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EFFECT OF ORGANIC AND INORGANIC SEED TREATMENTS ON SEED QUALITY OF FRENCH BEAN (*Phaseolus vulgaris* L.)

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Abstract - *A laboratory experiment was conducted to investigate the "effect of organic and inorganic seed treatments on seed quality of French bean (phaseolus vulgaris L.)". The seeds of French bean was subjected to different treatments viz., T_0: Control (untreated), T_1: Neem leaf powder @5g/kg of seed, T_2: neem oil @5ml/kg of seed, T_3: Castor oil @5ml/kg of seed, T_4: karanj oil @5ml/kg of seed, T_5: vekhand powder @10g/kg of seed, T_6: Termuric powder @5g/kg of seed, T_7: Citronella oil @5ml/kg of seed, T_8: Ash @5g/kg of seeds, T_9: Deltamethrin @0.04ml/kg of seed. Observations were taken to know the seed quality of French bean seed at regular intervals.*

The results revealed that, among different seed treatments, seed treated with deltamethrin, neem oil, castor oil, karanj oil found to be effective over control. The French bean seeds treated with Deltamethrin, neem oil significantly recorded lower moisture content (7.30%, 7.34%), higher germination (76.67%, 75.33%), higher speed of germination(19.42, 19.28), root length (11.59, 11.43 cm), shoot length (7.65, 7.59 cm), vigour index-I (1475,1432), vigour index-II (1606, 1572), seedling dry weight (20.95, 20.87 mg), lower electrical conductivity (1.86, 1.91dS m-1) and test weight (33.60, 33.51g),respectively. While, control seed recorded higher moisture content (7.69%), lower germination (64.33%), root length (9.46 cm), shoot length (6.58 cm), vigour index-I (1032), vigour index-II (1193), seedling dry weight (18.54 mg), higher electrical conductivity (2.27 dS m-1) and test weight (31.90g), at the end of 300 days of storage period. From present investigation it was clear that seed treated with organic and inorganic seed treatment i.e. deltamethrin (T9) and neem oil (T2) protected its quality while, control seed deteriorated at the end of storage period.

***Key Words*: Seed quality, French bean, seed treatment, Deltamethrin, germination and electrical conductivity**

1. INTRODUCTION

Pulses occupy a very important position in Indian diet. They are important source of protein and calories. On an average, pulses contain 22 to 24 per cent protein as against 8 to 10 per cent in cereals. A good amount of lysine is present in the pulses. French bean (Phaseolus vulgaris L.) belongs to the family Leguminoceae and it is native of South America. In India and most of the tropical Asia it is a major vegetable crop where indigenous pulses are also preferred. French bean is consumed as immature tender fruits, green grains as vegetables and dry grain (Rajmash). The nutritive value of 100 g of green pod contains 1.7 g protein, 0.1 g fat, 4.5 g carbohydrate, 1.8 g fibre and is also rich in minerals and vitamins. It is popularly grown in Punjab, Harayana, Jammu and Kashmir, Himachal Pradesh, Western Uttar Pradesh, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu states of our country. As French bean is major crop in Rabi season, the seeds are to be produced during Rabi and used for sowing during next season or year.

Botanicals have been used from a very long time by many farmers in the world from decades to control stored insect pest (Araya and Emana, 2009). Many scientists revealed that use of botanicals as pre storage seed treatment is effective in management of storage pest and thus helps in improving quality of seed. Botanicals viz., neem leaf powder, neem oil, karanj oil, castor oil, vekhand powder, citronella oil, turmeric powder, ash etc were used.

In storage, viability and vigour of the seeds is regulated by many physico-chemical factors like moisture content of the seed, atmospheric relative humidity, temperature and initial seed quality, physical and chemical composition of seed, gaseous exchange, storage structure, storage insects and packaging materials. Hence, storage of seed till next planting time assumes prime importance for successful seed production programme.

