Journal of AgriSearch, 12 (2): 74-80
An Open Access International Peer Reviewed Quarterly

ISSN : 2348-8808 (Print), 2348-8867 (Online)
https://doi.org/10.21921/jas.v12i02.15234

Assessment of Genetic Variability, Correlation and Path Coefficients among Varieties and Advanced Breeding Lines of Eggplant for Fruit Yield and Related Traits

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ABSTRACT

An experiment conducted at BUAT, U.P. (2021–2023) on 34 eggplant accessions assessed genetic variability, correlations, and path coefficients. High GCV and PCV were recorded for number of flowers per cluster, followed by the number of fruits per plant, average fruit weight and leaf area index indicating strong genetic variability and scope for selection. High heritability coupled with high GA% of mean was observed for number of flowers per cluster, number of fruits per plant, leaf area index, average fruit weight, fruit length, and fruit yield per plant suggesting additive gene action. Genotypic and phenotypic correlation revealed significant positive correlation on fruit yield per plant with average fruit weight and fruit length provide valuable insights into selecting traits for breeding improvement programs. Path coefficient analysis showed significant positive direct effect on fruit yield via number of fruits per plant, fruit diameter, days to 50% flowering, average fruit weight and fruit length. These results highlight key traits for targeted selection in eggplant breeding to improve yield and associated characteristics.

Keywords: Genetic variability, Heritability, Correlation and path coefficient, Breeding improvement

ARTICLE INFO

Received on	:	03/05/2025
Accepted on	:	15/06/2025
Published online	:	30/06/2025

INTRODUCTION

The Solanaceae family comprises approximately 2,450 species across 95 genera, widely cultivated globally (Mabberley et al., 2008). Eggplant (Solanum melongena L.), a member of this family with a chromosome number 2n=24 (Verma et al., 2023), is believed to have originated from Solanum incanum, a wild African ancestor, in the Indo-Burman region (Isshiki et al., 1994). Eggplant is nutritionally valuable, containing vitamins, minerals like magnesium, calcium, phosphorus, and essential fatty acids, which help manage asthma, diabetes, and liver issues (Santhosha et al., 2017). White eggplant, with high chlorogenic acid content and low sugar levels, is particularly beneficial for diabetic individuals (Bajaj et al., 1979). Chlorogenic acid exhibits anti-diabetic, antioxidant, anti-carcinogenic, and anti-obesity properties (Plazas et al., 2013), while nasunin, an anthocyanin, offers anti-aging and anti-cancer effects.

India, the second-largest producer of eggplant after China, cultivates this crop year-round, providing significant income to small and marginal farmers (Ravali et al., 2017). The country's diverse agro-climatic zones and indigenous germplasm exhibit considerable variability in traits like plant morphology, yield, and stress tolerance (Ullah et al., 2014). However, directional breeding and climate change have led to a narrowing gene pool, necessitating conservation efforts and strategic breeding. Yield, a polygenic and environmentally influenced trait, requires evaluating genetic variability and interrelationships among sub-traits for effective selection (Kumar et al., 2012). This study aims to analyze genetic variability, correlation, and path coefficients to improve eggplant yield and related traits.

MATERIALS AND METHODS

The study was carried out during the Rabi seasons of 2021–22 and 2022–23 at the Vegetable Research Farm, BUAT, Banda, Uttar Pradesh. Thirty-four eggplant accessions were evaluated using a randomized complete block design (RBD) with three replications. Data were recorded on sixteen quantitative traits. GCV and PCV were estimated following Burton and De Vane (1953), heritability as per Allard (1960) and Burton and De Vane (1953), and genetic advance using the method of Johnson et al. (1955). Correlation coefficients were also calculated following Johnson et al. (1955). This comprehensive approach aimed to assess genetic variability, trait associations, and their implications for yield improvement in eggplant.

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RESULTS AND DISCUSSION

Genetic Variability

Assessing genetic variability through genotypic and phenotypic coefficients of variation (GCV and PCV) is crucial for evaluating the scope of selection in eggplant breeding. The pooled analysis across two years revealed substantial variability among the studied accessions, with all traits showing a broad range of variation (Table 1). PCV values were higher than GCV values for all traits, suggesting environmental factors influenced trait expression. However, the narrow differences in certain traits implied limited environmental effects on their phenotypic expression. These findings are consistent with those reported by Kumar et al. (2020).

