

INFLUENCE OF SEED PELLETING ON GROWTH, SEED YIELD AND YIELD CONTRIBUTING TRAITS IN RAJMASH (*PHASEOLUS VULGARIS. L*)

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Abstract - The present investigation was carried to study the effect of seed pelleting on growth, seed yield and yield contributing characters in Rajmash (*Phaseolus vulgaris. L*). The study revealed that, all the seed pelleted treatments had significant effect on growth and seed yield contributing parameters. The seed pelleted with ZnSO₄ @ 3 g/kg + Borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg) recorded higher field emergence (%), plant height, number of primary branches per plant, number of leaves per plant, plant dry weight, dry pod weight per plant, number of pods per plant, number of seeds per pod, seed yield per plant, seed yield per plot, seed yield per hectare than the control.

The variety Phule Rajmah produced higher seed yield than the variety Varun. The variety Phule Rajmah reported significantly higher field emergence, plant height, number of primary branches per plant, number of leaves per plant, plant dry weight, dry pod weight per plant, number of pods per plant, number of seeds per pod, seed yield per plant, seed yield per plot, seed yield per hectare while variety Varun observed lower days to maturity than variety Phule Rajmah.

Seed quality parameters like seed index, moisture content, germination (%), root length, shoot length, seedling dry matter, seed vigour index-I and II and lower electrical conductivity (dsm-1) were also maintained up to storage periods (240 days) with seed pelleting treatments such as ZnSO₄ @ 3 g/kg + Borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg) and ZnSO₄ @ 3 g/kg followed by control.

From the above it is concluded that the seed pelleted with ZnSO₄ @ 3 g/kg + Borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg) performed best for both growth and yield parameters as well as for seed quality parameters.

Key Words: Seed yield, Rajmash bean, seed pelleting, Deltamethrin, germination, test weight and electrical conductivity.

1. INTRODUCTION

French bean (*Phaseolus vulgaris L.*) is one of the most important vegetable pulse crops. This belongs to family Fabaceae and called as Rajmash in Hindi.

Considering the nutritive value, 100 g of green pod contains 1.7 g protein, 0.1 g fat, 4.5 g carbohydrate, 1.8 g fiber and is also rich in minerals and vitamins. It possesses some medicinal properties which are useful in controlling diabetics and certain cardiac problems.

Seed quality enhancement is the important area for improving the quality of the seed. Amongst the advance technology available for seed quality enhancement, seed pelleting is the important technology for seed quality enhancement. Seed pelleting involves increasing the weight and changing the shape and size of the seed by putting a layer of material like organic and inorganic nutrients, pesticides, water absorbents carrier for nodule bacteria and other protective material for specific purposes.

However, the information on effect of seed pelleting on the growth and yield of the Rajmash is not available as very limited research has been done on this aspects. Due to this reason, the present investigation was carried out to know the influence of seed pelleting on growth and seed yield in French bean (*Phaseolus vulgaris L.*)

2. MATERIAL AND METHODS

The present investigation entitled, "Influence of seed pelleting on growth, seed yield in Rajmash (*Phaseolus vulgaris L.*)" was conducted during *kharif*, 2019 at Botany Farm, College of Agriculture, Pune, MPKV., Rahuri (Maharashtra state). The experiment material consist of two factors varieties viz., V₁ (Varun) and V₂ (Phule Rajmah). The seeds were obtained from Zonal Agriculture Research Station, Ganeshkhind, Pune and eight seed pelleted treatments viz., T₁ : Control (Unpelleted), T₂ : Seed pelleting with clay + Gypsum (1:1), T₃ : Seed pelleting with clay + Neem leaf powder + Gypsum (1:1:1), T₄ : Seed pelleting with biofertilizers (Rhizobium) @ 30 g/kg, T₅ : Seed pelleting with ZnSO₄ @ 3 g/kg, T₆ : Seed pelleting with Borax @ 3 g/kg, T₇ : Seed pelleting with Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg), T₈ : Seed pelleting with ZnSO₄ @ 3 g/kg + Borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg). The experiment was laid out in the Factorial Randomized Block Design (FRBD) with three replications. The gross plot size was 3.50 x 2 m² and net plot size was 3.30 x 1.80 m². Single seed was dibbled per hill at a spacing

