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Heritability and genetic variability studies for yield and yield attributing traits in Dolichos bean (*Lablab purpureus* L.) genotypes

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Abstract
The field experiment was carried out by using twenty-six field bean genotypes to study the genetic variability, heritability and genetic advance. The characters studied were days to fifty percent flowering, days to maturity, plant height, number of branches per plant, number of pods per plant, grain yield per plant (g), grain pod yield per plant (g). On the basis of mean performance, the genotypes, PYR 15-01, Nagavalli local 1 and Nallur local were found to be superior for yield and yield contributing traits. The genotype HA 3 was an early maturing type but which possess an optimal grain pod yield of 327 g/ plant. With respect to variability studies all the seven characters *viz.*, days to fifty percent flowering, days to maturity, plant height, number of branches per plant, number of pod per plant, grain yield per plant (g) and grain pod yield per plant (g) recorded high value of PCV, GCV, heritability and genetic advance indicated the involvement of additive genes for the control of these characters and favours selection.

Keywords: Heritability, genetic variability, yield, yield attributing traits, *Lablab purpureus* L.

Introduction
Field bean is mainly known for tender green pods, mature fresh green seeds and is rich in protein. The dry seeds are also utilized for several vegetable preparations and foliage of the crop affords hay, silage and green manures (Bose *et al.*, 1993) [2]. Dolichos bean is enriched with rich source of protein, minerals, vitamins and fibre. The primary center of origin of Dolichos Bean (*Lablab purpureus* L.) is India. Although this crop has originated in India but very minimum research work has been carried out for the genetic enhancement of yield and quality. In any crop breeding programme for improvement of specific trait through selection mainly rest on the genetic variability present in the existing germplasm of a particular crop. In addition, polygenes are responsible for main of the plant characters and is highly influenced by the environment. Hence the improvement of breeding approaches depends principally on the magnitude, nature and interrelationship of genotypic and non-genotypic variation. This creates a prerequisite to partition the total variability into heritable and non-heritable components. In a breeding programme, Heritability and genetic advance for different traits were estimated which help the breeder to apply suitable breeding methodology. Heritability together with genetic advance as percent of mean is relatively useful in predicting the accurate value of gene action responsible for effective selection. The variability found for various traits is compared with the help of genotypic co-efficient of variation (GCV) and phenotypic co-efficient of variation (PCV). Enhancing the yield is a major thrust area in crop improvement. Being a complex trait, the yield is typically inherited quantitatively. Only a scarce information on genetic variability for field bean is available. Hence, an effort was made with precise objective to estimate the genetic parameters of variability to identify the foremost characters responsible for obtaining higher yield.

Materials and Methods
The experiment material comprised of twenty-six genotypes *viz.*, Denkanikottai local, Kaveripattinam local, Mecheri local, PYR 15-01, Coll 29, HA 3, HA 4, CO 1, CO 2, Arka Vijay, Arka Swagath, Arka Joy, Arka Amogh, Arka sambhran, Thally local 2, Togarapuramrole local 1, Doddarayapet local 1, Somarpett local 1, Manuganahalli local 1, Agraharam thally local, Nagavalli local 1, Nagavalli local 2, Nallur local, Hulse local, Udhuru local and Bannekuppe local. These genotypes were raised at the Regional Research Station, Paiyur during *Kharif 2020* in Randomized Block Design with three replications.

The characters studied were days to fifty percent flowering, days to maturity, plant height, number of branches per plant, number of pod per plant, grain yield per plant (g), grain pod yield per plant (g).

Analysis of variance was performed by following the procedure given by Panse and Sukhatme (1967) [5]. The phenotypic and genotypic coefficients of variation (PCV, GCV) were calculated as per method given by Burton and Devane (1953) [3]. Heritability in broad sense and genetic advance (% of mean) were computed as per the method given by Allard (1960) [1].

Results and Discussion

The analysis of variance exhibited a significant difference for most of the characters studied. The mean performance of twenty-six genotypes were presented in Table 1. For days to fifty percent flowering the mean value ranged from 46 days (Arka Amogh, Arka sambhran) to 140 days (Denkanikottai local, Kaveripattinam local, Mecheri local, PYR 15-01, Thally local 2 and Togarapuramrole local 1). The genotypes Coll 29, HA 3, HA 4, CO 2, Arka Vijay, Arka Swagath, Arka Joy, Arka Amogh, Arka sambhran and Udhuru local recorded lower mean value than overall mean (103.54 days).

