

Influence of pre-harvest insecticide spray on seed quality of pigeonpea

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ABSTRACT A field experiment was carried out to study the efficacy of various new insecticides *viz.*, emamectin benzoate 5SG, flubendiamide 480SC, spinosad 45SC and malathion 50EC against pulse beetle (*Callosobruchus chinensis*) and their effect on seed quality of pigeonpea (*Cajanus cajan*) cv. BRG-1. Among the insecticides, the pods sprayed with spinosad 45 SC @ 0.4 ml/l recorded maximum seed qualities *viz.*, germination (83.75 per cent), seedling length (23.01cm), seedling dry weight (36.51mg), seedling vigour index-I (3012) and vigour index II (1909), pH of seed leachate (6.51), total dehydrogenase activity (2.66), field emergence (79.50 per cent), less pod infestation (23.50 per cent), electrical conductivity of seed leachate (1.027 mS) as compared to control. Spinosad 45SC @ 0.4 ml/l proved to be best in enhancing seed quality parameters.

Keywords: Pre-harvest, insecticide spray, spinosad, seed quality, insect infestation

Pulses occupy an important place in agriculture because of their proteinacious nature and ability to fix atmospheric nitrogen. Seed quality is a complex character and is determined by number of factors both internal and external. Among the external factors, season of cultivation, availability of nutrients, soil moisture, plant density and incidence of pests play a major role. Pigeonpea [*Cajanus cajan* (L.) Millsp.] seed is bound to show rapid and greater losses both quantitatively and qualitatively due to attack of several insect pests at both pre and post-harvest stages. As many as 65 different insect species attack pigeonpea crop at different stages of crop and also under storage. Among these pests, pulse beetle / bruchid (*Callosobruchus chinensis*) is the most destructive and major pest as it causes 50 to 60 per cent damage to pigeonpea seeds. The pest lays the eggs on the plants in the field even before harvest. Hence spray of pesticides becomes desirable. The present study was aimed at elucidating information on the effect of pre-harvest spraying of insecticides on seed quality in pigeonpea cv. BRG-1.

MATERIALS AND METHODS

A field trial was laid out with BRG-1 pigeonpea variety during *kharif* 2010 at Agricultural Research Station, Balajigapade, Chikkaballapur district of Karnataka consisting of four replications by adopting randomized block design. The plot size for each treatment was 5.4 m x 4.0 m and the crop was raised by following recommended package of practices. The treatments were T₁- Control, T₂- Malathion 50 EC @ 2 ml/l, T₃- Emamectin benzoate 5SG @ 0.5 g/l, T₄- Flubendamide 480 SC @ 0.25 ml/l and T₅- Spinosad 45 SC @ 0.4 ml/l. The exact dosages of test insecticides were prepared in adequate quantity and were sprayed once at 10 days before harvest (DBH) by using knapsack sprayer until all plants were fully covered with spray solution.

The mature pods were handpicked from the plants after fully dried and the seeds were separated by hand threshing, cleaned by winnowing and dried under aerated shade. The following observations such as pod infestation per cent from each treatment were recorded for 200 pods picked randomly and

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samples were examined on visual basis carefully for presence of pods possessing holes and damages. The numbers of such pods were counted as and average was expressed in percentage, Laboratory studies on seed quality parameters were done in the Seed Technology Research Unit, National Seed Project, University of Agricultural Sciences, GKVK, Bangalore. Observations were recorded for moisture content, germination per cent, vigour index-I and II calculated by formula VI-I = Germination per cent \times seedling length (cm), VI-II = Germination per cent \times seedling dry weight (mg) [1] electrical conductivity of seed leachate (mS), pH of seed leachate, total dehydrogenase and seed infection per cent were recorded as per ISTA standards [2].

RESULTS AND DISCUSSION

The seed quality parameters were determined immediately after harvest and the insecticides used for pre-harvest spraying showed significant difference for seed quality parameters.

Significant differences were not observed between insecticides with respect to pod infestation but all of them differed significantly with untreated control. The least infestation (30.75 per cent) was observed in plants sprayed with emamectin benzoate 5SG @ 0.5g/l, followed by spinosad 45SC @ 0.4 ml/l (31.25 per cent) and the highest infestation (48.75 per cent) was in untreated control (Table 1).

With respect to moisture content, the highest moisture content (9.65 percent) was in untreated pods and it differed significantly with all insecticidal treatments. Among insecticides least moisture content (9.86 per cent) was observed in emamectin treated pods which differed significantly over other insecticidal treatments and the highest (10.22 per cent) was in malathion 50EC treated pods. Significantly maximum (83.75%) germination was recorded in seeds obtained from pre-harvest spray of spinosad 45 SC @ 0.4ml/l,

which was on par with (82.50 %) malathion 50% EC @ 2 ml/l and differed significantly with remaining treatments. However, the control recorded significantly the lowest (78.25%) seed germination and was inferior to all other treatments except fluebendamide 480 SC @0.25 ml/l (79.25%).

The seedling length was found to differ significantly among the treatments. The highest (23.01 cm) seedling length was recorded by Spinosad 45 SC @ 0.4ml/l which was on par with malathion 50 % EC @ 2ml/l (21.94 cm) and both of them were significantly superior over other treatments. All other treatments were on par with each other and the least seedling length (18.95 cm) was in control. With respect to seedling dry weight, in response to different insecticide sprays, maximum (36.51 mg) seedling dry weight was noticed in spinosad @ 0.4 ml/l, which differed significantly over other insecticides, followed by malathion 50 % EC @ 2 ml/l (35.48 mg). However, control recorded the minimum (32.50 mg) seedling dry weight.

