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ASSESSMENT AND CORRELATION ANALYSIS OF POD YIELD AND YIELD-RELATED TRAITS IN M_6 MUTANTS OF DOLICHOS BEAN (*LABLAB PURPUREUS* VAR. *LIGNOSUS* L. PRAIN)

Shashank P.[1*], Sadarunnisa S.[1], Syamsundar Reddy P.[1], D. Srinivasa Reddy[2] and Lakshmidevi G.[3]

[1]Department of Vegetable Science, Dr. YSRHU-College of Horticulture, Anantharajupeta, Andhra Pradesh- 516105. India.

[2]Dr. YSRHU-Citrus Research Station, Tirupati, Andhra Pradesh- 516105. India.

[3]Department of plant Biotechnology, Dr. YSRHU-College of Horticulture, Anantharajupeta, Andhra Pradesh- 516105.India.

*Corresponding author Email: shashankpnaik4444@gmail.com

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ABSTRACT

The purpose of this study was to evaluate the performance and analyse the relationship between pod yield and its associated traits among fourteen mutant lines of Dolichos bean [*Lablab purpureus* var. *lignosus* (L.) Prain] (TFB-2 variety). These mutant lines were derived from the first generation of TFB-2, which was subjected to gamma irradiation at a dose of 30 kR. The study was conducted in the sixth generation (M_6) at the Department of Vegetable Science, Dr. YSRHU College of Horticulture, Anantharajupeta, during the 2023-24 *Rabi* season. Mutant $M_{6:19}$ exhibited the highest fresh pod yield and number of pods per plant, while $M_{6:17}$ recorded the highest dry seed yield. Number of primary branches per plant, number of inflorescence per plant, pod width, number of pods per inflorescence, number of pods per plant and dry seed yield per plant showed a positive significant correlation with fresh pod yield per plant which can be further utilised for breeding and crop improvement.

***Key word*:** Correlation, dolichos bean, mutants.

Introduction

Dolichos bean [*Lablab purpureus* var. *lignosus* (L.) Prain] is a genus of flowering plants in the legume family, Fabaceae and the subfamily Faboideae. It has a diploid somatic chromosome number of 22 and believed to have originated in Africa or India. In India, it is well known by diverse names in different languages *viz.*, bhatvas, sem (Hindi); chikkudu, adavichikkudu, (Telugu); avare, avarebaele (Kannada); amara, avara (Malayalam); nispavah (Sakrit); avarai, motchai (Tamil).

The dolichos bean, with its high nutritional value and broad climatic adaptability, holds a distinctive place among Indian-origin legume vegetables. Lablab, a versatile legume, offers multiple uses-its immature seeds, pods, and young leaves are edible and commonly cooked as vegetables. According to Snafi (2017), dry seeds of the field bean contain 33% starch as the primary component, with a very low-fat content of 0.8% and a high dietary fibre content of 7.2%. Fresh green pods and seeds are rich in protei (3.8-4.3%) and carbohydrates (6.9%), and are also good sources of vitami, including vitamin A (325 IU), vitamin B, and vitamin C. Additionally, the dolichos bean serves as an excellent source of green manure due to its dee foliage with high nitrogen content. In mixed farming systems, it is often used as a cover crop alongside maize and sorghum, helping to reduce moisture loss, prevent soil erosion, and enrich the soil by fixing nitrogen. Despite its multifunctionality, the crop remai underutilized due to challenges such as low productivity, long growing season, photoseitivity, and an indeterminate growth habit (Chakravarty, 1986).

Dolichos bean has limited genetic variability which affects the crop improvement programme. Ionizing mutage like Gamma rays, X-rays and Ethyl methane sulphonate are known to induce cytological, genetic, biochemical and physiological changes in plant growth

and development, which will help to improve the genetic potential of dolichos bean (Girija and Danavel, 2009). Among these mutage, Gamma radiation stands out as an effective agent for generating genetic diversity. The experiment aimed to examine the performance and correlation analysis of pod yield and its attributing characters in the M_6 generation of Dolichos bean mutants treated with 30 kR gamma irradiation.