For days to maturity the mean value ranged from 77 days (Arka Amogh, Arka sambhran) to 170 days (Denkanikottai local, Kaveripattinam local, Mecheri local, PYR 15-01, Thally local 2 and Togarapuramrole local 1). The genotypes Coll 29, HA 3, HA 4, CO 2, Arka Vijay, Arka Swagath, Arka Joy, Arka Amogh, Arka sambhran and Udhuru local recorded lower mean value than overall mean (134.23 days).

The mean value of plant height ranged from 116 cm (Arka joy) to 289.33 cm (Nagavalli local 2). The genotypes Kaveripattinam local, Mecheri local, PYR 15-01, HA 3, HA 4, CO 1, Togarapuramrole local 1, Doddarayapet local 1, Nagavalli local 1 and Nagavalli local 2 recorded higher mean value than overall mean (181.41 cm).

Regarding number of branches per plant the mean value ranged from 5.33 (Arka sambhran) to 13.33 cm (CO 1). The genotypes Mecheri local, PYR 15-01, Coll 29, HA 4, CO 1, CO 2, Togarapuramrole local 1, Doddarayapet local 1, Somarpett local 1, Agraharam thally local, Nagavalli local 1, Nagavalli local 2 and Nallur local recorded higher mean value than overall mean (8.96).

With respect to number of pods per plant the mean value ranged from 44.33 (Arka joy) to 166.67 cm (Nagavalli local 1). The genotypes Kaveripattinam local, Mecheri local, PYR 15-01, Coll 29, HA 3, HA 4, CO 1, CO 2, Nagavalli local 1, Nagavalli local 2, Nallur local, Hulse local and Udhuru local recorded higher mean value than overall mean (108.09).

For grain yield per plant (g) the mean value ranged from 46.10 g (Arka joy) to 176 g (PYR 15-01). The genotypes Kaveripattinam local, Mecheri local, PYR 15-01, Coll 29, HA 3, HA 4, CO 1, CO 2, Nagavalli local 1, Nagavalli local 2, Nallur local, Hulse local and Udhuru local recorded higher mean value than overall mean (114.20 g).

The trait grain pod yield per plant (g) recorded the mean value ranged from 103 g (Arka joy) to 395 g (PYR 15-01). The genotypes Kaveripattinam local, Mecheri local, PYR 15-01, Coll 29, HA 3, HA 4, CO 1, CO 2, Nagavalli local 1, Nagavalli local 2, Nallur local, Hulse local and Udhuru local recorded higher mean value than overall mean (255.50 g).

The results of variability analysis were presented in Table 2. PCV was relatively high in all the traits studied *viz.*, days to fifty percent flowering (38.68%), days to maturity (29.86%), plant height (28%), number of branches per plant (25.09%), number of pod per plant (42.19%), grain yield per plant (g) (42.71%) and grain pod yield per plant (g) (42.35%). The high estimate of GCV was recorded for days to fifty percent flowering (38.68%), days to maturity (29.86%), plant height (27.61%), number of branches per plant (22.27%), number of pod per plant (41.63%), grain yield per plant (g) (41.44%) and grain pod yield per plant (g) (41.60%). High heritability was recorded for days to fifty percent flowering (100%), days to maturity (100%), plant height (97.22%), number of branches per plant (78.75%), number of pod per plant (97.36%), grain yield per plant (g) (94.16%), grain pod yield per plant (g) (96.48%). Similar results were reported by Peer *et al.* (2018) and Sahu *et al.* (2018) [8]. The high estimate of genetic advance as percent of mean was observed for days to fifty percent flowering (79.67%), days to maturity (61.51%), plant height (56.07%), number of branches per plant (40.71%), number of pod per plant (84.63%), grain yield per plant (g) (82.84%), grain pod yield per plant (g) (84.17%). Similar results were reported by Peer *et al.* (2018). With regard to variability studies all the characters *viz.*, days to fifty percent flowering, days to maturity, plant height, number of branches per plant, number of pod per plant, grain yield per plant (g) and grain pod yield per plant (g) showed high value of PCV, GCV, heritability and genetic advance indicated the involvement of additive genes for the control of these characters. The results were in line with the findings of Mohan *et al.* (2014) [4]. Days to fifty percent fifty percent flowering and days to maturity indicated same value of PCV and GCV, suggesting that the environment has no role on the days to fifty percent fifty percent flowering and days to maturity for their expression. The relationship between PCV and GCV indicates that PCV values were slightly higher than GCV signifying a very least influence of environment for the trait expression. The results are similar with the findings of Upadhyay and Mehta (2010) [9] and Verma *et al*. (2014) [10]. High heritability accompanying with high genetic advance is recorded in all the biometrical traits observed as in the order of- Number of pods per plant > Grain pod yield per plant (g) > Grain yield per plant (g) > Days to fifty percent flowering > Days to maturity> Plant height > Number of branches per plant.

