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The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(4): 918-921

www.thepharmajournal.com
Received: 19-02-2022
Accepted: 21-03-2022

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Effect of gamma rays on flowering, maturity and grain yield in M_2 generation of soybean JS-335

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Abstract
The effect of gamma rays on flowering, maturity and grain yield in M2 generation of Soybean JS-335 was studied. Gamma rays affect maximum flowering was in T3 (71.24 day) while minimum in T1 (66.94 day). The maximum maturity was in T2 (118.30 day) and least in T3 (116.24 day) while highest grain yield plant-1 was observed in T2 (6.97 gm) and lowest in T1 (5.97 gm). The variability showed the coefficient of venation increased in all treatments. In M2 generation day to flowering days to maturity and yield plant-1 increased significantly in all treatments.

Keywords: Soybean JS-335, gamma rays, flowering, maturity and grain yield

Introduction
Soybean is referred as "Golden bean" and "Miracle crop" of 21st century. It is one of the important oilseed as well as legume crop. It contributes more than 50% to global production of edible oil. It contain 40% good quality protein rich in lysine & 20% oil high in essential amino acid (Omega 6 & Omega 3) soy protein is rich in all essential amino acid minerals salts vitamin A, B & D. it is highly self- pollinated crop. It is often called "Vegetarian's meat". Soybean straw is used as fodder & forage for livestock and poultry. Soybean are low in immersed fat & have no cholesterol, also contains antinutritional factors like trypsin inhibitor, phytohemagglutinin & phytic corrosive Lipids solvents of nutrients K, E, D are available in soybean. India ranked 5th position in respect of area & production. *Hugo de vries* (1903) first given concept of induction mutation. Gamma rays an ionizing physical mutagen is capable of inducing mutation in plants. The present research work was therefore undertaken by using soybean cultivar JS-335 subjected to treatment of different doses of gamma rays and hence improves its yield.

Materials and Methods
Dry healthy and genetically pure seed of JS-335 was utilized in this study. Four different lost of soybean seed cultivar JS-335 were made. Every lot was of 500 gm seed weight. The three lost of seed were sent to BARC, Trombay for irradiation with their diverse dosages of gamma beams i.e. 200 Gy, 250 Gy, and 300 Gy. The total amount of days needed for the first flower to occur in each procedure has been reported and its mean value has been recorded as flowering days. The amount of days required for the plant to mature completely from the date of sowing was recorded and the average mean value per treatment was calculated. The grain yield obtained from each observational plants were threshed separately treatment wise and the seeds were dried in sun and their weight were recorded.

Result and Discussion
Days to flowering
Treatment effect of various gamma rays on days to flowering in M2 generation is displayed in table 1. It is revealed from the table that the maximum mean value for days to flowering was in T3 (71.24 days) and was statistically significant, while the minimum days to flowering was evidenced in T1 (66.94 days) in contrast with their respective controls (66.95 days). In all the therapies for days to flowering, the coefficient of difference improved comparable to control. The maximum coefficient of variation was identified in T2 (7.99%) while the minimum in T1 (5.75%). The range of variation in treated population was (5.75% to 7.99%). The table 1 exposed that increase in days to flowering resulted from gamma rays treatment as compared to control.

Dhole (1999) also identified that the flowering delayed significantly in gamma rays treated soybean in contrast with control.

Days to Maturity

Impact of diverse treatments of gamma radiations on days to maturity within M2 generation is displayed in table The mean value for days to maturity augmented within all the therapies as evaluated to control. The maximum mean value was identified in T2 (118.30 days) and least in T3 (116.24 days). The day to maturity in control was (116.10 days) respectively. The coefficient of variation augmented within all the therapies as evaluated to control. The maximum variation was initiated to be in T2 (5.60%) while the minimum in T1 (4.60%). The range of coefficient of variation was (4.60% to 5.60%). Gopinath and Pavadai (2015) [5] also observed that in M2 and M3 generations mean for days to maturity augmented at mutagenic treatment than control in soybean.

