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ORIGINAL ARTICLE

Comparative Effect of Botanicals against Damage Caused by Insect in Stored Wheat Seed

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ABSTRACT
Today in the era of increasing population of country has intensified the enhanced need for higher food production. The intensification of food production has led to several problems in the post-harvest phase including the major concern of pest infestation during storage. An experiment was conducted to study two wheat varieties and five seed treatments with untreated control and their effect of insect on storage of wheat. The varieties were AKAW-4210-6, PKV.Washim and Seed treatments viz, Sweet flag rhizome @ 5 g/kg seed, Sweet flag rhizome @ 10 g/kg seed, NSK powder @ 10 g/kg, neemoil @ 5 ml/kg and deltamethrin 2.8 EC @ 0.5 ml/kg.were evaluated as seed protectant against storage insects like Sitophilus oryzae L. and Rhizopertha dominica in stored wheat seed The seed treatments Deltamethrin 2.8 EC @ 0.5 ml/kg recorded lower insect infestation, followed by sweet flag rhizome powder @ 10 g/kg has found optimum botanical seed treatment in wheat at the end of 10 months of storage period. Seed treatment with sweet flag rhizome powder @ 10 g/kg improve seed quality parameters and maintain it in storage upto 10 months hence it is better replacement for chemical treatments.

Keywords*: Sitophilus oryzae L., Rhizopertha dominica, neemoil, deltamethrin*

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INTRODUCTION

India is the second most populated and developing country. To feed its masses, India produced an estimated 95.85mt of wheat between 2013 and 2014, exporting only about 5.56 mt of that supply to other countries [6]. The major increase in the productivity of wheat has been observed in the states of Haryana, Punjab and Uttar Pradesh. Higher area coverage is reported from Madhya Pradesh in recent years. The intensification of food production has led to several problems in the post-harvest phase including the major concern of pest infestation during storage [3]. This is further aggravated by the increased attention paid to maintenance of buffer stocks to provide food security for a country. Pest problems have increased side by side with the increase in the quantity of food stockpiled and the longer duration of storage. Such pest problems are more acute in the tropics than in temperate zones because the environment in the former is more conducive to the growth and development of pests. As wheat has only few insect-pests under field conditions, but it is susceptible to storage pests which cause substantial qualitative/nutritional and quantitative losses of various magnitudes depending on the pest species and duration of storage [1, 5, 2]. Rice weevil (*Sitophilus oryzae* Linn.), a serious pest of stored wheat and feeds on rice, corn, oat, barley, sorghum, buck wheat ear and their products. It belongs to family curculionidae and order coleoptera and was first seen breeding on rice hence named as rice weevil way back in 1763. The adult female rice weevil lays an average of 4 eggs day-1 and may live for four to five months. The full life cycle may take only 26 to 32 days during hot summer months, but requires a much longer period during cooler weather. The eggs hatch in about 3 days. The larvae feed inside the grain kernel for an average of 18 days. The pupa is naked and the pupal stage lasts an average of 6 days. The new adult will remain in the seed for 3 to 4 days while it hardens and matures. It feeds voraciously, so much so that the grain is rendered unfit for human consumption.

MATERIALS AND METHODS

The experiment was laid out in factorial completely randomized design [4] with six treatment combinations and three replications. It was conducted during 2014-15 at the laboratory of Seed Testing Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.

Two wheat varieties were selected for seed treatment of wheat viz., **V1**-AKAW- 4210-6 (PKV Sardar) and **V2**-PKV Washim (WSM-1472) 6 kg seed of each variety was taken. **T1**-Sweet flag rhizome powder at @ 5 g kg^1, **T2**-Sweet flag rhizome powder at @10 g kg^1 and **T3**-Neem seed kernel powder @ 10 g kg^1 seed were weighed separately and treated to the seeds and **T4**-Neem oil 5.0 ml kg^1 seed and **T5**-Deltamethrin @ 0.5 ml kg^1seed were treated separately then packed in gunny bag and stored along with **T6**-Untreated control under ambient storage conditions in laboratory for a period of ten months. Hundred seeds in four replications were drawn at random from each treatment at monthly intervals for accessing insects infestation. The extent of seed damage due to rice weevil *Sitophulas oryzae* (rice weevil) and *Rhizopertha dominica* (lesser grain borer) was observed closely with help of magnifying lens (100 X). The seed either with single or multiple holes were considered as infested seeds. The infested seeds were counted manually and the average was expressed as percentage of infestation.

RESULTS AND DISCUSSION

Insect infestation

Insect infestation was observed to be influenced by different varieties and botanical seed treatments throughout the storage period with increase in storage period infestation was seen to be increased.

Effect of varieties

In general, the level of seed infestation due to *Sitophilus oryzae* (rice weevil) and *Rhizopertha dominica* (lesser grain borer) increased from zero per cent in the initial stage to (11.51%) at the end of 10th month of storage period irrespective of seed treatment.

Up to fifth months of storage, per cent infestation was negligible, so data was not analysed statistically. But, the varieties were compared numerically for infestation level. In seven, eight and nine months of storage, the insect infestation % significantly influenced by varieties and other months it is non significant. In seven month variety V_1 (AKAW -4210-6) recorded lower insect infestation (1.33%) which was significantly superior over variety V_2 (PKV.Washim) (1.68%). This trend followed throughout at the end of storage period. In nine month variety V_1 (AKAW-4210-6) recorded lower insect infestation (4.28%) which was significantly superior over variety V_2 (PKV.Washim) (4.44%).