Table 1: Grand mean, range, GCV, PCV, heritability (broad sense), and genetic advance (% of mean) were estimated for sixteen traits using pooled data from two years.

Characters	Mean	Min	Max	var (g)	var (p)	Heritability (%)	G A	GA% mean	GCV (%)	PCV (%)
Days to 50% flowering	58.25	50.00	69.67	26.41	34.50	76.55	9.26	15.90	8.82	10.08
Plant height at 50 % flowering (cm)	38.73	28.08	45.73	19.01	25.51	74.50	7.75	20.02	11.26	13.04
Number of flowers per cluster	3.62	1.20	24.09	15.19	15.24	99.65	8.01	175.30	95.39	97.36
Fruit setting percentage	53.58	18.94	92.41	417.36	430.36	96.98	41.44	77.35	38.13	38.72
Days to first fruit picking	73.14	62.49	90.00	33.79	43.02	78.56	10.61	14.51	7.95	8.97
Leaf Area Index	1.85	0.53	4.22	0.66	0.67	98.53	1.66	89.58	43.81	44.13
Number of primary branches/ plants	8.41	5.98	11.86	2.88	3.19	90.37	3.32	39.49	20.17	21.21
Fruit length (cm)	11.48	6.49	22.32	13.74	14.04	97.90	7.56	65.85	32.31	32.65
Fruit circumference (cm)	16.92	10.73	28.53	24.30	25.44	95.51	9.92	58.65	29.13	29.81
Fruit diameter (cm)	5.51	3.51	9.63	2.62	2.72	96.51	3.28	59.51	29.41	29.93
Specific gravity of fruits(g/cm3)	0.90	0.50	1.30	0.03	0.03	96.47	0.32	35.71	17.65	17.97
Total soluble solids (ºBrix)	4.55	3.18	5.60	0.65	0.67	97.15	1.64	36.11	17.79	18.04
Plant height at last picking (cm)	75.93	58.98	94.87	68.51	80.27	85.35	15.75	20.75	10.90	11.80
Number of fruits per plant	28.78	11.02	138.45	440.13	441.76	99.63	43.14	149.86	72.88	73.02
Average fruit weight (g)	116.65	15.67	251.09	3631.94	3697.97	98.21	123.03	105.47	51.66	52.13
Fruit yield per plant (kg)	2.66	1.46	3.57	0.44	0.47	94.36	1.33	49.82	24.89	25.63

Traits such as the number of flowers per cluster exhibited the highest GCV (95.39%) and PCV (97.36%), followed by the number of fruits per plant (GCV: 72.88%; PCV: 73.03%), average fruit weight (GCV: 51.66%; PCV: 52.13%), and leaf area index (GCV: 43.81%; PCV: 44.13%). Other traits with notable variability included fruit setting percentage, fruit length, fruit diameter, and fruit yield per plant, with PCV and GCV exceeding 24%, indicating strong potential for selection and improvement. These results align with the observations reported by Balasubramaniam et al. (2021). Traits with low to moderate variability included specific gravity of fruits (GCV: 17.65%; PCV: 17.97%), total soluble solids (GCV: 17.79%; PCV: 18.04%), and plant height at 50% flowering (GCV: 11.26%; PCV: 13.04%). Similarly, days to 50% flowering (GCV: 8.82%; PCV: 10.08%) and days to first fruit picking (GCV: 7.95%; PCV: 8.97%) exhibited lower variability, indicating these traits may require longer-term selection strategies. Traits with high GCV and PCV, such as the number of flowers per cluster and fruits

per plant, are ideal for selection in breeding programs, as they are less influenced by environmental variation and offer greater potential for genetic improvement.

Heritability and Genetic Advance

Broad-sense heritability is vital for breeders as it indicates the genetic contribution to phenotypic variation and the scope for selection. However, as noted by Burton (1952) and Johnson et al. (1955), high heritability should be paired with high genetic advance for effective genetic improvement.

In the present study, heritability estimates pooled across two years (Table 1) were high for most traits, such as the number of flowers per cluster (99.65%), number of fruits per plant (99.63%), leaf area index (98.53%), average fruit weight (98.21%), fruit length (97.90%), and fruit yield per plant (94.36%). This high heritability suggests a strong genetic influence and the potential for successful selection. Similar results were reported by Balasubramaniyam et al. (2021) in eggplant. High heritability coupled with high GA% of mean was observed for traits such as the number of flowers per cluster (221.30%), number of fruits per plant (148.70%), average fruit weight (104.19%), leaf area index (89.87%), and fruit yield per plant (44.67%). These traits are ideal targets for selection due to their substantial additive genetic variance and potential for significant improvement. Similar observations have been made in eggplant by Verma et al. (2021) and Samlindsujin et al. (2017).

