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Study on genetic variability, heritability and genetic advance in mungbean [*Vigna radiata* (L.) Wilczek] in *summer* season under timely sown condition

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Abstract

The present investigation entitled “Study on genetic variability, heritability and genetic advance in mungbean [*Vigna radiata* (L.) Wilczek] in *summer* season under timely sown condition” were undertaken to work out genetic variability, heritability and genetic advance in per cent of mean. These carried out during timely sown condition in *summer* seasons of 2020 at Genetics and Plant Breeding Research Farm of Acharya Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Ayodhya. The experimental materials comprised of 26 genetically diverse varieties/strains and their 88 crosses. The experimental material was evaluated under summer seasons in timely sown condition. The observations were recorded on ten characters. The high estimates of phenotypic and genotypic coefficient of variability were for number of branches per plant, reducing sugar, chlorophyll, pods per plant, grain yield per plant and harvest index character under timely sown condition in summer season. The estimates of heritability in broad sense were high for all the characters, except days to maturity under both conditions in summer season. High heritability coupled with high genetic advance in per cent of mean was not found in any characters.

Keywords: Lentil, fusarium, fungicides, evaluation, neem

Introduction

Mungbean [*Vigna radiata* (L.) Wilczek] ($2n=22$) is an ancient pulse crop widely cultivated in India and there family Leguminaceae, subfamily Papilionaceae; most important pulse crop in India after chickpea and pigeonpea. It can be grown in various crop rotation practices (Singh *et al.* 2015) ^[1] because of its short duration nature, wider adaptability, low water requirement and photo insensitiveness. Mungbean is short day, warm season crop, grown mainly in arid and semi-arid regions. It is drought tolerant and has ability to grow under harsh climate and medium to low rainfall situation. It is tolerant to moisture stress and heat as well. It has ability to grow under low input conditions. It is grown on a variety of soils including black, red lateritic, gravelly and sandy soils, well drained fertile sandy loam soil with a pH between 6.2-7.2 is best for mungbean cultivation. Water logged and saline soils are not suitable for mungbean cultivation (Sharma *et al.* 2016) ^[2].

It also acts as cover crop and protects soil from erosion through winds (as summer crop) and rains (as kharif crop). Green gram can be used as dehulled grain, hulled (Dahl), husked and dehusked dahl. Soaked and sprouted grains are used as salad and breakfast. It is also used for preparing variety of savoury and sweet dishes. It is a palatable fodder and concentrates for milch cattle. Thus, it occupies a prominent place and gaining popularity by virtue of its short duration high tonnage capacity and outstanding nutritional value as food, feed and forage.

In India, mungbean is 3rd important crop group, was sown over an area of 4.26 Mha in (*kharif* + *rabi*) and recorded a production of 2.01 Mt at and yield level of 472 kg/ha. There have been the major states of mungbean production like Rajasthan, Madhya Pradesh, Maharashtra, Karnataka, Bihar, Andhra Pradesh, Odisha, Tamil Nadu, Gujarat and Telangana (Min. of Agri. & FW (DAC&FW), GOI, 2017-18). Pulses share in total food grain production occupy 65 per cent of total gross cropped area comprising cereals in 50% and pulses in about 15%. Within pulses, gram occupies 2% area mung. Other pulses cover about 13% of gross cropped area.

Globally, it has acreage under pulses is about 85.40 (Mha) with production of 87.40 (Mt) at 1023 kg/ha yields level. In India, with >29 Mha pulses cultivation area, is the largest pulse producing country in the world. It ranks first in area and production with 34 per cent and 26 per cent respectively. During 2017-18 the country's productivity at 835 kg/ha, is a significant increase over Eleventh (662 kg/ha) and Twelfth plans (745 kg/ha) (Min. of Agri. & FW (DAC&FW), GOI, 2017-18).

The entire success of plant breeding programme of any crop largely depends on the wide range of variability present in that crop. It is the range of genetic variability in respect of important economic characters present in the population upon which is based on the effectiveness of selection. Environment has a profound influence upon the economically important characters, which are quantitatively inherited. Hence, it is difficult to decide upon whether the observed variability is heritable or due to environment and it is therefore, necessary to partition the same into its heritable and non-heritable components with suitable parameters like genetic coefficient, heritability estimates and genetic advance (Kumar *et al.*, 2013) [4].

Materials and Methods

The present investigation was carried out at the Genetics and Plant Breeding research form of A.N.D. University of Agriculture & Technology, Narendra Nagar (Kumarganj), Ayodhya. The crosses were made during *summer* and *kharif* in 2019. Further, the germplasm lines, hybrids along with parental lines and check varieties were evaluated during the *summer* and *kharif* 2020. Geographically, experimental site is located between 24° 47' and 26° 56' N latitude, 82° 12' and 83° 98' E longitude and at an altitude of 113 m above mean sea level. This area falls in sub-tropical climatic zone. The soil type is sandy loam. The experimental material comprised 26 diverse genotypes (22 lines and 4 testers) of mungbean obtained from Indian Institute of Pulses Research in Kanpur, (Uttar Pradesh). Quite good number of crosses were attempted to produce sufficient F₁ seed in each cross.