of 45 X10 cm during June, 2019. The field observations were recorded on yield and yield contributing parameters viz., field emergence, plant height (cm), number of primary branches per plant, number of leaves per plant, days taken to anthesis, days taken to 50% flowering, days taken to maturity, plant dry weight, dry pod weight per plant, number of pods per plant, number of seeds per pod, seed yield per plant, seed yield per plot and seed yield per ha. The mean of five randomly selected plants from each experimental plot in each replication were used for statistical analysis. The mean values of different field characters were analyzed by the usual procedure of Factorial Randomized Block Design (FRBD) method as described by (Panse and Sukhatme, 1985).

3. RESULT AND DISCUSSION

Effect of variety: The present investigation was carried out on yield and yield contributing highly significant differences were observed among all the characters in French bean. It revealed that there were highly significant differences among for all the characters under study. The variety Phule Rajmah recorded highest field emergence (78.83%) than variety Varun (78.48%).

The variety Phule Rajmah recorded significant superiority in seed yield per hectare (16.80 q/ha), seed yield per plot (1.76 kg) and seed yield per plant (27.07 g) over the variety Varun. The variety Phule Rajmah was also significantly superior over the Phule Varun in yield contributing characters like plant height (46.23 cm), number of primary branches per plant (4.82), number of leaves per plant (36.13), number of pods per plant (15.04), number of seeds per pod (5.20), pod length (8.08 cm) and dry pod weight per plant (35.20 g). However, the variety Varun required significant fewer days to anthesis (29.77), days to 50 per cent flowering (32.80) and lowest days to maturity (71.86) over the variety Phule Rajmesh.

Effect of seed pelleting treatments: Amongst all the seed pelleting treatments, the seed pelleted with ZnSO₄ @ 3g/kg + Borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg) recorded highest field emergence (84.80 %), plant height (47.12 cm), number of primary branches per plant (5.47), number of leaves per plant (36.87), plant dry weight at harvest (14.55 g), pod length (8.81 cm), dry pod weight (38.14 g), number of pods per plant (14.75), number of seeds per pod (5.80), seed yield

per plant (29.35 g), seed yield per plot (2.04 kg) and seed yield per quintal (16.89 q/ha) than other seed pelleting treatments. However, significantly the less number of days required for days to anthesis (30.60), days 50 per cent flowering (33.65) and days to maturity (76.35) for control as compare to other seed pelleting treatments.

The increase in seed yield and superior yield contributing characters due to seed pelleting may be the result of increase in sugar synthesis and its efficient translocation for seed formation and development after the pelleting of seed with Borax, ZnSO₄, Captan and Imidacloprid (Berger, 1949, Shkolnik and Abdurashitov, 1958).

Effect of Interaction: It was observed that the variety Phule Rajmah seed pelleted with ZnSO₄ @ 3 g/kg + Borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg) recorded the numerically highest field emergence (84.45%), number of primary branches per plant (5.57), number of leaves per plant (36.90), plant dry weight at harvest (14.82 g), pod length (8.81cm), dry pod weight (41.91 g), number of pods per plant (15.77), of seeds per pod (5.87), seed yield per plant (32.26 g), seed yield per plot (2.30 kg) and seed yield per hectare (17.79 q/ha). The increase in growth parameter like field emergence, plant height, more number of branches, leaves and flowers per plant was found in seed pelleted with ZnSO₄ @ 3 g/kg + borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg) is due to enhanced carbohydrate metabolism and metabolic and physiological processes by plants (Ashour and Reda, 1972).

Similar, result was also reported in french bean by Chaya Devi *et al.*, 2017 and Deshpande *et al.* (2009) in paprika chilli.

