Analysis of Genetic Variation and Correlation for Yield and its Component Traits among Different Genotypes of Yardlong Bean [*Vigna unguiculata* (L.) walp subsp. *sesquipedalis* (L.) Verdcourt]

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ABSTRACT

Background: Yardlong bean [*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdcourt], is significant among legume vegetable crops. Due to seasonal variation, global warming and climate change can significantly impact its cultivation, yield and production. Considering this, the present study with 25-yard-long bean genotypes collected from various parts of Kerala was undertaken to estimate the genetic divergence for thirteen traits related to morphology and yield of yard long bean.

Methods: Thirteen quantitative traits were recorded in 25-yard-long bean genotypes under the design of randomized block design (RBD) with three replications. The research trial was conducted during *Kharif* and *Rabi* season (Two season). Data analysed using R studio 4.4. To examine the data for correlation and variability, two programs are used.

Result: The study of 25 yardlong bean genotypes across two seasons (*Kharif* and *Rabi*) revealed significant genetic variation for yield and morphological traits. The traits include number of pods per plant, yield per vine, individual pod weight and yield per hectare showed high genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) and detected considerable variability. This indicates that these traits possess substantial genetic potential for improvement through selection. High broad-sense heritability coupled with high genetic advance (GAM) was observed for pod length, number of pods per plant, pod yield per vine, individual pod weight and yield per hectare. These results suggest these traits are primarily controlled by additive gene action, making them highly effective criteria for simple selection in breeding programs. Yield per hectare showed a positive association with pod yield per vine (r= 0.999 to 1.000) and strong associations with individual pod weight (r=0.903 to 0.936) and number of pods per plant (r=0.471 to 0.724). G19 was observed as a superior genotype recording the highest pod yield per vine (up to 1.36 kg), the highest yield per hectare (up to 25.17 t) and the highest 100-seed weight (up to 23.58 g) perform better than the check genotypes in yield attributing characters, which could be used as selection criteria to enhance yield in the yardlong bean breeding program.

Key words: Correlation, GCV-PCV, Genetic variability, Yardlong bean, Yield.

INTRODUCTION

Vigna unguiculata (L.) Walp subsp. *sesquipedalis* (L.) Verdcourt, commonly known as the yard-long bean (2n=22), is a cleistogamous plant species prevalent in countries such as Bangladesh, India, Indonesia, the Philippines, Thailand and Sri Lanka Sherly *et al.* (2025). In India, regions like Kerala, Karnataka, Maharashtra, the North-Eastern Hill (NEH) area, West Bengal and Assam collectively cultivate this bean over approximately 18,560 to 20,160 hectares. The yardlong bean pods are eaten as vegetables by most people (Dwivedi *et al*., 2023) and it is known as the "poor man's meat" because the vegetable contains digestible protein (23.5-26.3%), iron (0.47 mg/100 g), phosphorus (59 mg/100 g), magnesium (44 mg/100 g), calcium (50 mg/100 g), zinc (0.37 mg/100 g), copper (0.05 mg/100 g), selenium (5 g/100 g) and vitamins A (865 IU) and C (18.8 mg/100 g) (Benchasri *et al.,* 2012; Jayasinghe *et al.,* 2015).

Crop improvement programs rely on genetic diversity because it provides the variation necessary for selection processes such as mutation, selection, hybridization and

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recombination to work effectively. Yardlong beans, a crop suited to warm climates, can thrive in conditions of high humidity (Solankey *et al.,* 2021). This study focused on yard-long bean genotypes, aiming to determine the most advantageous among 25 genotypes by highlighting genetic variation and divergence to enhance future crop development initiatives (Ano and Ubochi, 2008).

MATERIALS AND METHODS

The research was conducted during *Kharif* and *Rabi* season (2025-2026) at the Department of Vegetable Science, located at College Orchard, SRM College of Agricultural Sciences in Baburayanpettai, Chengalpattu. The experimental setup included twenty-two genotypes along with three check lines sourced from various origins, as detailed in Table 1. The experiment was laid out in a Randomized block design (RBD) with three replications and a spacing of 60 cm between plants and rows under drip irrigation.

Data was collected on various parameters by selecting 10 plants per replication, including the number of days for germination, the count of primary branches on each vine, the time taken for the first flowering and the first harvest, pod length and girth (cm), the days required for pod setting, number of pods per plant, pod yield per vine (kg), number of seeds per pod, weight of individual pods (g), the weight of 100 seeds (g) and the yield per hectare (tons) Savithiri *et al*. (2018).

