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INFLUENCE OF SEED PELLETING ON GROWTH AND SEED YIELD PARAMETERS IN BRINJAL *(SOLANUM MELONGENA* L.)

Kannan. K and S. Padmavathi
Ph.D. Scholar*and Professor**, Seed Science and Technology,
Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University
Email :kannankarathe@gmail.com

Abstract

A field experiment was conducted during June 2017 at experimental farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalainagar, Chidambaram, Tamil Nadu, to study the influence of seed pelleting on growth and seed yield parameters in brinjal *(Solanum melongena* L.) The field experiment was laid out in a Randomized Block Design with three replications. The principles of this study, is to assess the seed quality as an impact by the seed pelleting. The seeds were collected from the Vegetable Research Station, Palur in CuddaloreDistrict. The collected seeds were cleaned and pelleted with botanical products*viz.,*Arappu powder,Nochi leaf powder, Prosopis leaf powder, Pungam leaf powder, and Neem leaf powder and biofertilizers *viz.,* Azospirillium, Phosphate Solubilizing Bacteria and VAM. Allthe pelleted seeds recorded significantly higher growth and yield attributes over the control. The seeds pelleted with biofertilizers recorded higher value than botanicals. Among them, Azospirillumrecorded significantly the highest values for growth characters *viz.,* plant height (106.91cm), number of branches per plant (15.04), days to first flowering (70.19), days to 50% flowering (80.12) and dry matter production (132.69) and yield contributing characters *viz.,* number of fruits per plant (28.88), fruit length (12.30cm), fruit girth (16.92cm), fruit weight (96.13g),fruit yield per plant (2.39 kg), seed yield per fruit (2.09 g) and seed yield per plant (60.36 g)followed by phosphate solubilizing bacteria by recording the growth parameters *viz.,* plant height (104.72 cm), number of branches per plant (14.42), days to first flowering (72.43), days to 50% flowering (82.39) and dry matter production (130.43) and yield parameters *viz.,* number of fruits per plant (27.16),fruit length (11.62cm), fruit girth (16.56cm), fruit weight (95.66g), fruit yield per plant (2.23 kg), seed yield per fruit (1.99 g),and seed yield per plant (54.05 g))than the other treatments. Among the botanicals, neem leaf powder exhibited better results for growth and yield parameters when compared to control. Hence, this study expressed clearly that the seed pelleting with azospirillum followed by phosphate solubilizing bacteria and neem leaf powder enhanced the growth and yield parameters in brinjal.
***Keyword*:** Brinjal, Seed pelleting, Biofertilizer,Azospirillium, Phosphate solubilizing bacteria,Neem leaf powder.

Introduction

Brinjal (*Solanum melongena* L.) regularly known as eggplant, comes underthe family of Solanaceae. Brinjal is a vegetable crop, extensively cultivated in India and other part of Asian countries like Bangladesh, Pakistan and Philippines. The major brinjal producing countries are China, Turkey, Japan, Egypt, Indonesia, Iraq, Italy, Syria and Spain. India contributes 12,987 thousand metric tons to the global production of brinjal and ranks second after China with an area of 680 thousand hectares (NHB, 2015). In India, major brinjal producing states are Orissa, Bihar, Karnataka, Tamil Nadu, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh.

In Tamil Nadu,brinjalwas grown under rainfedas well as irrigated condition. In CuddaloreDistrict,itis cultivated in a207 ha area with production of 3413 Mt. Chidambaram comes under the VeeranamAyacut area and the major crops grown in that area are Paddy and Pulses. Due to scarcity of water, potential farmers are switching over to Horticultural crops. Among them,brinjalis much preferred by the farmers in Chidambaram area, of which, Annamalaibrinjal hold its pride among the farmers.