The significant differences in seedling vigour index-I were observed among different insecticides sprays. It was maximum (3012) in spinosad 45 SC @ 0.4ml/l, which was on par with malathion 50 % EC @ 2ml/l (2971) and both them differed significantly with other treatments. The minimum (2543) vigour index was in control (untreated plants), which was inferior to insecticidal treatments. Similarly, seedling vigour index-II was maximum (1909) in spinosad 45 SC @ 0.4ml/l which differed significantly over other treatments followed by malathion 50 % EC @ 2ml/l (1809) but, it also differed significantly with other treatments, whereas it was significantly minimum (1477) in untreated plants.

Electrical conductivity of seed leachate was significantly minimum (1.027 mS) in spray of Spinosad 45 SC @ 0.4 ml/l over all other treatments and it was on par with Malathion 50% EC @ 2ml/l (1.06 mS), while, control recorded higher (1.67 mS) electrical

Table 1. Effect of pre-harvest insecticides spray on pod infestation, seed moisture content, germination, seedling length, seedling dry weight and vigour index -I and II in pigeonpea cv.BRG-1

Treatments	Pod infestation (%)	Moisture content (%)	Germination (%)	Seedling length (cm)	Seedling Dry weight (mg)	Vigour index -I	Vigour index -II
T ₁	48.75	9.65	78.25	18.95	32.50	2543	1477
T ₂	35.00	10.22	82.50	21.94	35.48	2971	1809
T ₃	30.75	9.86	81.25	20.03	33.90	2755	1621
T ₄	32.50	10.21	79.25	19.59	34.19	2709	1552
T ₅	31.25	10.11	83.75	23.01	36.51	3012	1909
Mean	35.25	10.01	81.00	20.70	34.51	2798	1674
SE(m)±	1.56	0.04	0.43	0.43	0.23	25.05	30.44
CD(p=0.05)	4.28	0.11	1.35	1.35	0.71	77.19	93.80

Treatments:

- T₁ : Control
 T₂ : Malathion 50 EC @ 2ml/l
 T₃ : Emamectin Benzoate 5 SG @ 0.5g /l
 T₄ : Fluebendamide 480 SC @ 0.25ml/l
 T₅ : Spinosad 45 SC @ 0.4ml/l

conductivity. The pH of seed leachate was maximum (6.51) in Malathion 50 % EC @ 2 ml/l, which was on par (6.45) with Spinosad 45 SC @ 0.4ml/l and Emamectin benzoate 5SG @ 0.5 g/l (6.39) but, it differed significantly with other treatments, and was minimum (6.21) in control. The highest (2.66) total dehydrogenase activity was noticed in Spinosad 45SC @ 0.4 ml/l. and was on par with (2.46), Malathion 50% EC @ 2ml/l. whereas, it was minimum (2.13) in control untreated plants. Significantly maximum (79.50 %) field emergence was recorded in seeds obtained from pre-harvest spray of Spinosad 45 SC @ 0.4 ml/l over the rest of the treatments which was on par with Malathion (78.75 %) @ 2 ml/l and Emamectin benzoate (77.75%) @ 0.5 g/l. while minimum (76.25 %) field emergence was noticed in untreated control. The statistical difference on seed health was significant due to different insecticides. Lowest (23.50 %) seed infection was found in Spinosad 45 SC @ 0.4ml/l which was on par with (24.50) Malathion 50% EC @ 2 ml/l but, it differed significantly with other treatments. Whereas, control recorded maximum (33.75 %) seed infection was recorded in control (Table 2).

Spray of spinosad is found to increase the seed quality parameter which can be attributed to better filling of seeds as compared to other treatments. The pods were highly infested with insects in control (48.7%) infested, this may be related to its broad spectrum nature, higher photo stability compared to other insecticides tried in the present study. These results confirmed the usefulness of spraying of insecticides at different stages of crop growth period by showing marked decrease

Table 2: Effect of pre-harvest insecticides spray on electrical conductivity of seed leachate, pH of seed leachate, total dehydrogenase activity, field emergence and seed infection in pigeonpea cv. BRG-1

Treatments	Electrical conductivity (mS)	pH	TDH (A ₄₈₀)	Field Emergence (%)	Infection (%)
T ₁	1.670	6.21	2.13	76.25	33.75
T ₂	1.061	6.45	2.46	78.75	24.50
T ₃	1.356	6.39	2.35	77.75	26.50
T ₄	1.336	6.34	2.32	76.50	25.00
T ₅	1.027	6.51	2.66	79.50	23.50
Mean	1.290	6.38	2.38	78.55	26.60
SE(m)±	0.029	0.045	0.052	0.64	0.66
CD(p=0.05)	0.089	0.140	0.161	1.99	2.06

Treatments:

- T₁ : Control
 T₂ : Malathion 50 EC @ 2ml/l
 T₃ : Emamectin Benzoate 5 SG @ 0.5g /l
 T₄ : Fluebendamide 480 SC @ 0.25ml/l
 T₅ : Spinosad 45 SC @ 0.4ml/l

in percentage of infested pods of pigeonpea. Similar positive effect of spinosad 45SC at higher dosage on higher seed qualities was recorded by various workers in different crops [3-7] in cowpea and pod borers of pigeonpea, but no information on pulse beetle. Irrespective of insecticides, spraying at different stages of crop growth revealed marked variations in seed quality parameters studied.

However pod infestation was minimum in seeds harvested from plants which received Spinosad 45 SC @ 0.4 ml/l of water before 10 days of harvest and had better seed quality parameters. Therefore, it is concluded that, the pigeonpea seed growers must take up one insecticide spray at 10 days before harvesting of the crop in order to minimize the damage caused by bruchids and get higher quality seeds.

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