Different genetic parameters, such as genotypic variance, phenotypic variance, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), genetic advance (GA), genetic advance as a percentage of mean (GAM) and correlation were determined using RStudio software (Popat *et al*., 2020).

RESULTS AND DISCUSSION

Mean performance of genotypes

The current study identified a significant range of variability for thirteen yield-related traits among the twenty-five yardlong bean genotypes shown in Table 2 (Sharma *et al*., 2025). Here the variation of several major attributes was described, number of days taken for germination ranged from S1: 3.15 days (G15) to 5.58 days (G22) with a mean of 4.28 days, S2: 2.94 days (G2) to 5.97 days (G22) with a mean of 4.24 days. Number of primary branches per vine was 5.60 (G7, G23) to 7.00 (G13, G14) with a mean of 6.26 in S1 and 5.29 (G7) to 7.21 (G13) with a mean of 6.22 in S2. Days to first flowering ranged from S1: 37.42 days (G7) to 50.37 (G24) with a mean of 40.00, S2: 36.11 days (G12) to 46.88 (G16) with a mean of 39.80. First harvest days varied from S1: 51.58 (G7) to 68.86 (G24) (mean: 57.59) and S2: 50.18 (G2) to 65.09 (G24) (mean: 57.26). Pod length (cm) ranged from 17.89 (G6) to 47.12 (G25) with a mean of 30.18 for S1 and 16.66 (G6) to 47.85 (G16) with a mean of 30.96 for S2. Pod girth (cm) ranged from S1: 1.86 (G19) to 3.58 (G23) (Mean 2.43) and S2: 1.75 (G6) to 3.45 (G13) (Mean 2.56) (Asmare *et al*., 2024).

Days to pod setting varied from 59.34 days (G12) to 87.98 (G13) with a mean of 75.74, 61.94 days (G12) to 84.08 (G13) with a mean of 74.82. Number of pods per plant ranged from S1: 27.73 (G3) to 67.36 (G10) with mean 50.92, S2:30.94 (G3) to 70.98 (G21) with mean 53.68. Pod yield per vine ranged from S1: 0.29 kg (G6) to 1.12 kg (G19, G23) with a mean of 0.61, S2: 0.31 kg (G2) to 1.36 kg (G19) with a mean of 0.72. Number of seeds per pod varied from S1: 14.55 (G18) to 20.20 (G14) with a mean of 17.28, S2: 14.66 (G4) to 22.40 (G14) with a mean of 18.66. Individual pod weight varied from S1: 4.85 g (G6) to 22.70 g (G19) with average of 11.10, S2: 6.98g (G6) to 23.44 g (G19) with average of 13.26. Yield per hectare ranged from S1: 5.50 t (G5) to 21.06 t (G19) with mean of 11.33, S2:5.80t (G2) to 25.17t (G19) with mean of 13.49. 100 seed weight ranged from S1:13.37 g (G4) to 22.63 g (G19) with mean of 18.39, S2:16.09 g (G4) to 23.58 g (G19) with mean of 19.26 (Afrose *et al*., 2023). The average performance of all the thirteen traits evaluated was found to be sufficiently variable, indicating that these features have space for improvement in the future (Mesera *et al*., 2022).

Table 1: List of genotypes assessed for yield and associated traits.

Genotypes	Source
G1	Thurthy, Kerala
G2	Nalukodi, Kerala
G3	Kurichi, Kerala
G4	Puthupally, Kerala
G5	Pariyaram, Kerala
G6	Panayampala, Kerala
G7	Chelakommpu, Kerala
G8	Piravom, Kerala
G9	Pampady, Kerala
G10	Pathanadu, Kerala
G11	Kangazha, Kerala
G12	Champakkara, Kerala
G13	Mulathuruthy, Kerala
G14	Perumbanoor, Kerala
G15	Adimali, Kerala
G16	Arekady, Kerala
G17	Nooromavu, Kerala
G18	Pathikkad, Kerala
G19	Kalloopara, Kerala
G20	Chengannur, Kerala
G21	Adoor, Kerala
G22	Pandalam, Kerala
Check 1-Geethika	KAU, Kerala
Check 2-Vyjayanthi	KAU, Kerala
Check 3-Vellani jyothika	KAU, Kerala

Table 2: Mean performance of twenty-five genotypes in 13 yield component traits.