Similar, result were reported by Manjunath *et al.* 2009 and Chaya Devi *et al.*, 2017 for maximum seed yield in seeds pelleted with ZnSO₄ @ 3 g/kg + borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg) as compared to control in paprika chilli and french bean, respectively.

However, the lowest days taken to anthesis (29.02), days to 50 per cent flowering (32.13) and days to maturity (71.25) were observed in the interaction of Varun with Control.

Table 1. Effect of varieties, seed pelleting treatments and their interaction on growth parameter

Treatments	Field emergence			Plant height			Primary branches per plant			Number of leaves per plant		
	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean
T ₁ : Control (Untreated)	75.09	75.28	75.19	40.17	44.03	42.10	4.06	4.30	4.18	34.65	35.02	34.83
T ₂ : Clay + Gypsum (1:1)	75.23	76.75	75.99	41.97	44.37	42.67	4.20	4.33	4.27	35.02	35.85	35.43
T ₃ : Clay+ Neem leaf powder + Gypsum (1:1:1)	76.91	77.10	77.00	41.03	45.33	43.18	4.33	4.63	4.48	35.15	35.61	35.38
T ₄ : Biofertilizers (Rhizobium) @ 30 g/kg	77.16	77.23	77.19	41.13	45.43	43.28	4.17	4.40	4.28	35.92	36.33	36.12
T ₅ : ZnSO ₄ @ 3g/kg	79.91	80.11	80.01	42.23	46.57	44.40	5.20	5.31	5.26	36.23	36.33	36.28
T ₆ : Borax @ 3g/kg	77.65	78.12	77.89	41.70	46.07	43.88	4.23	4.57	4.40	35.81	36.12	35.96
T ₇ : Captan @ 2.5g/kg + Imidacloprid @ 2.5g/kg	81.54	81.58	81.56	43.13	48.13	45.63	5.17	5.43	5.30	36.78	36.88	36.83
T ₈ : ZnSO ₄ @ 3g/kg + Borax @ 3g/kg + Captan@ 2.5g/kg + Imidacloprid @ 2.5g/kg	84.34	84.45	84.40	44.30	49.93	47.12	5.37	5.57	5.47	36.85	36.90	36.87
Mean	78.48	78.83	78.65	41.83	46.23	44.03	4.59	4.82	4.70	35.80	36.13	35.96
	variety	Treatment	Interaction	variety	Treatment	Interaction	variety	Treatment	Interaction	variety	Treatment	Interaction
S.E.m±	0.258	0.167	0.578	0.46	0.29	1.03	0.050	0.032	0.112	0.144	0.093	0.322
CD at 5%	0.753	NS	NS	1.54	0.86	NS	0.168	0.094	NS	0.417	0.269	0.940

Table 1 Contd....

Table 1. Effect of varieties, seed pelleting treatments and their interaction on growth parameters

Treatments	Days to anthesis			Day to 50 % flowering			Days to maturity			Plant dry weight at harvest (g)		
	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean
T ₁ : Control (Untreated)	29.02	32.17	30.60	32.26	35.47	33.87	71.25	81.45	76.35	13.25	13.34	13.30
T ₂ : Clay + Gypsum (1:1)	29.13	32.39	30.76	32.49	35.52	34.01	71.56	81.67	76.62	13.39	13.69	13.54
T ₃ : Clay+ Neem leaf powder + Gypsum (1:1:1)	29.43	32.51	30.97	32.35	35.29	33.82	71.84	81.71	76.77	13.49	13.97	13.73

