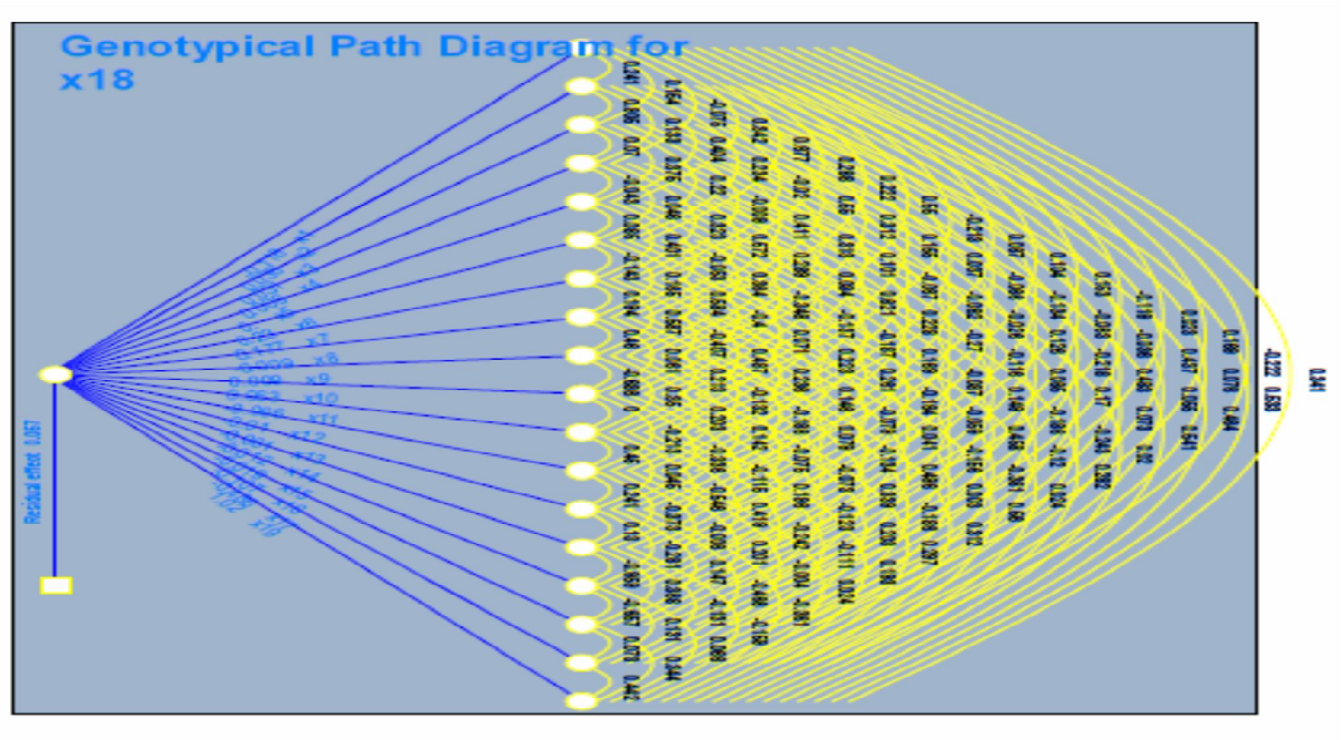

Fig. 1: Genotypic Path Diagram for Seed Yield per plant (g)