Genotype	Season	NDG	NPB	DFF	DFH	PL	PG	DPS	NPP	PYV	NSP	IPW	YPH	100 SW
G1	S1	3.45	6.80	37.95	54.51	32.75	2.17	70.17	35.16	0.32	17.85	9.15	5.95	14.13
	S2	3.14	6.23	36.23	52.32	30.88	2.54	74.50	34.65	0.36	14.78	10.50	6.74	16.54
G2	S1	3.35	5.70	37.72	52.94	29.87	2.37	73.61	36.05	0.38	18.55	7.78	7.15	16.00
	S2	2.94	6.10	39.97	50.18	25.63	2.08	78.19	40.97	0.31	16.51	7.65	5.80	17.89
G3	S1	3.45	6.50	40.93	59.30	25.68	2.48	79.62	27.73	0.49	16.65	9.58	9.11	15.65
	S2	3.13	6.40	41.05	61.35	29.15	2.94	83.55	30.94	0.35	18.32	11.32	6.49	17.58
G4	S1	4.55	6.10	40.05	55.70	33.12	2.73	79.18	54.71	0.68	18.20	12.60	12.35	13.57
	S2	5.01	6.20	41.96	57.64	30.23	2.58	77.30	51.30	0.69	14.66	13.52	12.84	16.09
G5	S1	3.45	6.40	38.45	56.17	31.18	2.39	69.39	34.07	0.31	17.55	9.22	5.50	20.76
	S2	3.03	5.99	38.65	53.90	33.50	2.85	72.98	38.77	0.44	19.45	11.32	8.13	20.87
G6	S1	4.43	6.40	37.95	54.33	17.89	1.96	84.77	49.11	0.39	15.20	4.85	7.34	16.85
	S2	4.52	6.28	38.10	52.66	16.66	1.75	80.01	48.96	0.34	15.11	6.98	6.33	18.64
G7	S1	5.28	5.60	37.42	51.58	36.41	2.34	77.44	58.15	0.60	17.50	10.22	11.12	18.70
	S2	4.85	5.29	37.88	53.42	34.25	2.58	79.40	62.45	0.77	15.08	12.34	14.27	18.95
G8	S1	4.33	6.10	38.10	55.61	29.35	2.02	65.00	51.90	0.38	17.55	7.44	7.13	20.76
	S2	4.52	6.15	39.20	57.09	31.54	2.37	65.82	55.08	0.47	20.45	8.47	8.64	20.16
G9	S1	4.65	5.80	38.80	59.98	27.63	2.35	70.65	47.95	0.63	17.30	10.18	11.46	19.45
	S2	4.35	6.05	37.78	57.36	30.55	2.54	68.30	46.87	0.60	22.13	12.84	11.14	21.33
G10	S1	4.35	5.80	39.50	58.00	33.05	1.98	87.34	67.36	0.98	17.45	14.73	18.19	18.64
	S2	4.74	5.88	40.55	59.48	30.46	2.67	82.18	65.69	1.03	17.63	15.66	19.05	19.78
G11	S1	4.08	6.50	43.06	58.19	22.63	1.98	60.27	50.04	0.30	15.75	6.30	5.58	17.53
	S2	4.00	6.21	43.16	60.91	24.44	2.22	62.17	53.88	0.48	18.36	8.97	8.95	18.97
G12	S1	4.08	6.20	37.65	55.21	25.58	2.67	59.34	47.24	0.47	16.35	10.01	8.81	16.27
	S2	4.56	5.68	36.11	52.76	29.64	2.45	61.94	51.74	0.65	20.85	12.56	12.03	17.14
G13	S1	4.30	7.00	38.90	58.68	27.68	2.49	87.98	56.23	0.55	18.50	9.81	10.29	20.94
	S2	3.99	7.21	39.32	59.85	31.89	3.45	84.08	54.38	0.75	19.01	13.73	13.83	18.28
G14	S1	4.50	7.00	39.76	58.54	22.07	2.31	71.70	50.23	0.77	20.20	10.29	14.12	19.05
	S2	4.11	6.76	39.58	59.39	25.10	2.16	65.62	55.62	0.69	22.40	12.48	12.85	20.30
G15	S1	3.15	5.90	44.21	63.95	25.30	2.35	73.18	46.93	0.40	17.05	8.92	7.69	17.14
	S2	3.62	6.11	43.51	60.72	28.67	2.68	68.77	51.38	0.60	18.67	11.77	11.20	18.41
G16	S1	4.28	6.00	38.45	55.72	27.43	2.18	87.00	50.58	0.72	15.95	10.25	13.15	19.78
	S2	4.49	6.32	46.88	56.36	47.85	2.48	80.35	56.77	0.79	17.58	13.94	14.66	20.86
G17	S1	3.93	6.60	41.06	59.66	26.14	2.75	74.39	56.88	0.61	15.95	10.83	11.24	17.87
	S2	3.42	5.99	40.11	56.16	30.74	2.65	69.98	61.35	0.88	21.20	14.35	16.30	18.77
G18	S1	4.70	6.40	38.99	57.36	25.06	1.97	83.91	46.78	0.32	14.55	6.92	6.02	17.04
	S2	4.14	6.51	39.85	54.30	24.51	1.89	80.30	53.14	0.47	16.30	8.84	8.70	19.48