Material and Methods

A widely cultivated local variety of Dolichos bean, TFB-2, was treated with 30 kR gamma irradiation to initiate the development of the M_1 generation, with untreated TFB-2 seeds included as a control. In the subsequent M_2, M_3, M_4 and M_5generatio, mutants exhibiting morphological abnormalities or suboptimal performance compared to the parental traits were systematically eliminated. In the M_6 generation, fourteen Dolichos bean mutants, along with the parent variety, were evaluated using a randomized block design with three replicatio at the experimental field of the Department of Vegetable Science, Dr. YSRHU-College of Horticulture, Anantharajupetaduring the 2023-24 growing season. The mutants were planted with a spacing of 1 m between rows and 1 m between plants. Optimal crop growth was eured by applying the recommended dose of fertilizers and implementing appropriate cultural practices. Observatio on various traits were recorded from five randomly selected and tagged competitive plants from each replication. Analysis of variance was carried out by using the method as per Pae and Sukhatme, (1954). Correlation for selected characters of mutants were analysed using GRAPES software.

Result and Discussion

The analysis of variance for pod yield and its traits showed that the mean sum of squares owing to 14 mutants along with control as parent TFB-2 (M_{32}) was found to be significant for all 14 traits at a 5% level of significance among dolichos bean mutants, as shown in Table 1.

Table 1: Analysis of variance for pod yield and its traits in Dolichos bean.

S. No	Character	Mean sum of squares		
		Treatment	Replication	Error
		d f 14	2	28
1	Plant height at last harvest (cm)	1974.80	887.49	100.60
2	Number of primary branches per plant	0.18	0.07	0.08
3	Days to 50% flowering	10.11	1.07	1.90
4	Number of inflorescences per plant	75.92	20.87	14.10
5	Length of inflorescence (cm)	0.14	0	0.06
6	Number of pods per inflorescence	2.77	0.04	0.39
7	Pod length (mm)	4.44	0.42	1.69
8	Pod width (mm)	1.20	0.29	0.16
9	10 green pod weight (g)	8.49	3.37	1.23
10	Number of pods per plant	9633.87	600.36	72.77
11	Number of seeds per pod	0.12	0	0.04
12	Fresh pod yield per plant (g)	103807.00	9093.94	10676.00
13	Dry seed yield per plant (g)	8246.34	1019.97	148.80
14	100 Dry seed weight (g)	12.70	0.16	0.23

Mean performance for growth and yield parameters

In reference with Table 2. In M_6 generation, the mean performance (Table 2) for maximum plant height was recorded in mutant $M_{.16}$. This result corresponds with the findings of Jagtap and More (2020), Kumar *et al.,* (2016) for field bea and Masry *et al.,* (2019) for peas. The highest number of primary branches per plant recorded in $M_{.3}$ and $M_{.4}$, where as the mutant $M_{.4}$ recorded maximum inflorescence length, number of inflorescences per plant and shortest days to 50% flowering. Similar observatio were documented by Horn (2016) in Cowpea, Ramya *et al.,* (2014) in black gram and Vaijayanthi *et al.,* (2015). The number of pods per inflorescence and maximum pod length recorded highest in $M_{.18}$. These findings mirror with the conclusion drawn by Vanmathi *et al.,* (2021) for number of pods per inflorescence in cowpea and Moushree and Kundagrami (2018) in mung bean for pod length. The highest count for number of seeds per pod, maximum pod width and 10 green pods weight were recorded highest in $M_{.14}$. The result outcomes align with the findings of Sonu *et al.,* (2021) in urd bean for number of seeds per pod, Kumar *et al.,* (2017) for 10 green pods weight and Masry *et al.,* (2021) in bea for pod width. Fresh pod yield (kg/plant) and number of pods per plant was recorded highest in the mutant $M_{.19}$. The results were similar with the findings of Justin *et al.,* (2012) in soya bean, Ramandeep *et al.,* (2018) for number of plants per plant and Goyal *et al.,* (2020) in black gram, Monica and Seetharaman (2017)

Table 2: Mean Performance of pod yield and its traits in M_6 generation of Dolichos bean.

