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Study of Genetic Variability Parameters for Seed Yield and Component Traits in Mothbean [*Vigna aconitifolia* (Jacq) Marechal] under Arid Environment

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ABSTRACT: A field experiment with 36 genotypes of mothbean was conducted to study genetic variability parameters for seed yield and its component traits at Swami Keshwanand Rajasthan Agricultural University, Bikaner during Kharif-2020. Significant differences were existed among genotypes for all 26 characters under study. The high degree of genetic variability along with high heritability and high genetic advance as percent of mean were recorded for harvest index, seed yield per plant, number of pods per plant, biological yield per plant, days to 50 percent flowering, membrane stability index, water absorption capacity, seedling vigour, water absorption index, chlorophyll-a, total chlorophyll content, days to maturity, seedling dry weight and plant height which indicates that these characters were under the control of additive gene action. Consequently, more stress should be laid on these characters and selection method may be adopted for improvement in the yield of mothbean. Genotypes/varieties exhibited higher seed yield along with other desirable traits were RMO-435, RMB-25, RMO-257, RMO-423, RMO-2251, RMO-225, FMM-12-6-134, IC-983, RMO-40, and CAZARI-MOTH-2. Besides higher seed yield per plant potential IC-983, RMO-40, RMB-25, RMO-257, RMO-2251, CAZARI-MOTH-2, RMO-225, RMO-435, RMO-423 and GP-387 genotypes were also found early in flowering and maturity which are considered as most desirable traits for crop cultivation in the arid region.

Keywords: Genotypes, mothbean, seed yield, variability parameters, desirable traits.

INTRODUCTION

Pulses are critical in the food basket, are a rich source of protein (20-25 percent) and help address obesity, diabetes and malnutrition etc. Among pulses, the mothbean is an important pulse crop of hot arid regions of India and adapts to extremes ecological niches particularly extreme drought and hot climatic conditions. It's the main ingredient in *Bikaneri Bhujiya*, a popular spicy snack. It's also used in the making of various foods including *papad*, *namkeen*, *mangori*, and *dal vada*, among others. Agri-industries in Bikaner consume almost 80% of Rajasthan's mothbean production. The existence of mothbean is extremely important for maintaining crop diversity and long term sustainability of agriculture in the arid zone (Sharma, 2016).

The efficacy of selection depends upon the magnitude of genetic variability for yield and yield contributing traits in the breeding material. Collection, maintenance and evaluation of germplasm for studying genetic variability of economically important traits basic steps for initiating breeding programme.

MATERIAL AND METHOD

The 36 genotypes of Mothbean were evaluated in randomized block design with three replications accommodating 3 meters long two rows per replication at 30 cm spacing. Observations were recorded for 26 characters *viz*; days to 50 percent flowering, days to maturity, plant height, number of pods per plant, number of seeds per pod, pod length, 100-seed weight, biological yield per plant, harvest index, seed yield per plant, chlorophyll-a, chlorophyll-b, total chlorophyll content, membrane stability index, relative water content, seed volume, bulk density, particle/true density, porosity, water absorption capacity, water absorption index, germination percentage at 40°C, seedling length at 40°C, seedling fresh weight at 40°C, seedling dry weight at 40°C, seedling vigour index at 40°C subjected to genetic variability analysis using standard procedures. Analysis of variance was done by subjecting the data to the statistical method described by Panse and Sukhatme (1985); Singh and Chaudhary (1985). Genotypic variances and phenotypic variances

were calculated according to Johnson *et al.,* (1955); Comstock and Robinson (1952), respectively from the expectations of mean squares by using an ANOVA table for each character. Heritability in a broad sense was calculated as suggested by Burton and Devane (1953). The expected genetic advance for each character was calculated as suggested by Johnson *et al.,* (1955).

RESULT AND DISCUSSION

Analysis of variance showed appreciable and significant genetic variability among the genotypes of mothbean for all 26 traits under the present study. Similar findings were earlier reported by Kohakade *et al*., (2017); Sahoo *et al*., (2019); Pal *et al.,* (2020).

Genotypes exhibited substantially higher seed yield per plant and performed relatively better for desirable agro-morphological and physiological traits were IC-983, IC-120966, IC-370469, IC-415104, GP-14, GP-387, PLMO-16, JADIYA, RMO-40, RMO-225, RMO-2-251, RMO-257, RMO-423, RMO-435, RMB-25, FMM-12-6-134 and CAZARI-MOTH-2. Besides higher seed yield potential IC-893, RMO-40, FMM-12-6-134, RMB-25, RMO-257, RMO-2-251, CAZARI-MOTH-2, RMO-225, RMO-435, RMO-423 and GP-387 genotypes were also found early in flowering and maturity, therefore, these genotypes can be utilized as promising parents in the future, mothbean breeding programme for developing high yielding varieties for the arid region.

The PCV values of all the attributes were higher than the particular GCV (Table 1). High GCV and PCV values were reported for harvest index followed by seed yield per plant, biological yield per plant, number of pods per plant, days to 50 percent flowering and membrane stability index. The occurrence of moderate GCV and PCV were recorded for seedling vigour index at 40°C, water absorption capacity, water absorption index, seedling dry weight at 40°C, chlorophyll content-a, total chlorophyll content, plant height and days to maturity which suggests that improvement in these traits might be gained to a reasonable extent. The low GCV and PCV values of variance were recorded for 100-seed weight, number of seeds per pod, bulk density, seedling fresh weight at 40°C, relative water content, chlorophyll-b and pod length.