High heritability associated with high genetic advance were observed in all the seven traits studied indicating that the heritability is due to the consequence of additive gene and these traits were least affected by environmental effects and selection based on all these characters would be rewarding.

Table 1: Mean performance of twenty-six genotypes for various traits in Dolichos Bean (*Lablab purpureus* L.)

Genotypes	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of branches per plant	Number of pods per plant	Grain yield /plant (g)	Grain pod yield per plant (g)
Denkanikottai local	140.00	170.00	172.00	8.33	92.33	96.00	215.00
Kaveripattinam local	140.00	170.00	236.67	7.67	155.33	162.00	361.00
Mecheri local	140.00	170.00	228.33	10.00	131.00	136.00	305.00
PYR 15-01	140.00	170.00	233.67	13.00	146.33	176.00	395.00
Coll 29	51.00	81.00	168.00	10.33	129.67	135.00	302.00
HA 3	54.00	84.00	211.33	8.67	140.33	146.00	327.00
HA 4	54.00	84.00	208.13	9.67	130.67	136.00	304.00
CO 1	110.00	140.00	262.67	13.33	162.33	169.00	378.00
CO 2	75.00	105.00	177.67	9.67	139.67	145.00	325.00
Arka Vijay	54.00	85.00	127.33	6.33	48.33	50.30	112.00
Arka Swagath	56.00	87.00	119.67	7.00	45.00	46.80	105.00
Arka Joy	56.00	87.00	116.00	5.67	44.33	46.10	103.00
Arka Amogh	46.00	77.00	126.33	6.00	49.33	51.30	115.00
Arka sambhran	46.00	77.00	122.00	5.33	47.33	49.20	110.00
Thally local 2	140.00	170.00	172.00	8.67	65.00	67.60	151.00
Togarapuramrole local 1	140.00	170.00	188.67	11.67	78.33	81.50	182.00
Doddarayapet local 1	128.00	160.00	223.33	10.33	87.00	90.50	202.00
Somarpett local 1	128.00	160.00	141.33	9.00	66.33	69.00	154.00
Manuganahalli local 1	128.00	160.00	176.67	8.67	85.67	111.40	249.00
Agraharam thally local	135.00	166.00	146.67	9.67	73.00	75.90	170.00
Nagavalli local 1	135.00	166.00	272.67	10.67	166.67	173.30	388.00
Nagavalli local 2	135.00	166.00	289.33	11.00	165.00	171.60	384.00
Nallur local	135.00	166.00	160.80	9.67	165.67	172.30	386.00
Hulse local	135.00	166.00	147.00	7.67	146.67	152.50	341.00
Udhuru local	56.00	87.00	136.00	7.33	164.67	171.30	383.00
Bannekuppe local	135.00	166.00	152.30	7.67	84.33	87.70	196.00

Table 2: Range, variability parameter, heritability and genetic advance as percent mean for seven characters in Dolichos Bean (*Lablab purpureus* L.)

Characters	Range	Minimum	Maximum	PCV (%)	GCV (%)	H2 (%)	GA	GAM (%)	Mean
Days to 50% flowering	94.00	46.00	140.00	38.68	38.68	100.00	82.49	79.67	103.54
Days to maturity	93.00	77.00	170.00	29.86	29.86	100.00	82.56	61.51	134.23
Plant height (cm)	173.33	116.00	289.33	28.00	27.61	97.22	101.72	56.07	181.41
Number of branches /plants	8.00	5.33	13.33	25.09	22.27	78.75	3.65	40.71	8.96
Number of pod/plant	122.33	44.33	166.67	42.19	41.63	97.36	91.47	84.63	108.09
Grain yield /plant (g)	129.90	46.10	176.00	42.71	41.44	94.16	94.60	82.84	114.20
Grain pod yield/plant (g)	292.00	103.00	395.00	42.35	41.60	96.48	215.13	84.17	255.50

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