Overall, the combination of high heritability and genetic advance underscores the potential for improving traits like fruit yield, fruit number, and average fruit weight through direct selection in advanced breeding programs.

Correlation Coefficients

Correlation studies provide insight into the relationship between yield and its component traits, aiding effective selection in breeding programs. The observed correlations can result from gene linkage or pleiotropy, where genes influence multiple traits either positively or negatively (Falconer, 1960; Dewey and Lu, 1959). In this study, genotypic correlations exceeded phenotypic ones, indicating that trait associations were mainly genetic. Pooled genotypic and phenotypic correlation analysis revealed that fruit yield per plant had a significant positive correlation with traits such as average fruit weight (0.552), fruit length (0.538), leaf area index (0.333), fruit diameter (0.318), fruit circumference (0.311), fruit setting percentage (0.294) and the number of fruits per plant (0.228). Conversely, fruit yield showed a significant negative correlation with plant height at last picking (-0.394) and the number of flowers per cluster (-0.214). These findings agree with those reported by Rameshwar et al. (2021) and others.

Average fruit weight exhibited a positive correlation with fruit circumference (0.794), fruit diameter (0.724), leaf area index (0.508), days to first fruit picking (0.400), and days to 50% flowering (0.344), but a negative correlation with plant height at last picking (-0.471), number of flowers per cluster (-0.395) and number of fruits per plant (-0.221). Similarly, the number of fruits per plant was positively correlated with the number of flowers per cluster (0.817) and fruit setting percentage (0.421). Total soluble solids (TSS) had a positive correlation with the number of flowers per cluster (0.223). Traits such as fruit diameter and fruit circumference showed significant positive correlations with days to 50% flowering (0.274), days to first fruit picking (0.255), and leaf area index (0.246). Fruit length positively correlated with leaf area index (0.414) and fruit setting percentage (0.268). Overall, the study highlights the importance of traits like average fruit weight, number of fruits per plant, and fruit circumference for yield improvement, as they positively influence fruit yield per plant. The findings are consistent with reports by Apkan et al. (2016). These results provide valuable insights into selecting traits for targeted genetic improvement in eggplant breeding programs.

Table 2: Estimation of Genotypic correlations coefficient among sixteen characters in eggplant genotypes pooled over two years

Characters	DFPF	PHFPF	NFPC	FSP	DFFP	LAI	NPBPP	FL	FC	FD	SGF	TSS	PHLP	NFPP	AFV	FYPP
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.000	0.487**	0.033	-0.262**	0.925**	0.281**	0.272**	-0.265**	0.355**	0.274**	0.045	0.018	-0.094	-0.155	0.344**	-0.072
2			0.075	-0.004	0.507**	0.169	0.273**	-0.328**	0.100	0.031	0.081	0.177	0.095	-0.100	0.161	-0.150
3				0.229*	-0.138	-0.260**	-0.089	-0.230*	-0.294**	-0.268**	-0.343**	0.223*	0.192	0.817**	-0.395**	-0.214*
4					-0.202*	0.083	0.084	0.268**	-0.018	-0.009	-0.152	-0.183	-0.350**	0.421**	0.047	0.294**
5						0.374**	0.323**	-0.230*	0.338**	0.255**	0.111	-0.069	-0.126	-0.313**	0.400**	-0.128
6							-0.083	0.414**	0.277**	0.246*	0.132	-0.296**	-0.165	-0.135	0.508**	0.333**
7								0.131	0.007	0.003	0.121	0.033	0.130	-0.178	0.093	-0.022

Characters	DFPF	PHFPF	NFPC	FSP	DFFP	LAI	NPBPP	FL	FC	FD	SGF	TSS	PHLP	NFPP	AFV	FYPP
8									-0.210*	-0.210*	0.080	-0.507**	-0.125	0.016	0.107	0.538**
9										0.965**	-0.179	0.046	-0.465**	-0.183	0.794**	0.311**
10											-0.176	0.078	-0.528**	-0.154	0.724**	0.318**
11												0.045	0.040	-0.366**	0.128	0.122
12													0.124	0.050	-0.084	-0.169
13														0.022	-0.471**	-0.394**
14															-0.221*	0.228*
15																0.552**
16																1.000