2. MATERIAL AND METHODS

A comprehensive laboratory study on "Effect of organic and inorganic seed treatments on seed quality of French bean (Phaseolus vulgaris)" was under taken at Seed Technology Research Unit, Mahatma Phule Krishi Vidyapeeth, Rahuri. Dist. Ahmednagar (MS) during May, 2019 to Feb, 2020. The material for present study consists of freshly harvested seeds of French bean variety Varun obtained from Botany Farm, College of Agriculture, Pune. The experiment was laid out in Completely Randomized Design (CRD) with three replications. HDPE (High Density Polythene Bags) were used as a container for the experiment. The seeds of French bean was subjected to ten different treatments viz., control (T0), neem leaf powder

(T1) @ 5 g/kg of seed, neem oil (T2) @ 5 ml/kg of seed, castor oil (T3) @ 5 ml/kg of seed, karanj oil (T4) @ 5 ml/kg of seed, vekhand powder (T5) @ 10gm/kg of seed, termuric powder (T6) @ 5 g/kg of seed, citronella (T7) @ 5 ml/kg of seed, ash (T8) @ 5 g/kg of seed and deltamethrin (T9) @ 0.04 ml/kg of seed.

The treated French bean seeds was stored in recommended storage container i.e. HDPE bag under ambient conditions at Seed Technology Research Unit, MPKV, Rahuri. Seed quality of French bean was tested for different parameters viz., moisture content (%), germination (%), root length (cm), shoot length (cm), seedling dry weight(mg), vigour index I and II, electrical conductivity (dSm-1) and test weight (g) at regular interval during storage period.

Statistical analysis of the present studies was carried out as per the procedure given by Panse and Sukhatme (1967) and Sundaraj et al. (1972) adopting "Fishers 'analysis of variance techniques".

3. RESULT AND DISCUSSION

The present investigation was carried to study the effect of organic and inorganic seed treatments on quality of French bean seeds during storage period. Seeds were subjected to different treatments and quality was tested for different parameters as below.

1. Moisture Content (%): At initial period, lower moisture content (8.23 %) was recorded in deltamethrin (T9) treated seeds, while higher moisture content (8.26 %) were recorded in neem oil (T2), castor oil (T4), turmeric powder (T6) and Ash (T9). At the end of 60 and 300 days of storage period, lowest moisture content (8.33% and 7.30 %) were recorded in deltamethrin (T9) respectively, followed by neem oil (T2), castor oil (T4) and karanj oil (T3), (Table.1). It was clear from the recording that, seed treated with chemicals and botanical oils protect the seed from fluctuation in the seed moisture content.

2. Germination (%): At initial period, highest germination (89.67 %) was recorded in seeds treated with neem oil (T2) followed by control (T0), neem leaf powder (T1), castor oil (T4) and deltamethrin (T9). At the end of storage period (60 and 300 days), highest germination (89.00% and 76.67 %) were recorded in deltamethrin (T9) and it was on par with neem oil (T2), castor oil (T4) respectively, (Table. 1).Similar findings were also observed by Gupta et al (2018) in chickpea, Mandali and Reddy (2014) in red gram and Rathod et al. (2018) in pigeon pea seed.

3. Root Length (cm): Initially higher root length (13.63 cm) was recorded in seeds treated with karanj oil (T3) followed by castor oil (T4) and neem oil (T2). While, lower root length (13.57 cm) was recorded in control (T0), neem leaf powder (T1) and turmeric powder (T6) treated seeds. At the end of 300 days of storage period, highest root length (11.59 cm) was recorded in deltamethrin(T9) treated seeds followed by neem oil(T2). (Table.1).

4. Shoot Length (cm): The shoot length (Table.2) due to seed treatments with botanicals and chemicals differed significantly at all the months of storage period except at initial and 60 days of storage. Initially, higher shoot length (9.12 cm) was recorded in seeds treated with castor oil (T3) followed by deltamethrin (T9) and neem oil (T2). At the end of 300 days of storage period, highest shoot length (7.65cm) was recorded in deltamethrin (T9) treated seeds followed by neem oil (T2), while lowest shoot length (6.58 cm) was recorded in untreated control (T0).

5. Vigour Index-I: Initially higher vigour index-I (2036) was recorded in seeds treated with neem oil (T2) followed by karanj oil (T4) and lower vigour index-I (1991) in vekhand powder (T5) treated seeds. Likewise, after 60 and 300 days of storage period, highest vigour index-I (2015 and1475) were recorded in deltamethrin (T9) treated seeds, respectively. While, lowest vigour index-I (1955 and 1031) were recorded in untreated control (T0) for after 60 and 300 days of storage period.

