Effect of Sitophilus oryzae on wheat cultivars

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ABSTRACT: Increased wheat demand is driven by a rapidly growing population and a change in food preference away from traditional cereals and towards wheat and wheat products. Rice weevil is widely distributed in the world and its cause's damage to stored products, specially stored grains. Damage caused by pest result in loss of seed weight and vigor. Damage and feeding rate of a bove mentioned pest cause to seed weight and vigor. Damage and feeding rate of this pest was studied in 8 lines and cultivars such as: Kouhdasht, Zagros, Morvarid, Darya, Pastor, Line 17 and N-80-19, in an RCBD with a four replications under the stored condition. A hundred grams of wheat was placed in a crystal container and then 10 adults were put on each container.

Keywords: Triticum aestivum, Pest, yield

INTRODUCTION

Cereals are the staple and nutritive food but their storage is not safe due to the attack of certain stored grain insect pests. So, there is an urge to protect them safely from qualitative and quantitative loss (Nyambo, 1993; Hagstrum, 1999) which can result from environmental conditions favored feeding by insects, wastes production by insects, mites, rodents or by microorganisms which are produced in stored products (Mohale, 2010). Wheat (Triticum aestivum L.) is ranked second after maize in cereal crops research priorities (KARI, 1991). Increased wheat demand is driven by a rapidly growing population and a change in food preference away from traditional cereals and towards wheat and wheat products (World Bank, 1989). On average, 145,000 ha is under wheat annually, producing about 350,000 t (KARI, 2002) which is only 40% of the national requirements. Wheat 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 (De Lima, 1979; Singhamony et al., 1985; Hell, 2000). Stored grain insect pests can cause reductions in weight, quality, commercial value and seed viability. Seventy percent of these insects are coleopterans (Vina uela, 1993) and the most damaging species of storage insects are in the genera Sitophilus and Tribolium (Marsans, 1987; Khan and Selman, 1988; Pinto, 1997).

Sitophilus oryzae L. (Coleoptera: Curculionidae) commonly called rice weevil has become primary pest of stored grains of warm climatic areas. They cause damage to grains which are stored at 25-30°C and at low RH as these conditions favored the development of this pest (Batta, 2004). It is the most destructive and widespread cereal pest in the world and got economic importance (Champ & Dyte, 1976). It causes 18.30% losses to stored grains (Adams, 1976). Rice weevil, Sitophilus oryzae (L.), (Curculionidae: Coleoptera) is a major pest of cereals like rice, sorghum, wheat, barley and maize both in field before harvest and in storage. The white apodous grub and the reddish brown adults are internal feeders and cause serious quantitative and qualitative losses to cereal grains. Owing to the advantages of the botanical insecticides over the synthetic ones in stored produce insect pest management these are extensively studied. Different types of plant preparations such as powders, solvent extracts,
essential oils and whole plants are being investigated for their insecticidal activity including their action as fumigants, repellants, anti-feedants, anti-ovipositors insect growth regulators (Isman, 2000; Weaver and Subramanyam, 2000; Erturk, 2004; Koul, 2004; Mordue, 2004; Negahban and Moharramipour, 2007). Currently, chemical control is the most commonly used strategy against the pests. There are many chemicals that are toxic to stored-grain pests, including insecticides such as organophosphates, pyrethroids and fumigants such as methyl bromide and phosphine (Park, 2003; Kljajic and Peric, 2006 and Wadhwa 2009). The pest prefers soft varieties of wheat grains (Zakladnoi and Retanova, 1987). Attempts have been made to get complete control of the stored grain insects by insecticidal application but in vain. Moreover, fumigation is the most widely adopted method and has been in practice. None of these methods and products can be declared as safe to the precious lives of human beings, birds, beneficial insects, animals and to the environment (Metcalf, 1982). Similarly they are recommended for use in residential premises with special precautions and care. In contrast, the products obtained from certain medicinal plants can be used without risk to non-target organisms. Additionally, consumption of extracts from some of the medicinal plants is even beneficial for human beings (Nawaz, 1999). These chemicals are effective for pest control but have several problems to users (Subramanyam and Hagstrum, 1995; Okonkwo and Okoye, 1996). Nano-pesticides and nano-encapsulated pesticides are expected to reduce the volume of application and slow down the fast release kinetics (Edibol, 2003, Niemeyer and Doz 2001, Leiderer and Dekorsy, 2008). Sitophilus oryzae L. (Coleoptera: Curculionidae), an ubiquitous pest of economic importance, is an internal feeding insect that bores into stored grain. Adult weevils feed mainly on the endosperm, reducing the carbohydrate content and the larvae feed preferentially on the germ of the grain, thus removing a large percentage of the protein and vitamins. Insects that selectively attack the germ will cause a greater loss in germination than others. The control of arthropod pests on stored products has been primarily through the use of fumigants and residual chemical insecticides to augment the more obvious approach of hygiene (Brooker, 1992; Adane, 1996). The excessive use of conventional chemical insecticides has resulted in a number of serious problems, e.g. resistance to the chemical insecticides, elimination of economically insects, persistence in the environment, toxicity to humans and wildlife and higher cost of crop production (Khan and Selman, 1989). Many insects and mites are capable of tolerating virtually all pesticides available for their control as a result of cross and multiple resistance (Metcalf, 1980). However, the potential hazards on mammals from synthetic insecticides increased concern by consumers over insecticide residues in processed cereal products, the occurrence of insecticide-resistant insect strains, the ecological consequences, increasing cost of application and the precautions necessary to work with traditional chemical insecticides all call for new approaches to control stored-product insect pests (Aslam, 2002; Fields, 2006; Mahdian and Rahman, 2008; Salem, 2007; Udo, 2005).