T ₄ : Biofertilizers (Rhizobium) @ 30 g/kg	29.33	32.23	30.78	33.28	36.37	34.83	71.42	81.53	76.48	13.34	13.89	13.62
T ₅ : ZnSO ₄ @ 3g/kg	30.48	33.11	31.80	32.63	35.55	34.09	72.16	82.12	77.14	14.16	14.56	14.36
T ₆ : Borax @ 3g/kg	29.45	32.55	31.00	33.59	36.64	35.12	71.37	81.54	76.46	13.53	14.31	13.92
T ₇ : Captan @ 2.5g/kg + Imidacloprid @ 2.5g/kg	30.64	33.23	31.94	33.63	36.80	35.22	72.45	83.18	77.82	14.21	14.78	14.50
T ₈ : ZnSO ₄ @ 3g/kg + Borax @ 3g/kg + Captan@ 2.5g/kg + Imidacloprid @ 2.5g/kg	30.66	33.27	31.97	32.80	35.85	34.32	72.82	83.54	78.18	14.29	14.82	14.55
Mean	29.77	32.68	31.23	0.078	0.157	0.222	71.86	82.09	76.98	13.71	14.17	13.94
	Variety	Treatment	Interaction	Variety	Treatment	Interaction	Variety	Treatment	Interaction	Variety	Treatment	Interaction
S.E.m±	0.064	0.129	0.182	0.226	0.453	0.648	0.144	0.288	0.407	0.401	0.801	1.133
CD at 5%	0.186	0.371	0.531	32.13	35.17	33.65	0.416	0.832	1.18	1.97	2.33	NS

Table 2. Effect of varieties, seed pelleting treatments and their interaction on yield and yield contributing Parameters

Treatments	Pod length (cm)			Dry pod weight per plant (g)			No of pods per plant		
	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean
T ₁ : Control (Untreated)	7.43	7.67	7.55	20.94	29.39	25.17	11.41	14.54	12.97
T ₂ : Clay + Gypsum (1:1)	7.55	7.70	7.62	23.88	31.90	27.89	11.61	14.72	13.17
T ₃ : Clay+ Neem leaf powder + Gypsum (1:1:1)	7.73	7.77	7.75	25.14	32.30	28.72	11.67	14.82	13.24
T ₄ : Biofertilizers (Rhizobium) @ 30 g/kg	7.47	7.57	7.52	26.51	34.56	30.53	11.51	14.55	13.03
T ₅ : ZnSO ₄ @ 3g/kg	8.37	8.49	8.43	31.75	38.59	35.17	13.13	15.57	14.35
T ₆ : Borax @ 3g/kg	7.77	7.80	7.78	25.56	32.25	28.90	12.90	14.60	13.75
T ₇ : Captan @ 2.5g/kg + Imidacloprid @ 2.5g/kg	8.77	8.80	8.78	34.16	40.67	37.41	13.70	15.74	14.72
T ₈ : ZnSO ₄ @ 3g/kg + Borax @ 3g/kg + Captan@ 2.5g/kg + Imidacloprid @	8.80	8.81	8.81	34.36	41.91	38.14	13.72	15.77	14.75

2.5g/kg									
Mean	7.99	8.08	8.03	27.79	35.20	31.49	12.46	15.04	13.75
	Variety	Treatment	Interaction	Variety	Treatment	Interaction	Variety	Treatment	Interaction
S.E.m±	0.039	0.132	0.088	0.044	0.088	0.125	0.147	0.094	0.329
CD at 5%	0.132	0.073	0.256	0.127	0.255	0.360	0.492	0.274	0.960

Table 2 Contd....

Table 2. Effect of varieties, seed pelleting treatments and their interaction on yield and yield contributing Parameters