Geno-types	PH (cm)	NPB	D 50%F	NIPP	LI (cm)	NPPI	PL (mm)	PW (mm)	10GPW (g)	NPPP	PP	FPYPP (kg)	DSYPP (kg)	100DSW (g)
$M_{6\cdot1}$	213.96	2.82	57.67	51.83	41.07	7.38	55.10	20.77	27.00	340.06	3.77	918.17	202.39	21.23
$M_{6\cdot3}$	212.14	3.42	52.67	52.78	44.46	9.85	57.36	21.26	28.89	390.34	3.43	1127.65	286.78	25.67
$M_{6\cdot4}$	226.63	3.42	51.33	62.72	44.89	8.77	56.77	20.49	31.97	394.65	3.83	1183.96	195.94	25.42
$M_{6\cdot10}$	208.68	2.72	52.67	56.58	41.99	8.97	53.50	20.52	27.89	324.74	3.29	905.68	198.79	28.54
$M_{6\cdot14}$	205.67	2.53	55.33	56.28	43.00	9.22	56.66	22.23	33.25	300.44	4.02	998.96	191.57	26.14
$M_{6\cdot15}$	239.84	3.03	57.00	57.67	43.26	9.77	56.15	20.94	30.97	264.47	3.68	819.12	199.53	26.06
$M_{6\cdot16}$	276.40	2.87	53.33	55.40	44.87	8.75	53.52	19.44	27.72	205.92	3.83	570.86	98.46	24.76
$M_{6\cdot17}$	224.73	3.02	55.67	60.57	43.80	9.42	55.37	20.96	30.47	351.81	3.76	1011.11	315.24	27.16
$M_{6\cdot18}$	251.82	3.07	55.67	58.33	44.13	10.72	57.74	21.28	29.33	332.04	3.85	973.99	207.98	27.53
$M_{6\cdot19}$	245.13	3.08	53.67	61.07	43.72	9.65	55.94	21.09	30.81	413.31	3.55	1273.24	217.86	26.84
$M_{6\cdot20}$	209.59	2.96	55.67	53.55	39.56	7.48	56.31	20.24	30.17	323.52	3.58	975.96	126.07	26.35
$M_{6\cdot23}$	218.52	2.69	54.67	56.53	43.27	9.10	55.76	20.50	28.61	356.22	3.74	1019.18	242.81	26.79
$M_{6\cdot28}$	224.41	2.82	56.67	56.03	44.04	8.30	55.03	20.63	29.75	320.49	3.44	953.45	209.25	27.08
$M_{6\cdot30}$	163.11	2.85	56.67	51.75	40.82	8.13	55.01	20.03	28.94	249.43	3.44	721.97	195.88	27.06
$M_{6\cdot32}$	206.51	2.80	55.33	54.20	43.56	7.61	56.07	20.55	30.81	224.77	3.77	692.42	199.57	21.43
Mean	221.81	2.94	54.93	56.35	43.10	8.87	55.75	20.73	29.77	319.48	3.67	943.05	205.87	25.87
CD (5%)	16.78	0.48	2.31	5.91	1.08	1.04	2.17	0.67	1.86	59.05	0.35	172.81	20.40	0.88
SE m±	5.79	0.17	0.80	2.04	0.37	0.36	0.75	0.23	0.64	20.39	0.12	59.65	7.04	0.31