MATERIALS AND METHODS

In this experiment, eight genotypes of wheat (Kouhdasht, Line 17, Line A, Zagros, Morvarid, N-18-20, Darya, Pastor) in a randomized complete block design with four replications was examined as a witness in the fourth repeat and without release to maintenance of viability, weight loss treatments are compared. Confirm that the release was just 3, was used for statistical analysis. Amount of 100 grams of wheat weighed and placed inside a glass container, 10 pcs per young adult was covered with a cloth and put the door. The Heat lost to the cup and the environment will not be dark for pest activity round glasses were covered with newspaper. Viability, purity and seed weight in two varieties, pest and release before the end of the experiment were measured. The purpose of testing seed purity and composition of the bulk properties of the sample action. Thus, the sample closely examined and pure seed, other seed varieties and other crops, weed seeds, and the solids are separated. The weight of each factor can be calculated with a balance accurate and sensitive. Hectolitre weight measured for the 0.25-liter graduated cylinder removed and weighed on scales that have Calculation and notes then the wheat from the graduated cylinder before filling impurities are clearly separated and then re-balance the weight of the weight we put in a formula to determine hectoliter weber kg we perform.

RESULTS AND DISCUSSION

Block and treatment effects were not significant in any of the traits were significantly different (Table 1). Physical characteristics of seeds Wheat cultivars against rice weevil feeding damage were compared (Table 2.) In other words, index characteristics in Wheat cultivars rice weevil feeding damage and the viability and physical characteristics similar reaction shown no significant differences.
Viability of Wheat cultivars seeds in the pre-test and the three groups were statistically significant. Line 17 and Line N-80-19 statistical group «a» and line 17 with an average of 96 percent, has the highest percentage of viability compared with an average of 75.91 percent, the lowest percentage viability sea before the experiment. It is noteworthy above all varieties viability were measured. Pearl varieties and lines N-80-19 with an average of 89 percent, with the highest and lowest 85% Average number Pasteur viability after the experiment. Although cultivars in terms of viability, but not significant, compared with an average of 4.03, the lowest river and line A, with an average 9.53 percent viability was highest. Pastor compared with an average of 67.96 g sample group «b» and the lowest grain weight before the experiment.