Treatments	Number of seeds per pod			Seed yield per plant(g)			Seed yield per plot			Seed yield hectare(q)		
	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean	Varun (V ₁)	Phule Rajmah (V ₂)	Mean
T ₁ : Control (Untreated)	4.27	4.50	4.38	16.13	22.71	19.42	1.17	1.36	1.27	13.88	15.85	14.86
T ₂ : Clay + Gypsum (1:1)	4.73	4.77	4.75	18.37	24.55	21.46	1.19	1.51	1.35	14.56	16.21	14.99
T ₃ : Clay+ Neem leaf powder + Gypsum (1:1:1)	4.87	4.80	4.83	19.34	24.80	22.07	1.23	1.53	1.38	14.71	16.28	15.49
T ₄ : Biofertilizers (Rhizobium) @ 30 g/kg	5.27	5.33	5.30	20.42	26.54	23.48	1.33	1.64	1.49	14.94	16.26	15.77
T ₅ : ZnSO ₄ @ 3g/kg	5.57	5.67	5.62	24.49	29.71	27.10	1.59	1.96	1.78	15.65	17.42	16.54
T ₆ : Borax @ 3g/kg	4.97	5.00	4.98	21.56	24.74	23.15	1.38	1.62	1.50	14.99	16.76	15.88
T ₇ : Captan @ 2.5g/kg + Imidacloprid @ 2.5g/kg	5.63	5.70	5.67	26.28	31.24	28.76	1.72	2.12	1.92	15.80	17.71	16.75
T ₈ : ZnSO ₄ @ 3g/kg + Borax @ 3g/kg + Captan@ 2.5g/kg + Imidacloprid @ 2.5g/kg	5.73	5.87	5.80	26.44	32.26	29.35	1.78	2.30	2.04	15.98	17.79	16.89
Mean	5.13	5.20	5.17	21.63	27.07	24.35	1.42	1.76	1.59	14.99	16.80	15.90
	Variety	Treatment	Interaction	Variety	Treatment	Interaction	Variety	Treatment	Interaction	Variety	Treatment	Interaction
S.E.m±	0.051	0.032	0.114	0.075	0.048	0.168	0.017	0.034	0.047	0.056	0.036	0.127
CD at 5%	0.148	0.095	0.332	0.251	0.140	0.490	0.048	0.097	0.137	0.190	0.106	0.370

3. CONCLUSIONS

1. The seed pelleted with ZnSO₄ @ 3 g/kg + Borax @ 3 g/kg + Captan (2.5 g/kg) + Imidacloprid (2.5 g/kg) recorded higher field emergence (%), plant height, number of primary branches per plant, number of leaves per plant, plant dry weight, number of pods per plant, number of seeds per pod, seed yield per plant, seed yield per plot, seed yield per hectare than the control.
2. The variety Phule Rajmah produced higher seed yield and yield contributing characters except days to flowering and maturity than the variety Varun.

growth of *Oryza sativa* (rice) cv. IR-66. Seed Sci. and Technol. 28: 391-401.

- [8] Shkolnik and Abdurashitov, S.A., 1958. Influence of micro-elements on synthesis and translocation of carbohydrates. Pl. Phy., USSR, 5 (5): 393-399.

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REFERENCES

- [1] Ashour, N.I. and Reda, F., 1972. Effect of foliar application of some micro-elements on growth and some physio-chemical properties of sugar beet growth in winter season. Curr. Sci., 41 (4) :146-147.
- [2] Berger, K.C., 1949. Boron in soils and crops. Adv. in Agron., 1: 321-351.
- [3] Chaya Devi, K., Balakrishna. P. and Chandraprakash, J. 2017. Studies on the influence of seed pelleting on seed yield and quality in french bean (*Phaseolus vulgaris* L.) cv. "Arka Anoop", University of Agricultural Sciences, GKVK, Bangalore - 65, India. Int. J. Curr. Microbiol. App. Sci. 6 (5): 1912-1918.
- [4] Deshpande, V. K., Manjunath, S. N., Masuthi, D., and Vyakaranal, B. S., 2009. Effect of seed tapes and seed pelleting performance in nursery and field in paprika chilli. Karnataka J. Agric., 22(4):762-764.
- [5] Manjunath, S. N., Deshpande, V. K., Sridevi, O., Uppar, D. S., Babalad, H. B. and Rao, M. S.L. 2009. Influence of seed pelleting on crop growth, seed yield and quality of paprika chilli (*Capsicum annuum* L.). Karnataka J. Agric. Sci. 22 (4): 762-764.
- [6] Panse, V. G. and Shukhatme, P. V., 1985. Statistical methods for Agricultural Workers, Indian Council of Agricultural Research, New Delhi pp. xvi + 361 pp.
- [7] Ros, C., Bell, R.W. and White, P. F. 2000. Phosphorus seed coating and soaking for improving seedling