6. Vigour Index-II: Initially higher vigour index-II (2123) was recorded in seeds treated with neem oil (T2) followed by deltamethrin (T9). After 60 and 300 days of storage period, highest vigour index-II (2071 and 1606) were recorded in deltamethrin (T9) treated seeds, respectively. While, lowest vigour index-II (1979 and 1193) were recorded in untreated control (T0) for after 60 and 300 days of storage period.

Vigour index-I and II decreased with advancement of storage period irrespective of seed treatment. Seed treated with deltamethrin showed higher vigour index-I followed by neem oil due to higher germination percentage, root shoot length and seedling dry weight. Similar findings regarding with vigour index I was also reported by Gupta et al. (2018) in chickpea and Rathod et al. (2018) in pigeon pea.

7. Seedling Dry Weight (mg): In all the three days of storage period highest seedling wt (mg) were recorded in deltamethrin (T9) i.e. 23.77 mg for initial, 23.27 mg for 30 days and 20.95 mg for after 300 days of storage period followed by neem oil (T2) and castor oil (T4). While, lowest seedling wt (mg) were recorded in 23.30 mg for initial, 22.80 mg for 30 days and 18.54 mg for after 300 days of storage period, respectively in untreated seeds of French bean (Table. 3). Similar results were obtained by Srimathi et al. 2003.

8. Electrical Conductivity (dSm-1): Initially, lower electrical conductivity (0.98 dSm-1) was recorded in control (T0) and deltamethrin (T9) treated seeds. At the

end of 60 and 300 days of storage period, lowest electrical conductivity (0.98 dSm-1 and 1.86 dSm-1) was recorded in deltamethrin (T9) treated seeds respectively, followed by neem oil (T2). (Table.3). The electrical conductivity of seed leachate indicates the membrane integrity and quality of seed and it is negatively related with seed quality. Hampton and Tekrony (1995) reported that the electrical conductivity was increased with increment in storage period. Seeds treated with deltamethrin showed lower electrical conductivity followed by neem oil as these treated seed recorded low pulse beetle infestation and lower seed mycoflora. These results finding are in conformity with Gupta et al. (2018) in chickpea.

9. Test Weight (g): Initially, higher test weight (34.37 g) was recorded in seeds treated with citronella oil (T7) followed by ash (T8), deltamethrin (T9). After 300 days of storage period, seeds treated with deltamethrin maintained significantly higher test weight and it was on par with neem oil @ 5 ml/kg of seed and castor oil @ 5 ml/kg of seed.

Table. 1 Effect of seed treatment on moisture content, germination and root length of French bean

Treatments	Storage Period (days)								
	Moisture Content (%)			Germination (%)			Root Length (cm)		
	Initial	After 60days	After 300 days	Initial	After 60days	After 300 days	Initial	After 60days	After 300 days
T_0	8.25	8.42	7.69	89.00	86.67	64.33	13.57	13.54	9.46
T_1	8.24	8.34	7.41	89.00	87.33	73.67	13.57	13.54	10.62
T_2	8.26	8.35	7.34	89.67	88.67	75.33	13.61	13.57	11.43
T_3	8.25	8.34	7.37	88.67	88.33	73.33	13.63	13.53	10.78
T_4	8.26	8.38	7.39	89.00	87.33	74.33	13.62	13.58	10.73
T_5	8.25	8.35	7.45	88.00	87.33	69.33	13.59	13.57	10.00
T_6	8.26	8.34	7.44	88.33	87.00	71.67	13.57	13.55	10.47
T_7	8.24	8.37	7.40	88.67	87.33	70.67	13.60	13.59	10.36
T_8	8.26	8.36	7.49	88.00	88.00	72.00	13.58	13.56	10.33
T_9	8.23	8.33	7.30	89.00	89.00	76.67	13.59	13.58	11.59
SE±	0.02	0.02	0.04	0.62	0.73	0.44	0.04	0.03	0.08
CD at 5%	NS	0.05	0.13	NS	NS	1.29	NS	NS	0.25