Table 2: Continue..

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G19	S1	4.75	6.50	45.28	64.03	42.68	1.86	77.08	50.20	1.12	18.25	22.70	21.06	22.63
	S2	4.84	6.84	46.05	60.11	38.72	2.39	72.50	57.99	1.36	21.10	23.44	25.17	23.58
G20	S1	4.35	6.70	38.10	55.11	25.71	2.64	80.13	60.29	0.56	16.20	9.38	10.41	20.09
	S2	4.10	6.44	37.91	57.67	27.68	2.78	81.59	64.70	0.82	19.11	12.71	15.23	19.14
G21	S1	4.18	6.60	39.86	57.08	26.26	2.52	83.06	73.80	0.60	17.55	8.23	11.33	21.76
	S2	4.23	7.09	40.54	53.50	32.83	2.99	80.61	70.98	0.98	22.30	13.81	18.15	21.10
G22	S1	5.58	6.60	38.05	55.96	28.86	2.89	79.36	64.29	0.77	16.00	12.40	14.62	18.84
	S2	5.97	6.95	36.40	59.34	30.77	2.76	76.80	60.40	1.01	18.09	16.69	18.67	19.78
G23	S1	4.48	5.60	40.46	58.11	44.85	3.58	76.83	59.01	1.12	20.00	19.00	20.41	19.80
	S2	4.61	5.31	40.10	61.33	41.99	2.87	80.63	62.88	1.22	18.98	19.45	22.65	20.21
G24	S1	4.20	6.00	50.37	68.86	40.36	2.88	69.25	47.24	0.70	17.30	14.98	12.76	17.45
	S2	4.54	5.77	36.33	65.09	41.08	2.50	73.57	54.34	0.90	19.29	16.63	16.73	17.88
G25	S1	5.15	5.70	38.96	55.13	47.12	3.04	72.92	51.24	1.11	18.55	21.70	20.34	19.00
	S2	5.23	5.85	37.74	58.60	25.32	2.75	69.25	56.84	1.23	19.10	21.56	22.69	19.79
Mean	S1	4.28	6.26	40.00	57.59	30.18	2.43	75.74	50.92	0.61	17.28	11.10	11.33	18.39
	S2	4.24	6.22	39.80	57.26	30.96	2.56	74.82	53.68	0.72	18.66	13.26	13.49	19.26
Min	S1	3.15	5.60	37.42	51.58	17.89	1.86	59.34	27.73	0.29	14.55	4.85	5.50	13.57
	S2	2.94	5.29	36.11	50.18	16.66	1.75	61.94	30.94	0.31	14.66	6.98	5.80	16.09
Max	S1	5.58	7.00	50.37	68.86	47.12	3.58	87.98	67.36	1.12	20.20	22.70	21.06	22.63
	S2	5.97	7.29	46.88	65.09	47.85	3.45	84.08	70.98	1.36	22.40	23.44	25.17	23.58
Sem ±	S1	0.15	0.22	1.43	2.05	1.17	0.09	2.76	1.81	0.91	0.67	0.56	0.59	0.71
	S2	0.15	0.22	1.43	2.05	1.17	0.09	2.76	1.81	0.91	0.67	0.56	0.59	0.71
CD (5%)	S1	0.41	0.63	4.06	5.83	3.33	0.26	7.85	5.15	2.58	1.90	1.60	1.68	2.01
	S2	0.41	0.63	4.06	5.83	3.33	0.26	7.85	5.15	2.58	1.90	1.60	1.68	2.01