Annamalaibrinjalwas developed at the Department of Horticulture, Faculty of Agriculture, Annamalai University. The fruits aremuchliked by the people in Cuddalore, Villupuram, Vellore, Thiruvannamalai, Chengalpattu and Chennai. Brinjal fruit contains high amounts of Carbohydrates (6.4%), Protein (1.3%), Fat (0.3%), Calcium (0.02%), Phosphorus (0.02%), Iron (0.0013%), Vitamins A and B and other mineral matters. Beside this the fruitalso contains- Carotene (34 mg), Riboflavin (0.05 mg), Thiamine (0.05 mg), Niacin (0.5 mg) and Ascorbic acid (0.9 mg) per 100 g fruit (Choudhury, 1976). Apartfrom adding value to the diet, it also provides some medicinal values for human health. The egg plant tissues and extract contain an alkaloid called “Solanin” which is used for treatment of diabetes, asthma, cholera, bronchitis and diarrhea. It's also reported to lower the blood cholesterol levels. Though brinjal said to be drought resistant crop, the yield appraised is low due to the use of poor quality seeds, soil moisture fluctuation, low and erratic rainfall and improper crop management practices. Pre-sowing seed treatments like seed pelleting can improve germination, seedling emergence, stand establishment and plant vigour.

Seed pelleting is the process of enclosing a seed with small quantities of inert material just large enough to produce globular unit of standard size to facilitate precision planting. The inert material creates natural water holding media and provides a small amount of nutrients to young seedlings (Krishnasamy, 2003). Physical seed enhancement techniques like seed pelleting resulted in more rapid and synchronous germination particularly when their seed size is very small (Halmer, 2003). Pelleting can indirectly improve seed germination and stand establishment, while nutrient pelleting enrich the rhizosphere region with macro and micro nutrient that trigger the vegetative growth of seedling in addition to the improvement in zone microbial activity (Suma, 2005). Pelleting of seed with adhesive, fillers and bioactive chemicals focuses on the performance of the seeds. This helps in the achievement of desired population, which is the key basis for successful crop/seed production. Seed pelleting

with botanicals are the cheapest and non-toxic and provide protection from pests and diseases during germination and early crop growth (Kavitha *et al*., 2009). There is a need to develop an appropriate seed pelleting technology fortheproduction of high quality brinjal seed. Hence, the seed pelleting study was advocated to brinjal seeds with botanicals and biofertilizers with the aim of evaluating the effect of pelleting on crop growth and seed yield parameters.

Materials & Methods

A field experiment was conducted in the Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalainagar, Chidambaram, Tamil Nadu, during June 2017**.**Genetically pure seeds of brinjal were obtained from the Vegetable Research Station, Palur, CuddaloreDistrictwas used in this study. Seeds were pelleted with biofertilizers *viz.,* Azospirillum, Phosphate Solubilizing Bacteria, VAM @50g/ kg of seeds and leaf powders prepared from Arappu (*Albizzia amara*), Nochi (*Vitex negundo*), Prosopis (*Prosopis juliflora*), Pungam (*Pongamia pinnata*), and Neem (*Azadiracta indica*) @ 200g/ kg of seeds for pelleting. 10% maida as an adhesive (250 to 300 ml kg^{-1}) and dried in shade to bring back the moisture content of 9%.

Treatments details:

The experiment was comprised of nine treatments involving one as a control (without pelleting)as detailed below:-

T_1- Neem leaf powder 200g / kg of seeds
T_2–Pungam leaf powder 200g / kg of seeds
T_3 - Arappu powder 200g / kg of seeds
T_4 - Prosopisleaf powder 200g / kg of seeds
T_5 - Nochileaf powder200g / kg of seeds
T_6 - Phosphate Solubilizing Bacteria 50g / kg of seeds
T_7 - Azospirillum50g / kg of seeds
T_8 – VAM50g / kg of seeds
T_9- Control

Observations were recorded for growth parameters and seed yield parameters from five randomly selected plants from each treatments replication wise.

Growth parameters:

Days to first flowering

The number of days taken from the date of sowing to anthesis of first flower in the first flower cluster was recorded and expressed in numbers.