Abbreviation: DFPF: Days to 50% flowering; PHFPF: plant height at 50 % flowering (cm); NFPC: number of flowers per cluster; FSP: fruit setting percentage; DFFP: days to first fruit picking; LAI: leaf area index; NPBPP: number of primary branches per plant; FL: fruit length (cm); FC: fruit circumference (cm); FD: fruit diameter (cm); SGF: specific gravity of fruits (g cm-3); TSS: total soluble solids (°Brix); PHLP: plant height at last picking (cm); NFPP: number of fruits per plant; AFV: average fruit weight (g); FYPP: fruit yield per plant (kg).

Table 3: Estimation of phenotypic correlation coefficient among sixteen characters in eggplant genotypes pooled over two years

Characters	DFPF	PHFPF	NFPC	FSP	DFFP	LAI	NPBPP	FL	FC	FD	SGF	TSS	PHLP	NFPP	AFV	FYPP
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.000	0.465**	0.035	-0.229*	0.902**	0.271**	0.291**	-0.205*	0.346**	0.264**	0.028	0.046	-0.003	-0.129	0.330**	-0.016
2			0.075	-0.026	0.494**	0.168	0.256**	-0.265**	0.123	0.052	0.047	0.158	0.138	-0.086	0.160	-0.101
3				0.220*	-0.115	-0.255**	-0.082	-0.227*	-0.284**	-0.261**	-0.337**	0.220*	0.182	0.813**	-0.390**	-0.205*
4					-0.182	0.074	0.081	0.259**	-0.026	-0.007	-0.149	-0.175	-0.327**	0.416**	0.044	0.280**
5						0.361**	0.319**	-0.176	0.336**	0.247*	0.087	-0.022	-0.004	-0.273**	0.383**	-0.063
6							-0.068	0.413**	0.280**	0.246*	0.127	-0.283**	-0.135	-0.133	0.508**	0.331**
7								0.132	0.021	0.015	0.097	0.037	0.130	-0.169	0.101	-0.007
8									-0.201*	-0.199*	0.082	-0.489**	-0.093	0.017	0.115	0.531**
9										0.941**	-0.179	0.051	-0.400**	-0.177	0.779**	0.311**
10											-0.172	0.080	-0.467**	-0.151	0.711**	0.322**
11												0.049	0.031	-0.360**	0.125	0.123
12													0.136	0.051	-0.074	-0.151
13														0.019	-0.416**	-0.347**
14															-0.219*	0.225*
15																0.542*
16																1.000

Abbreviation: DFPF: days to 50% flowering; PHFPF: plant height at 50 % flowering (cm); NFPC: number of flowers per cluster; FSP: fruit setting percentage; DFFP: days to first fruit picking; LAI: leaf area index; NPBPP: number of primary branches per plant; FL: fruit length (cm); FC: fruit circumference (cm); FD: fruit diameter (cm); SGF: specific gravity of fruits (g cm-3); TSS: total soluble solids (°Brix); PHLP: plant height at last picking (cm); NFPP: number of fruits per plant; AFV: average fruit weight (g); FYPP: fruit yield per plant (kg).

Path Coefficients Analysis

Path analysis, based on the methods of Wright (1921) and Dewey and Lu (1959), helps separate correlations into direct and indirect effects of traits on yield. In this study, the effects of 16 traits on fruit yield per plant were analyzed at both genotypic and phenotypic levels across two years.

