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# THE DEGREE OF ATTACK PRODUCED BY *Bruchus pisorum* L. IN AVATAR AND ALVESTA CULTIVARS

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***Abstract***
*Field pea is a crop with increased importance, because it is a rich source of proteins, carbohydrates and some minerals in human nutrition, but also animal feed. In crop systems, it also plays a significant role by improving the soil due to symbiotic nitrogen and its fixing capacity. Crop losses caused by insects are a threat to food security as a result of global growth. Production is the first to be affected by Bruchus pisorum, being the most important pest from an economic point of view, which causes significant losses in the pea crop. Infested seeds show reduced germination because the embryo is consumed and the grains can no loger produce new plants. The biological material was represented by two pea varieties, Alvesta and Avatar, analyzed in four repetitions, the frequency of the attack, the intensity and the degree of the attack produced by the weevil. The experience was established in the experimental field within the SCDA Pitesti station, where the treated variants were achieved by treating the seed with an ecological product.*

*Keywords: crop, pea, pest, variety, weevil.*

## 1. INTRODUCTION

On a world level, as well as domestically, the pea is a valued legume, being a crop with ample ecological and production potential, being cultivated for grains in the majority of countries around the globe (Celac, 2016). Grain legumes are a main plant protein source with high digestive and energy value for animal feed and human nutrition. Seeds play an important role in the transmission of genetic characters, their size is an important physical indicator of seed quality that affects vegetative growth (Rukavina et all., 2002). Seed germination is also influenced by many biotic and abiotic factors, such as water stress caused by drought and salinity, germination and limited plant growth at early stages (Mansour, 2000). Abiotic factors, light, water, nutrients have a major influence on the phenotype of crops which in turn influence the multitrophic interactions of the crop with ecological and economic implications (Dicke and Hilker, 2003). Specific insect resistance mechanisms have been identified in legumes, although these mechanisms are still not widely integrated into breeding programs (Edwards and Sing, 2006). Field pea is subject to damage by both field and stored insect pests, *Bruchus pisorum* L., thus affecting worldwide production (Reddy et al., 2018). The level of pea storage losses depends on the number of weevils remaining in the seed


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after harvest and the storage practices of farmers (MendesiL et al., 2022). Adults emerge from the seeds leaving an exit hole of approximately 2-3 mm, this behavior causes damage by eating the seed and reducing its germination capacity (Ceballos et. all, 2015).

## 2. MATERIALS AND METHODS

In order to obtain a high production both quantitatively and qualitatively, two pea varieties attacked by the Bruchus pisorum weevil were analyzed under the conditions of the Pitesti Research and Development Station.

The `Alvesta' variety is a spring pea variety (figure 1.), created in Germany. It is a semi-early variety, with rapid growth in the early stages of development. It shows good resistance to falling, drought tolerant, having good productivity. The height of the plants is medium to tall, between 70-80 cm. The berries are yellow, large, round, with a high protein content, over 25% and MMB over 240g. Seed quantity: 200-240 kg/ha, yield potential over 4.5 t/ha.


***Figure 1. `Alvesta` variety***

The `Avatar' variety is a spring pea variety (figure 2.), with yellow, semi-early, semi-foliar type beans that form stipules and tendrils. Plants are between 105-110 cm tall, show good resistance to drought and shaking. The mass of 1000 grains is 190-270 g, protein content 23.2-26.5%. The variety has a yield potential of 3.4-5.8 t/ha.


***Figure 2. `Avatar` variety***

Biosem is an insecto-fungicide that helps control pests and phytopathogenic agents that attack the seed. It is an ecological product containing Neem oil 30%, organic matter 30%, essential oils 2%, Trichoderma harzianum 2%, salicylic acid and humic acids. Biosem acts as a protective agent by colonizing the surface of the seeds, protecting them from pathogenic fungi, and Neem seed extract helps protect the seeds from attack by certain pests while the seed is in the soil. The recommended


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dose is 1.5 l/t. It is produced by BioHumusSol Romania and is approved, approval certificate no. 834/2007.
After harvesting, 100 peas were analyzed in 4 replicates for each variety:
-factor A: the variety with 2 graduations: A1-Avatar, A2-Alvesta,
-factor B: 2 grades: B1- untreated, B2- Biosem treated.
Attack frequency, intensity and degree of attack produced by the weevil were determined.

## 3. RESULTS AND DISCUSSIONS

The climatic conditions for the year 2022-2023 are characterized as an atypical year both in terms of temperatures and precipitation. March saw a temperature increase of 2.43 °C over the multi-year average and a precipitation deficit of 13.9 over the multi-year average. In the months of April and May, there is a decrease in temperature compared to the multi-year average and a deficit of precipitation in the months of May of 26.7, June of 24 and July of 45.5 (table 1).