PH (cm) - Plant height (cm), NPB- No. of primary branches per plant, D50%F - Days to 50% flowering, NIPP - No. inflorescence per plant, LI (cm) - Inflorescence length (cm), NPPI- No. of pods per Inflorescence, PL (cm) - Pod length (cm), PW (cm) - Pod width (cm), 10GPW (g)- 10 green pod weight per plant, NPPP - No. pods per plant, PP - No. of seeds per pod, FPYPP (kg) - Fresh pod yield per plant (kg), DSYPP (kg) – Dry seed yield per plant (kg), 100DSW (g)- 100 Dry seed weight

in garden bean for fresh pod yield. The highest dry seed yield per plant was recorded $M_{6.17}$. Khan *et al.*, (2005) reported a significant increase of chick pea grain yield and Harish Kumar *et al.*, (2018) in dolichos bean. Maximum 100 dry seed weight was recorded in $M_{.10}$. Similar results were reported by Pallavi (2021), Sonu *et al.*, (2021) in urd bean and Jyothireddy *et al.*, (2018) in dolichos bean.

Correlation among the yield and its attributing traits

The correlation analysis at 5% significance shows both positive and negative correlation among the desired traits of 14 dolichos bean mutants and parent TFB-2 (Table 3). The fresh pod yield per plant showed a significant positive correlation with number of primary branches per plant (0.304), number of inflorescence per

Table 3: Genotypic Correlation studies between the yield and its attributing traits in dolichos bean mutants.

	PH	NPB	D50%F	NIPP	LI	NPPI	PL	PW	10PW	NPPP	PP	DSYPP	100SWD	FPYP
PH	1													
NPB	0.098	1												
D50%F	-0.196	-0.319*	1											
NIPP	0.294*	0.278	-0.256	1										
LI	0.558*	0.285	-0.381*	0.399*	1									
NPPI	0.336*	0.241	-0.215	0.415*	0.453*	1								
PL	-0.033	0.383*	0.105	0.112	0.123	0.353*	1							
PW	-0.130	0.162	0.072	0.174	0.092	0.458*	0.474*	1						
10PW	-0.064	0.028	-0.067	0.295*	0.187	0.123	0.421*	0.326*	1					
NPPP	0.040	0.315*	-0.278	0.375*	0.080	0.352*	0.197	0.332*	0.032	1				
PP	0.286	-0.170	0.141	0.160	0.263	-0.008	0.208	0.206	0.185	-0.172	1			
DSYPP	-0.226	0.147	-0.011	0.153	0.247	0.351*	0.228	0.413*	0.101	0.459*	-0.105	1		
100SWD	0.023	0.020	-0.192	0.257	0.030	0.490*	-0.041	0.102	0.086	0.243	-0.298*	0.167	1	
FPYP	0.035	0.304*	-0.274	0.422*	0.104	0.386*	0.279	0.437*	0.212	0.970*	-0.112	0.412*	0.268	1

PH (cm) - Plant height (cm), NPB- No. of primary branches per plant, D50%F - Days to 50% flowering, NIPP - No. inflorescence per plant, LI (cm) - Inflorescence length (cm), NPPI- No. of pods per Inflorescence, PL (cm) - Pod length (cm), PW (cm) - Pod width (cm), 10PW (g)- 10 green podweight per plant, NPPP - No. pods per plant, PP - No. of seeds per pod, FPYPP (kg) - Fresh pod yield per plant (kg), DSYPP (kg) – Dry seed yield per plant (kg), 100DSW (g)- 100 Dry seed weight per plant

plant (0.422), number of pods per inflorescence (0.386), Pod width (0.437), number of pods per plant (0.970), dry seed yield per plant (0.412), whereas non-significant positive correlation was recorded with plant height (0.035), length of inflorescence (0.104), Pod length (0.279), 10 green pod weight (0.212), and 100 dry seed weight (0.268). The negative non-significant correlation was observed with number of seeds per pod (-0.112) and days to 50% flowering (-0.274).