The analysis revealed that most traits exhibited higher magnitudes of direct and indirect effects at the phenotypic level compared to the genotypic level. Traits such as the number of fruits per plant (0.8634), fruit diameter (0.8079), average fruit weight (0.5811), days to 50% flowering (0.5953), fruit length (0.5468), total soluble solids (0.1436), fruit setting percentage (0.1310) specific gravity of fruit (0.1124), and plant height at 50% flowering (0.1095) exerted a significant positive direct effect on fruit yield per plant. Hence, these traits should be prioritized in selection strategies to enhance fruit yield. Conversely, traits such as number of flowers per cluster, leaf area index, fruit circumference, days to first fruit picking, and number of primary branches per plant had significant negative direct effects on fruit yield and should not be prioritized during selection. The number of fruits per plant exhibited high positive indirect effects on fruit yield via the number of flowers per cluster and fruit setting percentage, while showing negative indirect effects via traits such as specific gravity of fruits, days to first fruit picking, average fruit weight, fruit circumference, and leaf area index. Similarly, average fruit weight demonstrated positive indirect effects on fruit yield through traits like fruit circumference, fruit diameter, and days to 50% flowering, but negative effects via traits such as plant height at last picking and number of flowers per cluster. These findings suggest that fruit yield per plant can be improved by simultaneously selecting for number of flowers per cluster and fruit setting percentage to enhance both yield and the number of fruits per plant. Likewise, simultaneous improvement in fruit yield and average fruit weight could be achieved by focusing on traits such as fruit circumference, fruit diameter, leaf area index, and early flowering and fruiting traits. These conclusions are supported by previous studies from Kumar et al. (2021).

Table 4: Direct and indirect effect of fifteen characters on fruit yield per plant (kg) at genotypic level in eggplant pooled over two years

Characters	DFPF	PHFPF	NFPC	FSP	DFFP	LAI	NPBPP	FL	FC	FD	SGF	TSS	PHLP	NFPP	AFV	FYPP
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.5953	0.0533	-0.0264	-0.0343	-0.3781	-0.0737	-0.0513	-0.1452	-0.2951	0.2213	0.0051	0.0025	-0.0115	-0.1342	0.1998	-0.072
2	0.2897	0.1095	-0.0610	-0.0005	-0.2072	-0.0444	-0.0515	-0.1792	-0.0835	0.0249	0.0091	0.0254	0.0117	-0.0863	0.0937	-0.150
3	0.0194	0.0083	-0.8088	0.0301	0.0563	0.0681	0.0167	-0.1258	0.2446	-0.2163	-0.0385	0.0321	0.0236	0.7054	-0.2293	-0.214*
4	-0.1560	-0.0005	-0.1856	0.1310	0.0824	-0.0218	-0.0158	0.1468	0.0152	-0.0070	-0.0171	-0.0263	-0.0431	0.3638	0.0275	0.294**
5	0.5508	0.0555	0.1115	-0.0264	-0.4087	-0.0981	-0.0608	-0.1259	-0.2808	0.2061	0.0124	-0.0099	-0.0154	-0.2703	0.2323	-0.128
6	0.1673	0.0186	0.2099	0.0109	-0.1528	-0.2623	0.0156	0.2264	-0.2305	0.1984	0.0149	-0.0425	-0.0202	-0.1163	0.2953	0.333**
7	0.1620	0.0299	0.0718	0.0110	-0.1319	0.0218	-0.1885	0.0714	-0.0061	0.0022	0.0136	0.0047	0.0160	-0.1536	0.0539	-0.022
8	-0.1580	-0.0359	0.1861	0.0352	0.0941	-0.1086	-0.0246	0.5468	0.1750	-0.1696	0.0090	-0.0728	-0.0154	0.0143	0.0624	0.538**
9	0.2112	0.0110	0.2379	-0.0024	-0.1380	-0.0727	-0.0014	-0.1151	-0.8318	0.7793	-0.0201	0.0066	-0.0571	-0.1576	0.4616	0.311**
10	0.1631	0.0034	0.2165	-0.0011	-0.1042	-0.0644	-0.0005	-0.1148	-0.8023	0.8079	-0.0198	0.0112	-0.0649	-0.1331	0.4210	0.318**
11	0.0268	0.0088	0.2772	-0.0199	-0.0453	-0.0347	-0.0228	0.0437	0.1486	-0.1421	0.1124	0.0065	0.0049	-0.3164	0.0743	0.122
12	0.0104	0.0194	-0.1806	-0.0240	0.0281	0.0776	-0.0062	-0.2774	-0.0382	0.0630	0.0051	0.1436	0.0153	0.0435	-0.0487	-0.169
13	-0.0559	0.0104	-0.1556	-0.0459	0.0513	0.0432	-0.0246	-0.0683	0.3867	-0.4268	0.0045	0.0179	0.1229	0.0194	-0.2737	-0.394**
14	-0.0925	-0.0110	-0.6609	0.0552	0.1280	0.0353	0.0335	0.0090	0.1518	-0.1245	-0.0412	0.0072	0.0028	0.8634	-0.1284	0.228*
15	0.2047	0.0177	0.3191	0.0062	-0.1634	-0.1333	-0.0175	0.0588	-0.6608	0.5853	0.0144	-0.0120	-0.0579	-0.1908	0.5811	0.552**