T_0 : Control T_1 : Neem leaf powder T_2 : Neem oil T_3 : Castor oil
T_4 : Karanj oil T_5 : Vekhand powder T_6 : Turmeric powder T_7 : Citronella oil
T_8 : Ash T_9 : Deltamethrin

Table. 2 Effect of seed treatment on Shoot length, Vigour Index-I and Vigour Index-II of French bean

Treatments	Storage Period (days)								
	Shoot Length (cm)			Vigour Index-I			Vigour Index-II		
	Initial	After 60days	After 300 days	Initial	After 60days	After 300 days	Initial	After 60days	After 300 days
T0	9.05	9.02	6.58	2013	1955	1032	2077	1979	1193
T1	9.07	9.04	7.39	2015	1972	1327	2094	2012	1512
T2	9.10	9.08	7.59	2036	2008	1432	2123	2055	1572
T3	9.12	9.09	7.35	2017	2007	1330	2090	2037	1507
T4	9.08	9.05	7.36	2020	1976	1345	2101	2018	1529
T5	9.03	9.02	6.93	1991	1973	1174	2050	1991	1362
T6	9.05	9.00	7.33	1998	1962	1276	2069	1995	1455
T7	9.05	9.02	7.27	2009	1974	1246	2079	2004	1430
T8	9.09	9.04	7.29	1995	1989	1269	2050	2006	1435
T9	9.10	9.07	7.65	2019	2015	1475	2115	2071	1606
SE±	0.03	0.03	0.07	15.64	18.78	13.47	22.33	25.79	16.82
CD at 5%	NS	NS	0.21	NS	NS	39.75	NS	NS	49.61

T_0 : Control T_1 : Neem leaf powder T_2 : Neem oil T_3 : Castor oil
T_4 : Karanj oil T_5 : Vekhand powder T_6 : Turmeric powder T_7 : Citronella oil
T_8 : Ash T_9 : Deltamethrin

Table. 3 Effect of seed treatment on seedling dry weight, Electrical Conductivity and Test Weight of French bean

Treatments	Storage Period (days)								
	Seedling Dry Weight (mg)			Electrical Conductivity (dSm-1)			Test Weight (g)		
	Initial	After 60days	After 300 days	Initial	After 60days	After 300 days	Initial	After 60days	After 300 days
T0	23.50	22.83	18.54	0.98	0.99	2.27	34.32	34.37	31.90
T1	23.53	23.03	20.53	1.00	1.00	2.00	34.33	34.51	33.42
T2	23.68	23.18	20.87	0.99	0.99	1.91	34.44	34.62	33.51
T3	23.56	23.06	20.55	1.01	1.02	1.97	34.43	34.61	33.47
T4	23.61	23.11	20.57	1.02	1.02	2.01	34.36	34.54	33.34
T5	23.30	22.80	19.65	1.00	1.00	2.17	34.30	34.48	32.80
T6	23.43	22.93	20.30	1.03	1.04	2.05	34.32	34.50	33.29
T7	23.45	22.95	20.24	1.01	1.01	2.09	34.37	34.50	33.32
T8	23.35	22.80	19.94	1.02	1.02	2.10	34.36	34.54	33.30
T9	23.77	23.27	20.95	0.98	0.98	1.86	34.35	34.62	33.60
SE±	0.24	0.16	0.18	0.03	0.03	0.03	0.07	0.08	0.07
CD at 5%	NS	NS	0.52	NS	NS	0.10	NS	NS	0.19

T_0 : Control T_1 : Neem leaf powder T_2 : Neem oil T_3 : Castor oil
T_4 : Karanj oil T_5 : Vekhand powder T_6 : Turmeric powder T_7 : Citronella oil
T_8 : Ash T_9 :Deltamethrin

3. CONCLUSIONS

- The seeds treated with deltamethrin (T9) followed by neem oil (T2) maintained better quality throughout storage period (300 days). It maintained germination percentage (76.67 %) above Minimum Seed Certification Standards up to 300 days of storage.

- Among botanicals, neem oil (T2) @ 5 ml kg-1 seed maintained better quality during storage period (300 days) as compared to other botanicals. It maintained germination percentage (75.33 %) above Minimum Seed Certification Standards up to 300 days of storage period.

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