Results and Discussion

The phenotypic, genotypic and environmental coefficients of

variability for all the seventeen characters under timely sown condition in *summer* season have been given in Table 1. In general, the magnitude of phenotypic coefficient of variation was higher than genotypic coefficient of variation for all the traits in timely sown condition.

The high estimates of phenotypic and genotypic coefficient of variation (>20%) were found for reducing sugar (47.41), number of branches per plant (29.19), grain yield per plant (27.36), harvest index (24.04), pods per plant (20.46) and 100-seed weight (20.02) characters under timely sown. The characters which exhibited moderate estimates (10-20%) of PCV and GCV were recorded for and plant height (cm) (19.70), seeds per pod (19.13), pod length (16.90) and biological yield (16.35) characters under timely sown. low estimates (< 10%) of PCV and GCV under days to 50% flowering, days to maturity in *summer* timely sown Heritability in broad sense, genetic advance and genetic advance in per cent of mean under timely *summer* season were estimated for all the characters are presented in Table 1. High estimates of broad sense heritability (> 75%) were recorded for the all characters under timely sown condition in Table 1. High genetic advance in per cent of mean (>20%) was recorded for plant height (39.92), number of branches per plant (56.93), pod length (32.09), Pods per plant(41.60), seeds per pod (36.86), biological yield (32.87), harvest index (47.62), 100-seeds weight (41.24), and grain yield per plant (53.75) whereas, days to 50% flowering (13.47, 14.17) showed moderate estimates of genetic advance in per cent of mean (10-20%) and other showed low estimates of genetic advance in per cent of mean (<10%) under timely sown conditions. High heritability coupled with high genetic advance in per cent of mean was recorded for plant height, number of branches per plant, pod length (cm), Pods per plant, seeds per pod, biological yield, harvest index, 100-seeds weight and grain yield per plant while, high heritability coupled with moderate genetic advance in per cent of mean was recorded for days to 50% flowering. High heritability coupled with low genetic advance in per cent of mean was recorded for days to maturity. low heritability coupled with high genetic advance in per cent of mean and low heritability coupled with low genetic advance in per cent of mean were not found for any characters under timely sown condition.

Table 1: Estimate of range coefficient of variation (ECV, GCV and PCV), heritability, genetic advance and genetic advance in percent of mean for eleven characters under summer season timely sown condition in mung bean

Characters Parameters	Days to 50% Flowering	Days to Maturity	Plant Height (Cm)	Number of branches plant	Pod length (cm.)	Pods per plant	Seeds per pod	Biological Yield per plant (g)	Harvest index (%)	100- seed weight (g)	Grain yield per Plant (g)
Range	27.61-37.44	64.42- 76.22	34.53- 75.83	1.89-6.27	2.74-7.20	4.94- 32.35	4.11- 10.56	21.74-48.74	11.00- 34.21	2.11-5.78	2.94-11.99
ECV	2.61	1.58	2.54	6.74	4.74	2.34	4.86	2.53	4.71	0.43	5.90
GCV	6.98	3.26	19.54	28.40	16.23	20.33	18.50	16.15	23.57	20.02	26.72
PCV	7.45	3.62	19.70	29.19	16.90	20.46	19.13	16.35	24.04	20.02	27.36
h ² (Broad Sense)	87.70	81.00	98.30	94.70	92.10	98.70	93.50	97.60	96.20	100.00	95.30
Genetic Advancement 5%	4.33	4.22	20.02	2.09	1.63	9.12	2.48	10.81	9.36	1.42	3.45
Genetic Advancement 1%	5.55	5.41	25.66	2.68	2.09	11.69	3.18	13.86	12.00	1.82	4.42
Gen. Adv as % of Mean 5%	13.47	6.04	39.92	56.93	32.09	41.60	36.86	32.87	47.62	41.24	53.75
Gen. Adv as % of Mean 1%	17.27	7.75	51.16	72.96	41.12	53.32	47.24	42.13	61.03	52.85	68.88
General Mean	32.14	69.80	50.16	3.68	5.10	21.93	6.73	32.89	19.66	3.44	6.42
Exp Mean next Generation	36.48	74.02	70.19	5.78	6.73	31.05	9.21	43.70	29.03	4.86	9.88

Summery and conclusion

The present investigation entitled "Study on genetic variability, heritability and genetic advance in mungbean [*Vigna radiata* (L.) Wilczek] in *summer* season under timely

sown condition" were undertaken to work out genetic variability, heritability and genetic advance in per cent of mean. The high estimates of phenotypic and genotypic coefficient of variation (>20%) were found for number of

branches per plant, grain yield per plant, harvest index, pods per plant and 100-seed weight characters under timely sown condition. High estimates of broad sense heritability (> 75%) were recorded for the all characters under timely sown condition. High genetic advance in per cent of mean (>20%) was recorded for plant height, number of branches per plant, pod length, pods per plant, seeds per pod, biological yield per plant, harvest index, 100-seeds weight timely sown conditions. High heritability coupled with high genetic advance in per cent of mean was recorded for plant height, number of branches per plant, pod length, pods per plant, chlorophyll, seeds per pod, biological yield per plant, harvest index, 100-seeds weight, methionine content, TSS, reducing sugar, non-reducing sugar and grain yield per plant.

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