Grain yield

Impact of diverse rays of gamma doses on grain yield plant-1 in M2 generation is shown inside table 3. The maximum grain yield plant-1 was observed in T2 (6.97 gm) and minimum in T1 (5.97 gm). The variability studies showed that coefficient of variation increased in all the treatments. The maximum coefficient of variation was noticed in T1 (43.89%) followed by T3 (40.38%) and the minimum was in T2 (37.30%). The variation for this parameter ranged between (37.30% to 43.89%). Table 3 shows that grain yield plant-1 has a general meaning, increased treatment of gamma rays compared to control. Khan *et al.* (2005) [8] Looked at a similar result and reported that gamma rays increased the yield of radiation much more than it controlled. Mudibu *et al*. (2012) [10] studied the impacts of 0.2 kGy and 0.4 kGy irradiation in M2 generations and observed noteworthy augment of grain yield and yield parts in all the three soybean assortments cvs. Kitoko, Vuangi and TGX814-49D. Gopinath and Pavadai (2015) [5] also reported that the yield parameters like amount of seeds plant-1, grain yield per plant-1, is stated to have a moderate and high mean value of 0.5 percent of the EMS and 0.4 percent of the DES treated population in the 50 kR of gamma rays are relative to controlling plants in soybean.

Table 1: Effect of gamma rays treatments on days to flowering in M2 generations

Sr. No.	Treatments	Range	Mean	Variance	S.D	CV (%)
1	T1 (200 Gy)	19	66.94	14.82	3.85	5.75
2	T2 (250Gy)	35	68.20	29.70	5.45	7.99
3	T3 (300 Gy)	31	71.24	28.62	5.35	7.51
4	T4 (Control)	11	66.95	14.06	3.75	5.60

Table 2: Effect of gamma rays treatments on days to maturity in M2 generation

Sr. No.	Treatments	Range	Mean	Variance	S.D	CV (%)
1	T1 (200gy)	24	117.85	29.37	5.42	4.60
2	T2 (250gy)	36	118.30	43.96	6.63	5.60
3	T3 (300gy)	28	116.24	32.60	5.71	4.91
4	T4 (Control)	13	116.10	21.62	4.65	4.01

Table 3: Gamma rays treatment effect on grain yield plant-1 (g) in M2 generation

Sr. No.	Treatments	Range	Mean	Variance	S.D	CV (%)
1	T1 (200gy)	16	5.97	6.86	2.62	43.89
2	T2 (250gy)	13	6.97	6.76	2.60	37.30
3	T3 (300gy)	10	6.24	6.35	2.52	40.38
4	T4 (Control)	4	5.39	1.59	1.26	23.19