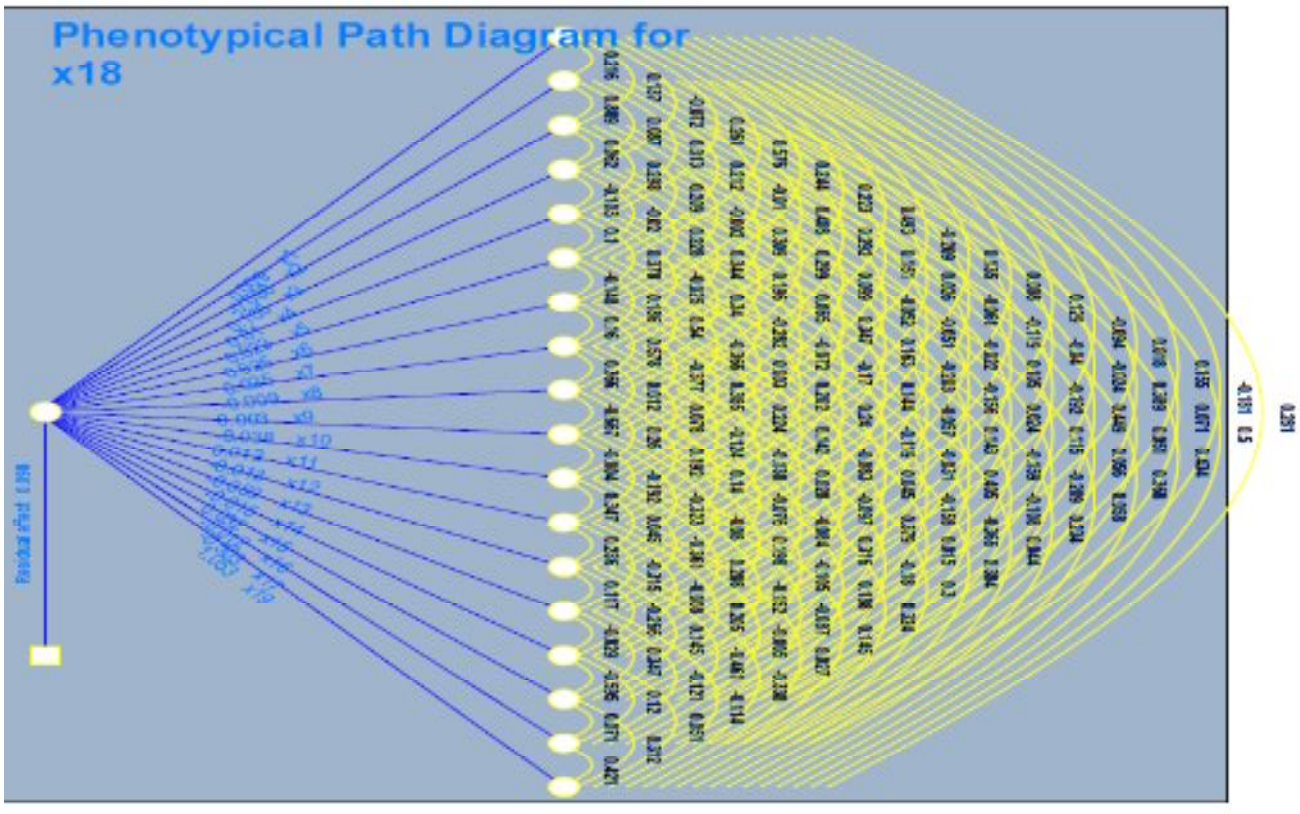

Fig. 2: Phenotypic Path Diagram for Seed Yield per plant (g)

References

Abate, M., Mekbib, F., Ayana, A. and Nigussie, M. (2015). Genetic Variability and Association of Traits in Mid-altitude Sesame (*Sesamum indicum* L.) *American Journal of Experimental Agriculture*, **9(3):** 1-14.

Abou-Gharbia, H.A., Shehata, A.A.Y. and Shahidi, F.F. (2000). Effect of processing on oxidative stability and lipid classes of sesame oil. *Food Res. Intl.*, **33:** 331-340.

Aremu, C.O., Adewale, D.B. and Adetunji, I.A. (2011). Cause and effect variations and trait selection index for indigenous sesame (*Sesamum indicum* L.) genotypes. *International Journal of Applied Agriculture and Apiculture Research*, **7(1&2):** 64-71.

Bamrotiya, M.M., Patel, J.B., Malav, A., Chetariya, C.P., Ahir, D. and Kadiyara, J. (2016). Genetic variability, character association and path analysis in sesame (*Sesamum Indicum L.*) *International Journal of Agriculture Sciences*, **8(54):** 2912-2916.

Baraki, F., Tsechaye, Y. and Abay, F. (2015). Assessing inter-relationship of sesame genotypes and their traits using cluster analysis and principal component analysis methods. *International Journal of Plant Breeding and Genetics*, **9(4):** 228-237.