Days to 50% flowering

Number of days taken from sowing to 50 per cent flowering in the total population was recorded and the mean value was expressed as days to 50% flowering in whole numbers.

Number of branches per plant

The branches arising from the primary and secondary stem were counted at the time of the last harvest and expressed in numbers.

Plant height (cm)

The height of the plant from the ground level to the tip of the main stem was measured at the time of the last harvest and expressed in centimeters.

Dry Matter Production

Five randomly selected plant samples were collected, washed, air dried to obtain constant weight. Oven dried at $80^0C \pm 5^0C$ for 48 hours till reached a constant weight. Estimation of dry matter was recorded at harvest stage the DMP was calculated and expressed in kilogram ha^{-1}.

Yield parameters

Number of fruits per plant

The number of fruits per plant was recorded at each harvest and the total number of fruits of all the harvest was recorded as fruits per plant and expressed in numbers.

Fruit length (cm)

Randomly selected five fruits were measured from blossom end to pedicel end (polar diameter) with measuring scale and expressed in centimeter.

Fruit girth (cm)

Fruit girth was recorded by measuring the circumference of randomly selected five fruits at the broadest portion using measuring tape and expressed in centimeter.

Fruit weight (g)

The weight of five randomly selected fruits in each replication was measured and the mean weight of the fruit was expressed in grams.

Fruit yield per plant (kg)

The weight of fruits per plant was recorded at each harvest and the total weight after all the harvest was recorded as a yield per plant and expressed in kilogram.

Seed yield per fruit (g)

The weight of the seeds per fruit was recorded as seed yield per fruit and expressed in gram.

Seed yield per plant (g)

The weight of the seed per plant was recorded at each harvest and the total weight after all the harvest was recorded as a seed yield per plant and expressed in gram.

Statistical Analysis

The experiment comprised of nine treatments including control with three replications of each. The experiment was laid out in a Randomized Block Design. The data's collected from the field experiment for growth and seed yield parameters were statistically analyzed using ANOVA as suggested by Panse and Sukhatme (1985). The critical difference (CD) was computed at 5% probability.

Results and Discussion

A highly significant difference was noticed due to the organic seed pelleting for all the evaluated growth and yield parameters (Table 1).

Seeds pelleted with azospirillum (T_7) recorded higher values for all the traits *viz.,* plant height (106.91cm), number of branches per plant (15.04), days to first flowering (70.19), days to 50%flowering (80.12) and dry matter production(132.69) followed by phosphate solubilizing bacteria (T_6). Next nearest values were noticed with seeds pelleted with VAM (T_8) and neem leaf powder (T_1) which are on par with each other for all the growth characters studied. When compared to the control, nearly 10 per cent

increase was noticed by the pelleted seeds for all the growth parameters.

Among the growth parameters, plant height is said to be a genetically controlled character. But in the present study significant differences were observed for various pelleting treatments. The seeds pelleted with azospirillum (T_7) exhibited maximum plant height (106.91 cm), which may be due to the production of GA_3 and other nutrients leads to the elongation of internodes, as the cell elongation is the principle characters of GA_3. Similar findings were reported by Tiwari *et al*., 1998; Panwar and Elanchezhian, 1999 and Beatrix *et al*., 2000.

The number of branches per plant showed nearly 13 per cent increase over the control. Pelleting with azospirillum (T_7) showed positive effects towards number of branches. This may be due to triggering the activity of biofertilizers which results in increased in uptake of available nitrogenous fertilizers in the soil and increased photosynthetic activity of the plant. These results are in concordance with the findings of Mirzaei, 2010.

Shortening the days to first flowering and 50 per cent flowering (70.19 DAS and 80.12 DAS) may be due to the increased availability of nutrients by the biofertilizers. In the present study azospirillum results in earliest flowering followed by phosphate solubilizing bacteria. Azospirillum is one of the best known rhizosphere bacteria, increases the activity of N_2 fixation and production of GA_3 which trigger the physiological activity to build up sufficient food reserve for reproductive stage. The next best result was observed by the seeds pelleted with phosphate solubilizing bacteria (T_6) may be due to the activation of the 'P' solubilization and make available more 'P' in soil which results in increased root surface of the plant. Phosphorus plays an important role in accelerating tillering, flower formation, good fruit and seed setting besides early maturation. Similar findings were made by Tewari *et al*. (2001), Veerabhadra. (2002), Ponmurugan and Gopi (2006), Anand and Kamaraj (2017). and Kalyan *et al*. (2018).