Abbreviation: DFPF: days to 50% flowering; PHFPF: plant height at 50 % flowering (cm); NFPC: number of flowers per cluster; FSP: fruit setting percentage; DFFP: days to first fruit picking; LAI: leaf area index; NPBPP: number of primary branches per plant; FL: fruit length (cm); FC: fruit circumference (cm); FD: fruit diameter (cm); SGF: specific gravity of fruits (g cm-3); TSS: total soluble solids (°Brix); PHLP: plant height at last picking (cm); NFPP: number of fruits per plant; AFV: average fruit weight (g); FYPP: fruit yield per plant (kg).

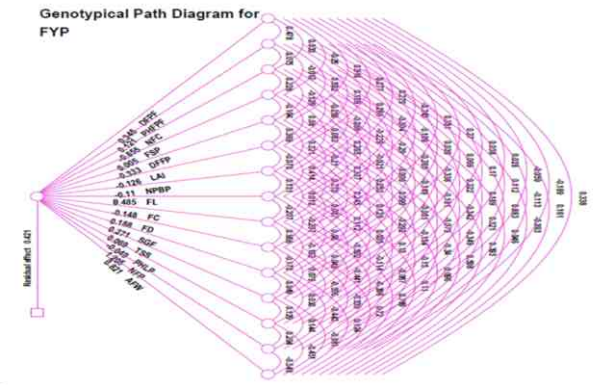

Fig 1: Genotypical path diagram for fruit yield per plant

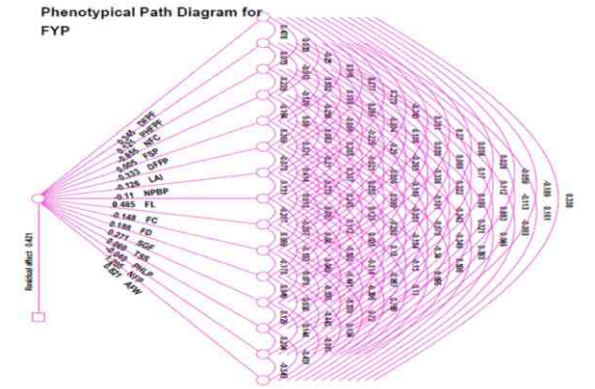

Fig 2: Phenotypical path diagram for fruit yield per plant

Table 5: Direct and indirect effect of fifteen characters on fruit yield per plant (kg) at phenotypic level in eggplant pooled over two years