***Table 1. Temperatures and precipitation 2022-2023***

| | | Sep. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TEMPERATURES | Dec.l | 18.48 | 14.31 | 12.25 | 3.8 | 5.63 | -1.98 | 6.15 | 7.68 | 13.55 | 18.53 | 22.95 |
| | Dec.ll | 17.08 | 12.02 | 7.73 | 2.63 | 5.45 | 3.48 | 6.45 | 10.90 | 14.8 | 19.73 | 26.18 |
| | Dec.lll | 13.93 | 13.07 | 4.83 | 2.75 | 1.42 | 7.03 | 9.09 | 11.35 | 18.35 | 27.07 | 24.02 |
| | Monthly average | 16.50 | 13.13 | 8.27 | 3.06 | 4.17 | 2.84 | 7.23 | 9.98 | 15.57 | 24.73 | 24.38 |
| | Multiannual average | 16.9 | 11.3 | 5.5 | 0.7 | -1.1 | 0.6 | 4.8 | 10.9 | 16.3 | 19.5 | 21.7 |
| | Deviation | -0.4 | 1.83 | 2.77 | 2.36 | 5.27 | 2.24 | 2.43 | -0.92 | -0.73 | 5.23 | 2.68 |
| PRECIPITATION | Dec.l | 12.0 | 0.0 | 0.0 | 14.9 | 26.8 | 1.7 | - | 45.6 | 9.1 | 17.2 | 6.4 |
| | Dec.ll | 8.5 | 2.2 | 31.9 | 25.4 | 28.0 | 0.1 | 6.9 | 18.9 | 21.5 | 26.8 | 15.8 |
| | Dec.lll | 25.1 | 0.0 | 9.0 | 0.1 | 62.3 | 6.1 | 17.1 | 5.3 | 23.2 | 25.6 | 13.4 |
| | Monthly average | 45,6 | 2.2 | 41.5 | 40.4 | 117.1 | 7.9 | 24.1 | 68.8 | 53.8 | 69.6 | 35.6 |
| | Multiannual average | 52,9 | 47.9 | 49.3 | 45.0 | 41.5 | 37.7 | 38 | 55.9 | 80.5 | 93.6 | 81.1 |
| | Deviaton | - 7,3 | -45.7 | -7.8 | -4.6 | 75.6 | -29.8 | -13.9 | 12.9 | -26.7 | -24.0 | -45.5 |

To calculate the degree of attack, the following was taken into account:
- the attack frequency (F%) represents the number of attacked grains (n) related to the number of analyzed grains (N).

$$F\% = \frac{n}{N} 100$$

From the interaction of the two factors, variety x treatment, the frequency of the attack in the version treated with Biosem of the Avatar variety registered a significantly positive value (33.0) compared to the untreated control (table 2). The frequency of the attack in the Alvesta variety, the treated variant recorded an insignificant value.


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***Table 2. Frequency-the interaction of the two factors***

| Variety | Factor | Variant | Mean | % | Difference | Significance |
|---|---|---|---|---|---|---|
| A1 Avatar | B1 | Martor | 48.0 | 100.0 | - | Mt. |
| | B2 | Biosem | 50.5 | 168.8 | 33.0 | * |
| A2 Alvesta | B1 | Martor | 81.0 | 100.0 | - | Mt. |
| | B2 | Biosem | 56.0 | 69.1 | -25,0 | - |
| | | | | DL 5%= | 30.622 | |
| | | | | DL 1%= | 49.813 | |
| | | | | DL0,1%= | 101.424 | |

- the attack intensity (I%) represents the degree to which an analyzed bean is attacked.

**I%= (ixf)/n= attacked area/observed area**

From table 3, it can be seen that the intensity of the attack, through the interaction of the two factors, the variant treated with Biosem in the Alvesta variety registered a significantly positive value (6.67%), compared to the untreated control variant, while the Avatar variety registered an insignificant value.

***Table 3. Intensity-the interaction of the two factors***

| Variety | Factor | Variant | Mean | % | Difference | Significance |
|---|---|---|---|---|---|---|
| A1 Avatar | B1 | Martor | 31.13 | 100.0 | - | Mt. |
| | B2 | Biosem | 31.75 | 102.0 | 0.63 | - |
| A2 Alvesta | B1 | Martor | 21.83 | 100.0 | - | Mt. |
| | B2 | Biosem | 28.50 | 130.6 | 6.67 | * |
| | | | | DL 5%= | 6.53 | |
| | | | | DL 1%= | 10.89 | |

-attack degree (AD%);

$$AD\% = \frac{F x I}{100}$$

F-frequency of attack;
I-the intensity of the attack.
In table 4. the interaction of the two factors, it is found that the degree of attack in the Avatar variety recorded a significantly positive value (10.75%), compared to the control, while the Alvesta variety showed an insignificant difference.

***Table 4. Degree of attack-the interaction of the two factors***

| Variety | Factor | Variant | Media | % | Difference | Semnificance |
|---|---|---|---|---|---|---|
| A1 Avatar | B1 | Martor | 15.00 | 100.0 | 0.00 | Mt. |
| | B2 | Biosem | 25.75 | 171.7 | 10.75 | * |
| A2 Alvesta | B1 | Martor | 15.50 | 100.0 | 0.00 | Mt. |
| | B2 | Biosem | 15.75 | 101.6 | 0.25 | - |
| | | | | DL 5%= | 10.58 | |
| | | | | DL 1%= | 17.65 | |
| | | | | DL0.1%= | 34.03 | |


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## 4. CONCLUSIONS

The two pea varieties, respectively `Avatar' and `Alvesta', recorded both a significant frequency, intensity and degree of attack.

The variety `Avatar' registered a significant frequency of attack, compared to the variety `Alvesta'.

Following the observations, the attacked surface of the bean had a significant intensity in the `Alvesta' variety, compared to the `Avatar' variety.

From the interaction of the two factors, it emerges that the degree of attack was significant in the variety `Avatar', compared to `Alvesta'.

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