Max- Maximum, Min-Minimum, NDG- Number of days taken for germination, NPB- Number of primary branches, DFF- Days taken for first flowering, DFH- Days taken for first harvest, PL- Pod length, PG-Pod girth, DPS- Days taken for pod setting, NPP- Number of pods per plant, PYV- Pod yield per vine, NSP- Number of seeds per pod, IPW- Individual pod weight, YPH- Yield per hectare, 100 SW- 100 seed weight.

Variability studies

Genetic variability of these traits indicated significant variation among the traits, which suggests that selection and genetic improvement are possible. These traits may be influenced by the environment, since the PCV is greater than the GCV (Thangam *et al*., 2020; Basavaraja *et al*., 2021).

Significant genetic diversity was observed for pod length S1: PCV=24.79% and GCV=23.68%, S2: PCV= 21.49% and GCV=20.47% followed by number of pods per plant (S1: PCV=21.04% and GCV=20.27%), pod yield per vine (S1: PCV=42.51% and GCV=41.78%), weight of individual pods (S1: PCV=40.75% and GCV=39.88%, S2: PCV=31.12% and GCV=30.24%) and yield per hectare (S1: PCV=42.06% and GCV=41.34%, S2: PCV=41.14% and GCV=40.44%) (Table 3). So, genetics will be optimal for selection and improvement, of these features. The findings align with the studies by Kyada *et al.* (2022) regarding the number of pods per plant, Patel *et al.* (2021) concerning seed production and Shintawati *et al.* (2022) on the count of pods per plant.

Number of pods per plant (S2: PCV = 18.55% and GCV=17.60%) followed by pod yield per vine (S2: PCV=15.84% and GCV= 10.41%), Days to germination S1: (PCV= 14.83% and GCV= 13.54%, S2: PCV= 17.97% and GCV= 16.95%), pod girth (S1: PCV= 17.48% and GCV= 16.17%, S2: PCV= 15.08% and GCV= 13.73%), number of seeds per pod (S2: PCV = 13.50% and GCV= 11.99%) and 100 seed weight (S1: PCV= 13.34% and GCV= 11.76%, S2: PCV= 10.07%) exhibited moderate PCV and GCV values suggesting that these traits are influenced by environmental factors. Similar findings were also obtained by Haque *et al*. (2021).

The number of primary branches per vine (S1: PCV= 8.55% and GCV= 5.8%, S2: PCV= 9.33% and GCV= 7.00%), days to first flowering (S1: PCV = 9.07% and GCV= 6.44%, S2: PCV= 8.73% and GCV= 6.14%), the days until the initial harvest (S1: PCV= 8.31% and GCV= 5.38%, S2: PCV= 8.12% and GCV= 5.25%), days to pod setting (S2: GCV= 8.24%) and the 100 seeds weight (S2: GCV= 7.80%) had low PCV and GCV, indicating strong environmental influence on these traits and selection would be ineffective. Similar findings were earlier studied by Berhanu *et al*. (2011) for days to first harvest.

Heritability and genetic advance

High GAM values indicate additive gene effect, whereas low GAM values indicate non-additive gene effect (Singh *et al*., 1991). The findings showed high broad-sense heritability and genetic advance as per cent of mean were observed among days to germination (S1: 25.44% and 83.26%, S2: 32.95% and 89.04%), pod length (S1: 46.59% and 91.24%, S2: 40.15% and 90.69%), pod girth (S1: 30.8% and 85.52%, S2: 25.75% and 82.91%), number of pods per plant (S1: 40.23% and 92.83%, S2: 34.42% and 90.08%), pod yield per vine (S1: 84.59% and 96.59%), individual pod weight (S1: 80.38% and 95.76%, S2: 60.53%

Table 3: Estimate of variability and genetic parameters for yardlong bean genotypes.