The plant height showed a significant positive correlation with number of pods per inflorescence (0.336), inflorescence length (0.558), and number of pods per inflorescence (0.294). A strong, significant positive correlation for the number of primary branches with pod length (0.383), number of pods per plant (0.315) and significant negative correlation with days to 50% flowering (-0.319). Whereas Days to 50% flowering recorded a negative significant correlation for the inflorescence length (-0.381). The number of inflorescences per plant observed a significant positive correlation with inflorescence length (0.399), number of pods per inflorescence (0.415), and 10 green pod weight (0.295). Inflorescence length showed a significant positive correlation with number of pods per inflorescence (0.453). The number of pods per inflorescence exhibited a positive significant correlation with pod length (0.474), 10 green pod weight (0.421). Pod length and pod width (0.474) were significantly positively correlated with each other and Pod width was significantly positively correlated with dry seed yield per plant (0.474) and 10 green pod weight (0.421) whereas pod width showed a positive correlation with 10 green pod weight (0.326), number of pods per plant (0.322) and dry seed yield per plant (0.413). Number of pods per plant showed a significant positive correlation with dry seed yield per plant (0.459). the number of seeds per pod had a significant negative correlation with 100 dry seed weight (-0.298). Similar trends were observed by Magalingam *et al*., (2013) and Nandi *et al*., (1997).

Conclusion

Fresh pod yield (kg/plant) and number of pods per plant were recorded as highest in mutant $M_{.19}$. Hence, mutant $M_{.19}$ can be concluded as the best performer in the present investigation. Results of Correlation studies expressed that the number of primary branches per plant, number of inflorescence per plant, pod width, number of pods per inflorescence, number of pods per plant and dry seed yield per plant showed a positive significant correlation whereas non-significant positive correlation was observed for plant height, inflorescence length, pod length, 10 green pod weight, and 100 dry seed weight with fresh pod yield. The non-significant negative correlation was observed days to 50% flowering and number of seeds per pod with fresh pod yield per plant. All the morphological traits showed highly significant variation among the mutants, and the variation could be used in selecting the elite mutant for developing a high-yielding variety.

Authors contribution: Concept ualization and designing of the research work: Sadarunnisa, S; Execution of field/lab experiments and data collection: Shashank P. Analysis of data and interpretation: Shashank P., Sadarunnisa, S., Syamsundar Reddy, P., D. Srinivasa Reddy., and Lakshmidevi, G. Preparation of manuscript: Shashank P, Sadarunnisa, S.

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References

Ajjappalavara, P.S. and Dharmatti P.R. (2006). Combining ability studies in brinjal (*Solanum melongena* L.). *Journal of Asian Horticulture,* **3(1)**: 1-7.

Goyal, S., Wani M.R., Laskar R.A., Raina A. and Khan S. (2020). Performance evaluation of induced mutant lines of black gram (*Vigna mungo* (L.) Hepper). *Actafytotechnica et zootechnica*, **23(2)**, 70-77.

Harish, K., Ghawada S.M., Shivaputra and Meghwal M.L. (2018). Effect of gamma irradiationon growth, yield and quality traits of Dolichos bean. *International Journalof Current Microbiology and Applied Sciences,* **6**, 853-59.

Horn, L.N., Ghebrehiwot H.M. and Shimelis H.A. (2016). Selection of novel cowpea genotypes derived through gamma irradiation. *Frontiers in Plant Science,* **7**, 262.

Jagtap, S.S. and More A.A (2020). Viable mutatio in M_2, M_3, and M_4 generatio in *lablab purpureus* (l.) sweet**.** *International Journal of Research and Analytical Reviews (IJRAR),* **7(1)**, 2349-5138.

Justin, M., Kabwe K.C., Adrien K.M. and Roger V.K. (2012). Effect of gamma irradiation on morpho-agronomic characteristics of soybea (*Glycine max* L.). *American Journal of Plant Sciences,* **3**, 331-337

Jyothi, R., Prabhakar B.N., Saidaiah P. and Pandravada S.R. (2018). Study of different qualitative traits in Dolichos bean (*Dolichos lablab* L., var. typicus Prain) germplasm. *International Journal of Current Microbiology and Applied Science,* **7(10)**.