Characters	DFPF	PHFPF	NFPC	FSP	DFFP	LAI	NPBPP	FL	FC	FD	SGF	TSS	PHLP	NFPP	AFV	FYPP
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.2477	0.0475	-0.0237	-0.0032	-0.1308	-0.0518	-0.0334	-0.1120	-0.0636	0.0851	0.0048	0.0068	0.0000	-0.1129	0.1234	-0.016
2	0.1152	0.1022	-0.0510	-0.0004	-0.0716	-0.0322	-0.0293	-0.1450	-0.0226	0.0169	0.0079	0.0234	-0.0002	-0.0747	0.0598	-0.101
3	0.0086	0.0076	-0.6833	0.0031	0.0167	0.0487	0.0094	-0.1240	0.0522	-0.0841	-0.0569	0.0326	-0.0002	0.7099	-0.1455	-0.205*
4	-0.0568	-0.0027	-0.1507	0.0140	0.0264	-0.0141	-0.0093	0.1419	0.0048	-0.0023	-0.0252	-0.0260	0.0004	0.3628	0.0166	0.280**
5	0.2233	0.0505	0.0787	-0.0025	-0.1450	-0.0690	-0.0367	-0.0962	-0.0619	0.0796	0.0147	-0.0032	0.0000	-0.2386	0.1430	-0.063
6	0.0672	0.0172	0.1743	0.0010	-0.0524	-0.1910	0.0078	0.2261	-0.0516	0.0792	0.0215	-0.0419	0.0002	-0.1161	0.1898	0.331**
7	0.0722	0.0261	0.0559	0.0011	-0.0463	0.0129	-0.1148	0.0724	-0.0038	0.0048	0.0163	0.0056	-0.0002	-0.1471	0.0378	-0.007
8	-0.0507	-0.0271	0.1548	0.0036	0.0255	-0.0789	-0.0152	0.5471	0.0370	-0.0641	0.0138	-0.0726	0.0001	0.0148	0.0428	0.531**
9	0.0856	0.0125	0.1937	-0.0004	-0.0488	-0.0535	-0.0024	-0.1099	-0.1840	0.3031	-0.0303	0.0076	0.0005	-0.1541	0.2911	0.311**
10	0.0654	0.0054	0.1783	-0.0001	-0.0358	-0.0469	-0.0017	-0.1089	-0.1731	0.3222	-0.0291	0.0119	0.0006	-0.1319	0.2654	0.322**
11	0.0070	0.0048	0.2302	-0.0021	-0.0126	-0.0243	-0.0111	0.0448	0.0330	-0.0554	0.1690	0.0072	0.0000	-0.3145	0.0468	0.123
12	0.0113	0.0162	-0.1504	-0.0025	0.0031	0.0540	-0.0043	-0.2678	-0.0094	0.0258	0.0083	0.1483	-0.0002	0.0444	-0.0278	-0.151
13	-0.0008	0.0142	-0.1246	-0.0046	0.0005	0.0258	-0.0149	-0.0508	0.0736	-0.1505	0.0053	0.0202	-0.0013	0.0166	-0.1552	-0.347**
14	-0.0320	-0.0087	-0.5556	0.0058	0.0396	0.0254	0.0193	0.0093	0.0325	-0.0487	-0.0609	0.0075	0.0000	0.8730	-0.0816	0.225*
15	0.0819	0.0164	0.2662	0.0006	-0.0555	-0.0971	-0.0116	0.0627	-0.1434	0.2290	0.0212	-0.0110	0.0005	-0.1908	0.3734	0.542**

Abbreviation: DFPF: days to 50% flowering; PHFPF: plant height at 50 % flowering (cm); NFPC: number of flowers per cluster; FSP: fruit setting percentage; DFFP: days to first fruit picking; LAI: leaf area index; NPBPP: number of primary branches per plant; FL: fruit length (cm); FC: fruit circumference (cm); FD: fruit diameter (cm); SGF: specific gravity of fruits (g cm-3); TSS: total soluble solids (°Brix); PHLP: plant height at last picking (cm); NFPP: number of fruits per plant; AFV: average fruit weight (g); FYPP: fruit yield per plant (kg).

CONCLUSION

The assessment of 34 eggplant accessions revealed substantial genetic variability, correlations, and path coefficients for key morphological traits. Accessions such as BUB-18-27 (highest fruit yield per plant and plant height at 50% flowering), Kashi Uttam (maximum fruit weight and circumference), BUB-18-15 (maximum number of fruits per plant), Kashi Taru (maximum fruit length), BUB-18-2 (maximum fruit diameter), and Pusa Shyamal & BUB-18-14 (earliest flowering and fruit picking) were identified as valuable for breeding programs. Traits with high GCV, PCV, heritability, and genetic advance-including number of flowers

per cluster, number of fruits per plant, average fruit weight, leaf area index, fruit setting percentage, fruit length, fruit diameter, fruit circumference, fruit yield per plant, and number of primary branches per plant-offer significant potential for selection. Fruit yield per plant showed strong positive correlations with average fruit weight, fruit length, leaf area index, fruit diameter, fruit circumference, fruit setting percentage, and number of fruits per plant, while negative correlations were observed with plant height at last picking and number of flowers per cluster. Traits like number of fruits per plant, fruit length, average fruit weight, fruit diameter, days to 50% flowering, specific gravity, total soluble solids, plant height at 50% flowering, and fruit setting percentage exhibited high direct positive effects on fruit yield per plant. These findings highlight the potential of specific traits and accessions for improving eggplant yield through targeted breeding strategies.

ACKNOWLEDGMENT

The authors gratefully acknowledge the Department of Vegetable Science, BUAT, Banda, Uttar Pradesh, for providing essential field and lab facilities that supported the completion of this research.

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Citation:

Verma A K, Mishra A C and Singh V.2025. Assessment of genetic variability, correlation and path coefficients among varieties and advanced breeding lines of eggplant for fruit yield and related traits. Journal of AgriSearch 12(2) : 74-80.