Traits	σ^2g		σ^2p		GCV (%)		PCV (%)		h^2 (%)		GA		GAM (%)	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
NDG	0.34	0.52	0.40	0.58	13.54	16.95	14.83	17.97	83.26	89.04	1.09	1.40	25.44	32.95
NPB	0.13	0.19	0.29	0.34	5.80	7.00	8.55	9.33	45.94	56.31	0.51	0.67	8.09	10.82
DFF	6.63	5.97	13.16	12.08	6.44	6.14	9.07	8.73	50.38	49.41	3.77	3.54	9.41	8.89
DFH	9.58	9.03	22.89	21.63	5.38	5.25	8.31	8.12	41.85	41.75	4.13	4.00	7.16	6.99
PL	51.08	40.16	55.99	44.28	23.68	20.47	24.79	21.49	91.24	90.69	14.06	12.43	46.59	40.15
PG	0.15	0.12	0.18	0.15	16.17	13.73	17.48	15.08	85.52	82.91	0.75	0.66	30.80	25.75
DPS	54.05	37.99	76.61	60.86	9.71	8.24	11.56	10.43	70.56	62.42	12.72	10.03	16.80	13.41
NPP	106.55	89.31	114.78	99.14	20.27	17.60	21.04	18.55	92.83	90.08	20.49	18.48	40.23	34.42
PYV	0.07	1.88	0.07	4.34	41.78	10.41	42.51	15.84	96.59	43.22	0.52	1.86	84.59	14.10
NSP	1.47	5.00	2.66	6.34	7.02	11.99	9.44	13.50	55.33	78.85	1.86	4.09	10.76	21.92
IPW	19.59	16.08	20.45	17.03	39.88	30.24	40.75	31.12	95.76	94.41	8.92	8.03	80.38	60.53
YPH	21.92	29.75	22.69	30.80	41.34	40.44	42.06	41.14	96.63	96.59	9.48	11.04	83.72	81.86
100 SW	4.67	2.26	6.02	3.76	11.76	7.80	13.34	10.07	77.62	60.07	3.92	2.40	21.34	12.46

and 94.41%), yield per hectare (S1: 83.72% and 96.63%), S2: 81.86% and 96.59%, number of seed per pod (S2: 21.92% and 78.85%) and 100 seed weight (S1: 21.34% and 77.62%, S2: 60.07%). The above stated results are strong heritability paired with high genetic progress as per cent of suggest that considerable phenotypic variance in these features is genetically controlled by additive gene action hence, easy selection may be followed to improve these characters. The present results concur with the findings of (Yohannes *et al*., 2020; Patel *et al*., 2021). On the other hand, characteristics such as primary branches per vine (S1: 8.09% and 45.94%, S2: 10.82% and 56.31%), pod yield per vine (S2: 14.10% and 43.22%), days to first blooming (S1: 9.41% and 50.38%, S2: 49.41%), days to first harvest (S1: 7.16% and 41.85%, S2: 41.75%) and 100 seed weight (S2: 12.46%) showed low to moderate genetic progress as a percentage of the mean and moderate heritability. These above suggests character is controlled by both additive and non-additive gene action. Similar results by Rambabu *et al*. (2016).

Correlation studies

Correlation analysis revealed a moderate to strong connection between various factors affecting productivity when examining the relationship between yield and its contributing traits, as shown in Table 4 (Ramasamy *et al*., 2021).

In this study, positively significant associations were observed between yield per hectare and several traits at both season I and II, pod yield per vine (r= S2= 1.00; S1 = 0.999), individual pod weight (r= S2= 0.903; S1= 0.903), days to germination (r= S2= 0.626; S1= 0.552), number of pod per plant (r= S2= 0.724; S1= 0.471), pod length (r = S2= 0.479; S1 = 0.685) and the pod girth (r = S1= 0.414). Furthermore, there was a positively correlation between yield and the number of days for pods setting (r= S2= 0.085; S1= 0.279), pod girth (r= S2= 0.381), days taken for first harvest (r = S1= 0.239) and days taken for first flowering (r= S2= 0.161; S1= 0.218), indicating that improving these characteristics all at once can increase yield potential. These findings are consistent with the results of Thapa *et al.* (2021); Lokesh and Murthy (2017); Pandiyan *et al.* (2020) and Tambitkar *et al.* (2021) (Fig 1 and 2).

The correlation between days to germination and various yield components is notably positive, with the number of pods per plant (r= S1= 0.581; S2= 0.606), pod yield per vine (r= S1= 0.547; S2= 0.627) and individual pod weight (r = S1= 0.398; S2= 0.527 all showing positively significant relationships (Nanda *et al*., 2022). This suggests that prompt and enhanced germination fosters strong plant establishment, thereby boosting yield factors. Similar conclusions by Venkatesan *et al.* (2024) and Gogoi *et al.* (2024).