Kumar, H., Ghawade S.M. and Manoharlal M.S. (2016). Mutagenic effect gamma radiatio on seed germination, plant growth and mortality of dolichos bean (*Lablab purpureus* L.) in M_2 generation. *Progressive Research,* **11(7)**, 4844-4847.

Kumar, H., Ghawade S.M., Shivaputra T. and Meghwal M. (2018). Effect of gamma radiatio on growth, yield and quality traits of dolichos bean (*Lablab purpureus* L.). *International Journal of Current Microbiology and*

Applied Sciences, **6**, 853-859.

Khan, M.R., Qureshi. A.S., Hussain S.A. and Ibrahim M. (2005). Genetic Variability Induced by Gamma Irradiation and Its Modulation with Gibberellic Acid in M_2 Generation of Chickpea (*Cicer arietinum* L.). *Pakistan Journal of Botany*, **37(2)**, 285-292.

Magalingam, V., Yassin M. and Kumar R. (2013). Genetic variability and character association in dolichos bean. *SAARC Journal of Agriculture*, **11(2)**, 161-171.

Masry, A., Fayad A. and Mohamed R. (2021). Improving seed yield and protein content of Common bea (*Phaseolus vulgaris* l.) through mutation breeding. *Menoufia Journal of Plant Production*, **6(9)**m 443-60.

Masry, A.I., Fayad A.M. and Taher D.I. (2019). Genetic Improvements in pea (*Pisum sativum* L.) through irradiation by gamma rays. *Journal of Plant Production*, **10(12)**, 1089-1093.

Monica, S. and Seetharaman N. (2017). Gamma radiation and EMS induced geneticvariability on the improvement of garden bean. *Journal of Chemical, Biological and Physical Sciences*, **7(1)**, 077-084.

Moushree, S. and Kundagrami S. (2018). Selection of high-yielding, extra short-duration lines of mungbean derived through gamma radiation. *Indian Society of Genetics and Plant Breeding*, **78(2)**, 233-241.

Nandi, A., Tripathy P. and Lenka D. (1997). Correlation, co-heritability and path analysis studiedcharacters studied in Dolichos bean. *ACIAR-Food-Legume-Newsletter*, **25**, 1-2.

Pallavi, B.N. (2021). Evaluation of M_3 and M_4 generation of Natural mutant of dolichos bean. *Ph.D. Thesis*. Mahatma Phule Krishi Vidyapeeth, Rahuri.

Pae, V.G. and Sukhatme P.V. (1954). Statistical methods for agricultural workers. Statistical methods for agricultural workers.

Ramandeep, T., Dhillon S., Dhall R.K. and Gill B.S. (2018). Effect of mutagen-ethylmethane sulphonate on yield increasing parameters of french bean (*Phaseolusvulgaris*.).*Genetika*, **50(1)**, 199-207.

Ramya, B., Nallathambi G. and Ganesh Ram S. (2014). Genetic variability,heritability and genetic advance in induced mutagenesis black gram (*Vigna mungo* L. Hepper). *Plant Archives*, **14(1)**, 139-141.

Sonu, G., Wani M.R., Raina A., Laskar R.A. and Khan S. (2021). Phenotypic diversity in mutagenized population of urdbean (*Vigna mungo* (L.) Hepper). *Heliyon*, **7(5)**.

Vaijayanthi, P.V., Ramesh S., Gowda M.B., Rao A.M., Keerthi C.M. and Reena G.A. (2015). Genetic variability for morpho-metric traits in Dolichos bean (*Lablab purpureus* L. Sweet) germplasm. *Journal of Food Legumes*, **28(1)**: 5-10.

Vanmathi, S., Arulbalachandran D. and Soundarya V. (2021). Effects of gamma radiation on quantitative traits and genetic variation of three successive generatio of cowpea (*Vigna unguiculata* (L.) Walp.). *Plant Science Today*, **8(3)**, 578-589.