Table 1: Genetic variability parameters for different characters in mothbean genotypes.

Sr. No.	Characters	Range	Mean	GCV	PCV	h^2 (%)	GA (5%)	GA as % of mean
1.	Days to 50 percent flowering	30.00-68.33	46.30	24.55	24.58	99.70	23.39	50.52
2.	Days to maturity	59.00-89.33	71.06	11.14	11.36	96.20	16.00	22.52
3.	Plant height (cm)	30.70-53.31	41.76	12.17	14.09	74.60	9.05	21.66
4.	Number of pods per plant	15.82-61.62	39.88	31.05	31.94	94.50	24.79	62.16
5.	Number of seeds per pod	4.72-6.51	5.66	6.31	8.26	58.30	0.56	9.93
6.	Pod length (cm)	3.56-4.80	4.06	4.30	5.96	52.10	0.26	6.39
7.	100-seed weight (g)	2.61-3.96	3.31	7.54	9.20	67.10	0.42	12.72
8.	Biological yield per plant (g)	22.36-68.95	39.90	37.72	38.18	97.60	30.63	76.77
9.	Harvest index (%)	4.17-35.12	11.95	66.78	67.26	98.60	16.33	136.59
10.	Seed yield per plant (g)	1.55-7.95	4.04	43.18	44.18	95.50	3.51	86.95
11.	Chlorophyll content-a (mg/g)	0.90-2.22	1.47	13.11	15.04	75.90	0.34	23.52
12.	Chlorophyll content-b(mg/g)	0.20-0.32	0.26	5.60	7.84	50.90	0.02	8.23
13.	Total chlorophyll content (mg/g)	1.10-2.27	1.73	12.23	13.10	87.20	0.41	23.51
14.	Membrane stability index	29.56-73.05	48.00	20.89	21.83	91.60	19.77	41.18
15.	Relative water content (%)	79.04-94.78	87.32	5.64	7.92	50.60	7.21	8.26
16.	Seed volume (µl/seed)	21.00-31.00	26.72	9.60	10.94	76.90	4.63	17.33
17.	Bulk density (g/cm³)	0.69-0.86	0.75	6.04	7.31	68.30	0.07	10.29
18.	Particle/ true density (g/cm³)	0.71-1.36	1.13	9.59	11.49	69.70	0.19	16.49
19.	Porosity (%)	23.97-39.56	33.16	8.76	10.56	68.80	4.96	14.97
20.	Water absorption capacity (mg/seed)	27.52-61.77	38.87	16.57	17.94	85.30	12.26	31.54
21.	Water absorption index (WAI)	0.91-1.73	1.19	13.45	15.52	75.10	0.29	24.02
22.	Germination percentage at 40°C	53.33-90.00	72.68	8.86	12.00	54.60	9.80	13.49
23.	Seedling length (cm) at 40°C	10.46-17.17	13.96	9.50	12.04	62.20	2.15	15.43
24.	Seedling fresh weight(mg) at 40°C	0.68-0.99	0.88	5.96	8.42	50.10	0.08	8.69
25.	Seedling dry weight(mg) at 40°C	0.03-0.11	0.07	13.38	16.45	66.20	0.02	22.43
26.	Seedling vigour index at 40°C	695.51-1535.29	1029.86	16.66	18.18	84.00	323.96	31.46

High PCV and GCV for biological yield per plant was previously reported by Kumar *et al.,* (2015) and Malli *et al.* (2018); days to 50 percent flowering by Kohakade *et al*., (2017). The moderate PCV and GCV for days to maturity and plant height were earlier found by Solanki *et al.,* (2003). High values of heritability with high genetic advance as percent of mean were exhibited by harvest index, seed yield per plant, number of pods per plant, biological yield per plant, days to 50 percent flowering, membrane stability index, water absorption capacity, seedling vigour index at 40°C, water absorption index, chlorophyll content-a, total

chlorophyll content, days to maturity, seedling dry weight at 40°C and plant height; while high estimate of heritability coupled with moderate genetic advance as percent of mean was recorded for germination percentage at 40°C and bulk density which indicate that these traits were under the control of additive gene action. Therefore, these beneficial traits may be taken into consideration for the mothbean breeding programme.

High heritability coupled with high genetic advance as percent of mean for biological yield per plant has also been confirmed by Ramakrishnan *et al.*, (2018); Singh *et al.*, (2020); for harvest index by Sahoo *et al*., (2019); Singh *et al.*, (2020); for seed yield per plant by Ramakrishnan *et al.*, (2018); Sahoo *et al*., (2019); Singh *et al.*, (2020); Kanavi *et al.* (2020) for plant height by Kumar *et al.*, (2015), Yogeesh *et al.*, (2016); Soni and Mishra (2020). High heritability coupled with moderate genetic advance as percent of mean for days to maturity has been reported by Kohakade *et al.*, (2017); Ramakrishnan *et al.* (2018).

FUTURE SCOPE

These findings suggest that the material has sufficient variability to sustain a breeding effort aimed at increasing seed output in mothbean.

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Conflict of Interest. Nil.

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