Number of primary branches per plant exhibited positive associations with days taken for first flowering (r = S2= 0.226), days taken for first harvest (r= S1= 0.065; S2= 0.053), number of days for pods setting (r= S2= 0.201; S1 = 0.088) and number of pod per plant (r= S2= 0.052) (Kumar *et al*., 2024).

The number of days to first flowering was significantly and positively correlated with number of days to first harvest (r = S1= 0.912), number of days to first harvest (r = S1= 0.221), pod length (r = S2= 0.324; S1 = 0.293), pod yield per vine (r = S2= 0.159; S1= 0.221) and individual pod weight

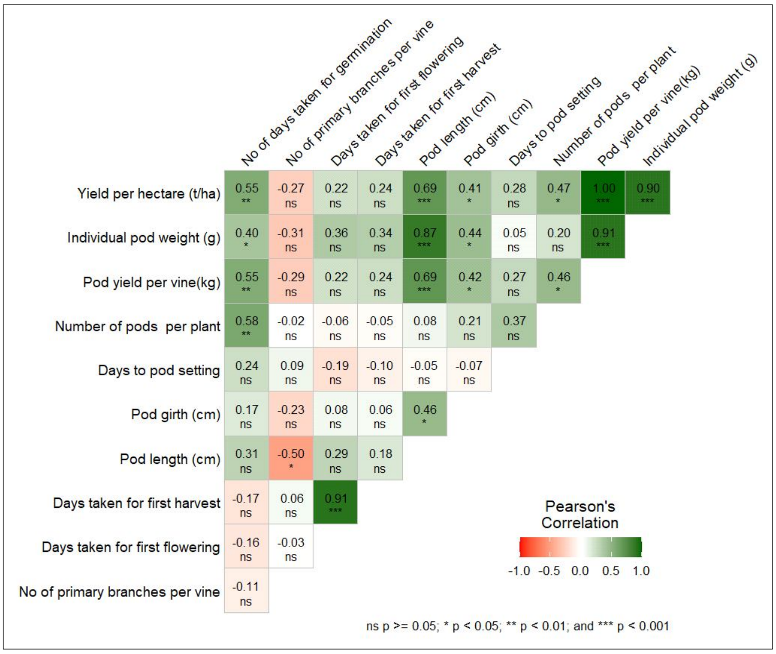

Fig 1: Estimates of correlation coefficient among 11 quantitative traits in 25 yardlong bean genotypes (Season-I).

Table 4: Genotypic correlation among yield and yield influencing traits of yardlong bean.

		No. of days taken for germination	No. of primary branches per vine	Days taken for first flowering	Days taken for first harvest	Pod length (cm)	Pod girth (cm)	Days to pod setting	Number of pods per plant	Pod yield per vine (kg)	Individual pod weight (g)	Yield per hectare (t/ha)
No. of days taken	S1	1	-0.113	-0.156	-0.169	0.307	0.168	0.238	0.581**	0.547**	0.398*	0.552**
for germination	S2	1	-0.003	-0.075	0.28	0.156	-0.009	-0.011	0.606**	0.627**	0.527**	0.626**
No. of primary branches	S1		1	-0.034	0.065	-.499*	-0.23	0.088	-0.018	-0.286	-0.305	-0.274
per vine	S2		1	0.226	0.053	-0.162	0.141	0.201	0.052	0.001	-0.023	-0.001
Days taken for first flowering	S1			1	0.912**	0.293	0.077	-0.187	-0.056	0.221	0.363	0.218
	S2			1	0.221	0.324	-0.056	0.071	0.115	0.159	0.15	0.161
Days taken for first harvest	S1				1	0.18	0.06	-0.099	-0.045	0.241	0.341	0.239
	S2				1	0.306	0.333	-0.067	0.196	0.445*	0.510**	0.446*
Pod length (cm)	S1					1	0.463*	-0.049	0.08	0.693**	0.871**	0.685**
	S2					1	0.406*	0.175	0.226	0.478*	0.519**	0.479*
Pod girth (cm)	S1						1	-0.068	0.207	0.423*	0.440*	0.414*
	S2						1	0.301	0.156	0.382	0.430*	0.381
Days to pod setting	S1							1	0.373	0.269	0.053	0.279
	S2							1	0.088	0.085	0.034	0.085
Number of pods per plant	S1								1	0.459*	0.2	0.471*
	S2								1	0.724**	0.443*	0.724**
Pod yield per vine (kg)	S1									1	0.906**	0.999**
	S2									1	0.936**	1.000**
Individual pod weight (g)	S1										1	0.903**
	S2										1	0.936**
Yield per hectare (t/ha)	S1											1
	S2											1

*Indicates significance at 5%.