Among the botanicals, seeds pelleted with neem leaf powder exhibited highest values and nearest to biofertilizers in all growth characters studied. This may be due to the presence of some antioxidants like Quercetin and Nimbosterol which act as an antifungal agent controlled the soil borne pathogens resulting in better crop growth and development. Similar findings were made by Venudevan and Srimathi (2018).

Azospirillum pelleted seeds exhibited the highest values for yield contributing traits *viz.,* number of fruits per plant, fruit length, fruit girth, fruit weight, fruit yield per plant, seed yield per fruit and seed yield per plant which were respectively, showed 14.9 %, 18.9 %, 11 %, 6.7 %, 20.5 %, 25 % and 43 % increase over the control (Table 2). This may be due to the nature of azospirillum which apparently stimulating the root development results in efficient uptake of macro and micronutrients, there by the plants remains physiologically more active, source to sink relationship in plant parts and build up sufficient food reserve for developing flowers and fruits. Thus the plants gave a higher fruit yield resulted in high seed yield per unit area. Similar findings were reported by Veerabhadra. 2002 and Kalyan *et al*. (2018) in brinjal.

Conclusion

From this study, it is concluded that the seed pelleting with azospirillumor neem leaf powder are performed well for growth and yield contributing characters in brinjal. Hence, it is recommended to the farmers for further exploitation.

Table 1: Effect of seed pelleting on growth parameters in brinjal.

Treatments	Plant height (cm)	Number of branches per plant	days to first flowering	days to 50% flowering	DMP (mg)
T_1	104.23	14.29	72.78	82.70	130.09
T_2	103.90	14.22	72.97	82.85	129.75
T_3	101.37	13.69	75.15	85.27	127.49
T_4	100.98	13.54	75.49	85.59	126.89
T_5	101.19	13.61	75.33	85.44	127.23
T_6	104.72	14.42	72.43	82.39	130.43
T_7	106.91	15.04	70.19	80.12	132.69
T_8	104.42	14.34	72.61	82.53	130.25
T_9	97.19	13.08	77.67	88.05	124.62
S.Ed.±	**0.78**	**0.20**	**1.02**	**1.02**	**1.04**
CD (P=0.05)	**1.65**	**0.43**	**2.16**	**2.16**	**2.21**

Table: 2 Effect of seed pelleting on seed yield parameters in brinjal.

Treatments	number of fruits per plant	fruit length (cm)	fruit girth (cm)	fruit weight (g)	fruit yield/plant (kg)	seed yield per fruit (g)	seed yield per plant (g)
T_1	27.09	11.56	16.49	95.04	2.19	1.95	52.83
T_2	27.05	11.52	16.43	94.66	2.18	1.94	52.48
T_3	26.34	11.16	16.01	93.70	2.07	1.85	48.73
T_4	26.09	11.01	15.81	92.90	2.06	1.79	46.70
T_5	26.29	11.09	15.94	93.32	2.04	1.83	48.11
T_6	27.16	11.62	16.56	95.66	2.23	1.99	54.05
T_7	28.88	12.30	16.92	96.13	2.39	2.09	60.36

T_8	27.11	11.59	16.54	95.32	2.22	1.97	53.41
T_9	25.12	10.34	15.24	90.12	1.90	1.67	42.00
S.Ed.±	**0.34**	**0.15**	**0.16**	**0.21**	**0.05**	**0.04**	**1.71**
CD(P=0.05)	**0.72**	**0.32**	**0.33**	**0.44**	**0.10**	**0.08**	**3.63**

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