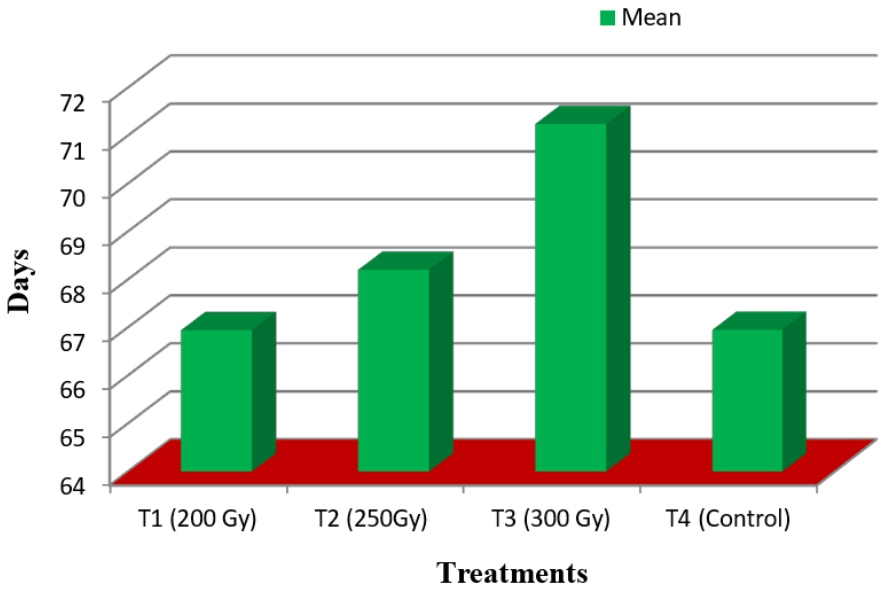

Fig 1: Effect of gamma rays treatments on days to flowering in M2 generations

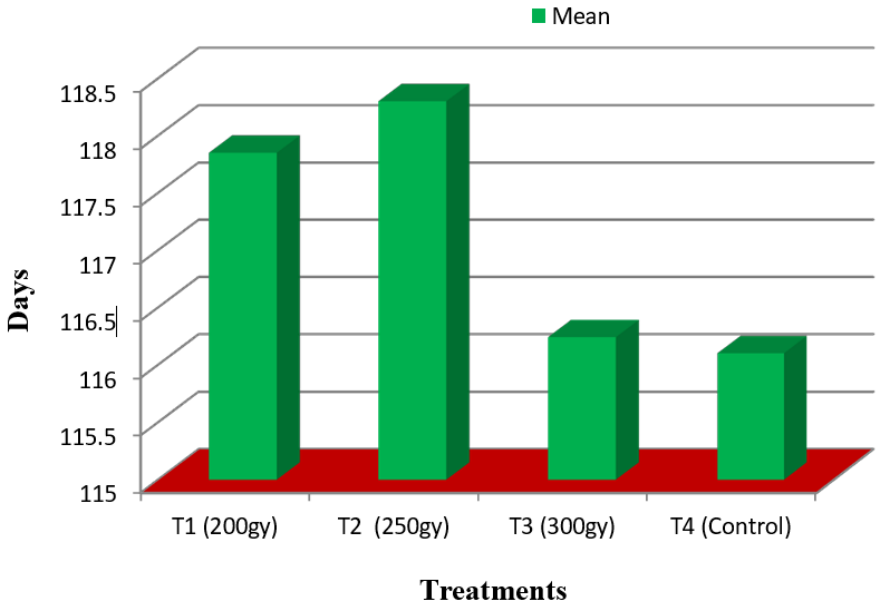

Fig 2: Effect of gamma rays treatments on days to maturity in M2 generation

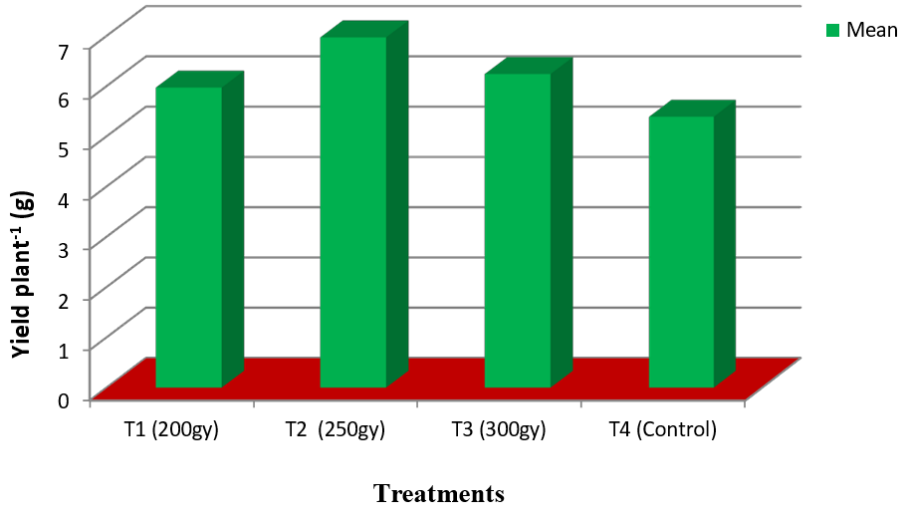

Fig 3: Gamma rays treatment effect on grain yield plant-1 (g) in M2 generation

Conclusions

In M2 generation days to flowering increased significantly in all treatments followed a specific trend and days to maturity increased significantly over all treatment. Grain yield per plan was found to be increased significantly in all treatments.

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