**Indicates significance at 1% level of significance.

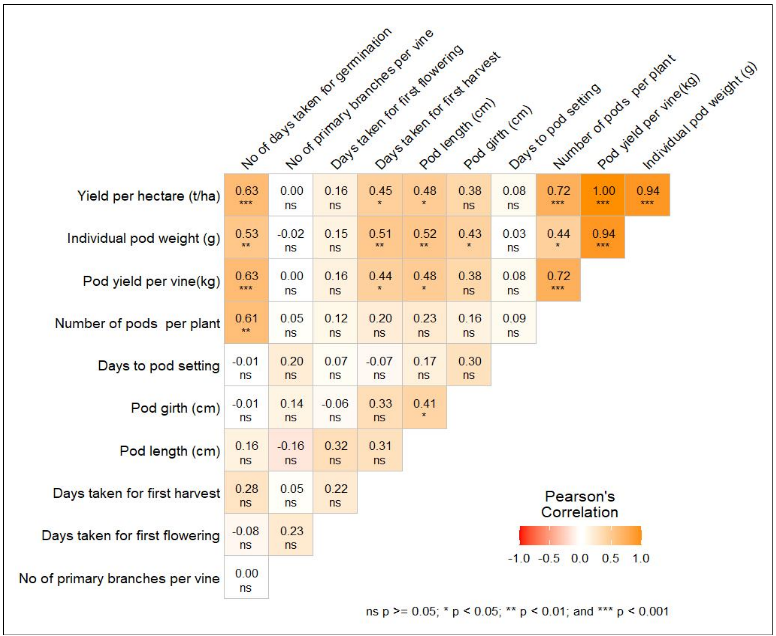

Fig 2: Estimates of correlation coefficient among 11 quantitative traits in 25 yardlong bean genotypes (Season-II).

(r= S2= 0.150; S1= 0.363). Pod length was positively and significantly associated with pod girth (r= S2= 0.406; S1= 0.463), pod yield per vine (r = S2= 0.478; S1= 0.693) and individual pod weight (r = S2= 0.519; S1 = 0.871). Pod girth was also found to be strongly and positively linked with both the pod yield per vine (r = S2= 0.382; S1= 0.423) and the individual pod weight (r= S2= 0.430; S1= 0.440) emphasizing the importance of pod girth as a key yield component. Similar results were found by (Paghadar *et al*., 2019) in yardlong bean.

The number of pods per plant was positively significant associated with pod yield per vine (r= S1= 0.459; S2= 0.724), individual pod weight (r= S2= 0.443) and positively associated individual pod weight (r= S1= 0.200) indicating that plants with a higher pod count generally produce more (Bhagavati *et al*., 2019). Furthermore, the pod yield per plant (r= S1= 0.906; S2= 0.936) were positively significant correlated with pod yield per hectare, similar findings were observed in cowpea by (Snehal *et al*., 2021) as well as in yardlong bean by (Noru and Thomas, 2025).

CONCLUSION

The study revealed that the 25 yardlong bean genotypes exhibit significant genetic variation, especially with regard to yield-related characteristics. Because they show a high genotypic coefficient of variation, genetic progress and heritability, traits including number of pods per plant, pod weight, pod yield per plant and yield per hectare are useful factors for choosing and enhancing yardlong bean varieties. Furthermore, the greatest positive and direct influence on yield comes from the quantity of pods per plant and seeds per pod. In order to create high-yielding varieties, it is recommended that certain characteristics be given priority throughout the selection process.

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Disclaimers

The opinions and findings presented in this article are the writers' own and may not necessarily reflect those of the organizations with which they are affiliated. The writers disclaim any liability for any direct or indirect losses resulting from the use of this content, however they are accountable for the accuracy and completeness of the information presented.

Conflict of interest

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