Table 1: Effect of varieties and botanical seed treatments on insect infestation% in wheat during storage

Treatments	Storage period (months)										
	0	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Varieties											
V_1(AKAW-4210-6)	0	0	0	0	0.09	0.31	0.71	1.33	2.08	4.28	6.65
V_2(PKV.Washim)	0	0	0	0	0.23	0.37	0.75	1.68	2.45	4.44	6.80
SE (m) ±	0	0	0	0	0	0	0.07	0.08	0.05	0.05	0.07
CD at 5 %	NA	NA	NA	NA	NA	NA	NS	0.23	0.15	0.13	NS
Botanical treatments											
T_1- Sweet flag rhizome powder @ 5 g per kg seed	0	0	0	0	0.00	0.00	0.35	1.20	2.17	4.18	6.39
T_2- Sweet flag rhizome powder @ 10 g per kg seed	0	0	0	0	0.00	0.02	0.46	0.92	1.22	3.25	5.30
T_3- NSK powder @ 10 g per kg seed	0	0	0	0	0.00	0.00	0.53	1.43	2.37	4.23	6.22
T_4- Neem oil @ 5.0 ml per kg seed	0	0	0	0	0.00	0.28	0.74	1.67	2.85	4.90	7.53
T_5- Deltamethrin 2.8 EC @ 0.5 ml per kg seed	0	0	0	0	0.00	0.00	0.15	0.52	0.79	2.20	3.41
T_6- Control (no seed treatment)	0	0	0	0	0.93	1.73	2.15	3.28	4.18	7.40	11.51
SE (m) ±	0	0	0	0	0	0	0.10	0.11	0.07	0.06	0.09
CD at 5 %	NA	NA	NA	NA	NA	NA	0.29	0.33	0.21	0.19	0.27
Interaction											
SE (m) ±	0	0	0	0	0	0.10	0.14	0.16	0.10	0.09	0.13
CD at 5 %	NA	NA	NA	NA	NA	NA	0.41	0.46	0.30	0.27	0.39
CV (%)	0	0	0	0	0	0	33.54	18.16	7.84	3.64	3.41

NS – Non significant NA- Not analysis

Effect of treatments

Up to fifth months of storage, per cent infestation was negligible, so data was not analysed statistically. In all of another month of storage, the insect infestation due to botanical seed treatment varied significantly. All the treatments recorded significantly lower insect infestation over the control treatment. at six month the lower insect infestation (0.15%) was recorded by seed treatment T_5 (deltamethrin @ 0.5 ml per kg seed) and it was significantly superior over all treatments T_2 (sweet flag rhizome powder @ 10 g per kg seed) (0.46%), T_3 (NSK powder @ 10 gm per kg seed) (0.53%). T_4 (neemoil @ 5 ml per kg seed) (0.74) and it was at par with T_1 (sweet flag rhizome powder @ 5 g per kg seed) (0.35%). at 10 month the lowest insect infestation (3.41%) was recorded by seed treatment T_5 (deltamethrin @ 0.5 ml per kg seed), and it was significantly superior over all treatment. T_2 (sweet flag rhizome powder @ 10 g per kg seed) (5.30%), T_3 (NSK powder @ 10 gm per kg seed) (6.22 %).T_1 (sweet flag rhizome powder @ 5 g per kg seed) (6.39 %), T_4 (neemoil @ 5 ml per kg seed) (7.53 %).

Interaction effect

At six to ten months of storage, interaction effect between varieties and botanical seed treatments were found statistically significant. At six month of storage the lowest insect infestation was recorded in V_2T_5 (0.14 %) and it was at par with V_1T_5 (0.16 %) followed by V_1T_2 (0.22 %) and V_2T_1 (0.32 %). The highest insect infestation was recorded in V_2T_6 (2.20 %). At last (10th) month of storage the lowest insect infestation was recorded in V_2T_5 (3.32 %) and it was at par with V_1T_5 (3.51 %) followed by V_1T_2 (5.23 %) and V_2T_2 (5.37 %). The highest insect infestation was recorded in V_2T_6 (11.70 %).

Table 2: Insect infestation% as influenced by Interaction of varieties x botanical seed treatments during storage

insect infestation affected by interaction of variety X treatments										
	6th		7th		8th		9th		10th	
Treatments	**V1**	**V2**	**V1**	**V2**	**V1**	**V2**	**V1**	**V2**	**V1**	**V2**
T_1- Sweet flag rhizome powder @ 5 g per kg seed	0.37	0.32	1.13	1.27	2.00	2.33	4.30	4.07	6.32	6.46
T_2- Sweet flag rhizome powder @ 10 g per kg seed	0.22	0.71	0.90	0.93	1.27	1.17	3.27	3.23	5.23	5.37
T_3- NSK powder @ 10 g per kg seed	0.32	0.73	1.03	1.83	1.97	2.77	3.97	4.50	6.38	6.06
T_4- Neem oil @ 5.0 ml per kg seed	1.07	0.41	1.80	1.53	2.70	3.00	4.77	5.03	7.15	7.91
T_5- Deltamethrin 2.8 EC @ 0.5 ml per kg seed	0.16	0.14	0.26	0.78	0.50	1.08	2.07	2.33	3.51	3.32
T_6- Control (no seed treatment)	2.10	2.20	2.83	3.73	4.03	4.33	7.30	7.50	11.32	11.70
SE (m)	0.14		0.16		0.10		0.09		0.13	
CD at 5%	0.41		0.46		0.30		0.27		0.39	

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