Table 2. Cultivars for resistance to the rice weevil compared in a randomized complete block on the physical characteristics of seed

<table>
<thead>
<tr>
<th>Wheat cultivars</th>
<th>Agviability</th>
<th>postviability</th>
<th>Reduceviability</th>
<th>Agweight</th>
<th>Postweight</th>
<th>Reduceweight</th>
<th>Gross amount</th>
<th>Hectolitreweight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kouhdasht</td>
<td><strong>ab</strong> 25.94</td>
<td>a 75.85</td>
<td>a 99.8</td>
<td><strong>ab</strong> 12.97</td>
<td>a 74.83</td>
<td>a 79.13</td>
<td>a 37.13</td>
<td>a 50.59</td>
</tr>
<tr>
<td>Line 17</td>
<td>a 00.96</td>
<td>a 75.87</td>
<td>a 58.8</td>
<td>a 67.96</td>
<td>a 47.83</td>
<td>a 67.13</td>
<td>a 19.13</td>
<td>a 12.61</td>
</tr>
<tr>
<td>Line A</td>
<td>a 50.94</td>
<td>a 50.85</td>
<td>a 53.9</td>
<td>a 91.97</td>
<td>a 45.80</td>
<td>a 82.17</td>
<td>a 46.17</td>
<td>a 40.62</td>
</tr>
<tr>
<td>Zagros</td>
<td>a 75.94</td>
<td>a 00.88</td>
<td>a 10.7</td>
<td>a 70.97</td>
<td>a 67.79</td>
<td>a 43.18</td>
<td>a 03.18</td>
<td>a 82.63</td>
</tr>
<tr>
<td>Morvarid</td>
<td>a 50.94</td>
<td>a 00.89</td>
<td>a 78.5</td>
<td>a 56.97</td>
<td>a 675.84</td>
<td>a 19.13</td>
<td>a 88.12</td>
<td>a 25.63</td>
</tr>
<tr>
<td>N-18-20</td>
<td>a 75.95</td>
<td>a 00.89</td>
<td>a 04.7</td>
<td>a 95.97</td>
<td>a 11.83</td>
<td>a 66.15</td>
<td>a 84.14</td>
<td>a 12.62</td>
</tr>
<tr>
<td>Darya</td>
<td>b 75.91</td>
<td>a 00.88</td>
<td>a 03.4</td>
<td>a 31.99</td>
<td>a 76.83</td>
<td>a 66.15</td>
<td>a 54.15</td>
<td>a 57.62</td>
</tr>
<tr>
<td>Pastor</td>
<td><strong>ab</strong> 50.93</td>
<td>a 00.85</td>
<td>a 09.9</td>
<td>a 31.98</td>
<td>a 74.81</td>
<td>a 88.16</td>
<td>a 60.16</td>
<td>a 32.63</td>
</tr>
<tr>
<td>LSD</td>
<td>84.3</td>
<td>56.6</td>
<td>43.6</td>
<td>22.2</td>
<td>55.6</td>
<td>55.6</td>
<td>46.6</td>
<td>58.5</td>
</tr>
</tbody>
</table>

* Any two means not sharing a common letter differ significantly from each other at 5% probability

Although Pastor sea and in the same experimental group «a» under the sea but with an average weight of 31.99 grams of the highest amount of grain before the experiment. Other cultivars in the same group «ab», respectively. Grain weight and nutritional value of the rice weevil damage reduced , but the weight of numbers were not statistically different pearl varieties, and most critical , and the lowest Zagros . Effects of pest feeds on the seed weight and purity winnow specified. Pest damage and power loss column and the amount of impurities is found . In terms of the gross amount of seed varieties have been a significant factor and Pastor and pearls, with a mean of 88.12, the lowest average of 60.16 was the highest of the gross amount. Hectolitre weight was not significantly different among cultivars Kouhdasht Zagros mean 50.59 and 82.63 respectively the lowest and highest mean hectolitre weight. Analysis of variance and mean comparison showed that the cultivars evaluated, a similar response than rice weevil feeding damage and so Dah shows the percentage of such as viability, no significant differences% deficit weight figures hectoliter Weight. Nourishes Damage rice weevil 4.9 percent decrease in Wheat cultivars force, but their viability is not less than the standard. Pastor Pearl cultivar, respectively, with the lowest and highest viability, seed weight and the amount of impurities, the most resistant and most susceptible varieties, the varieties were studied. Pastor cultivar had the highest viability and hectolitre weight and weight loss were the most important figure of the Zagros and the amount of seed impurities. Sea figure was the lowest percentage viability. The lowest percentage of weight loss and the amount of seed impurities from line 17.
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