Bharathi, D., Rao, V.T., Venkanna, V. and Bhadru, D. (2015). Association analysis in sesame (*Sesamum indicum* L.). *International Journal of Applied Biology and Pharmaceutical Technology*, **6(1):** 209-212.

Dewey, D.R. and Lu, K.H. (1959). A correlation and path coefficient analysis of components of crested wheatgrass seed production. *Agronomy Journal*, **57:** 515-518.

Fazal, A., Mustafa, H.S.B., Hasan, E.U., Anwar, M., Tahir, M.H.N. and Sadaqat, H.A. (2015). Interrelationship and path coefficient analysis among yield and yield related traits in sesame (*Sesamum indicum* L.) *Nature and Science*, **13(5):** 27-32.

Ibrahim, S.E. and Khidir, M.O. (2012). Genotypic correlation and path coefficient analysis of yield and some yield components in sesame (*Sesamum indicum* L.). *International Journal of Agricultural Sciences*, **2(8):** 664-670.

Mahajan, R.C., Wadikar, P.B., Pole, S.P. and Dhuppe, M.V. (2011). Variability, Correlation and Path Analysis Studies in Sorghum. *Res. J. Agri. Sci*., **2:** 101-103.

Mohanty, T.A., Singh, U.K., Singh, S.K., Kushwaha, N. and Singh, D. (2020). Study of Genetic Variability, Heritability and Genetic Advance inSesame (*Sesamum indicum* L.) Genotypes. *Int. J. Curr. Microbiol. App. Sci.*, **9(02):** 347-356.

Mohanty, T.A., Singh, U.K., Singh, S.K., Singh, D. and Kushwaha, N. (2020). Assessment of Genetic Diversity in Sesame (*Sesamum indicum* L.) Based on Agro-Morphological Traits. *Current Journal of Applied Science and Technology*, **39(25):** 101-107.

Muhamman, M.A., Mohammed, S.G., Lado, A. and Belel, M.D. (2010). Interrelationship and Path Coefficient Analysis of Some Growth and Yield Characterestics in Sesame (*Sesamum Indicum* L.). *Journal of Agricultural Science*, **2(4):** 100-105.

Panse, V.G. and Sukhatme, P.V. (1985). Statistical methods of agricultural research works. III Edition, ICAR, New Deihi. 146.

Sasipriya, S., Paimala, K., Eswari, B.K. and Balram, M. (2018). Correlation and path analysis for seed yield and its components in sesame (*Sesamum indicum* L.). *Electronic Journal of Plant Breeding*, **9(4):** 1594-1599.

Singh, D., Kumar, A., Kumar, R., Singh, S.K., Kushwaha, N. and Mohanty, T.A. (2020). Correlation and path coefficient analysis for 'yield contributing' traits in quality protein Maize (*Zea mays* L.). *Current Journal of Applied Science and Technology*, **39(25):** 91-99.

Thirumalarao, V., Bharathi, D., Chandramohan, Y., Venkanna, V. and Bhadru, D. (2013). Genetic variability and association analysis in sesame (*Sesamum indicum L.*). *Crop Research*, **46(1, 2 & 3):** 122-125.

Thiyagu, K., Kandasamy, G., Manivannan, N., Muralidharan, V. and Uma, D. (2007). Correlation and path analysis for oil yield and its components in cultivated sesame (*Sesamum indicum* L.). *Agriculture Science Digest*, **27(1):** 62-64.

Tripathy, S.K., Mishra Nayak, N.K., Dash, P.K. and Mohanty, G.B. (2016). Assessment Of Genetic Divergence In Sesamum Based On Morpho-Economic Characters. *International Journal ofCurrent Research*, **8(3):** 27283-27287.

Wright, S. (1921). Correlation and causation. *Agric. Res.*, **20:** 257-287.

Yingzhong, Z. and Yishou, W. (2002). Genotypic correlation and path coefficient analysis in sesame (*Sesamum indicum* L.). *Sesame and Safflower Newsletter*, **17:** 10-12.