Research Concerning the Changes in Hydro Soluble Vitamins in the Wheat Grain After a Month Attack by *Rhizoperta Dominica*

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Abstract. Wheat grains are, in general, good sources of thiamine (vitamin B₁), pyridoxine (vitamin B₆), niacin, inositol, biotin and vitamin E. They also contain important amounts of pantotenic acid (vitamin B₅). Vitamin A is absent in wheat grains. The goal of our research was to monitor quantitative changes in hydro soluble vitamins in wheat grains damaged by *Rhizoperta dominica*. They have published relatively few data about the effects of insect infestation on the vitamins in wheat grains. Insects are one of the main causes of the losses produced in stored cereals and seeds. (Munro, 1966). *Rhizoperta dominica* F. infests cereals and develops inside the grains thus producing the ‘hidden infestation’ of the cereals.

Bio-chemical analyses through modern methods, we used a chromatographic equipment for liquids, model Shimadzu 10 AD-VP. Quantitative changes the lipids and fat acids were monitored on a number of 5 sample variants infested with 25, 50, 75, and 100 insects of *Rhizoperta dominica*, respectively. According to the results we obtained, we can note that after a month of attack by *Rhizoperta dominica* F., the quantity of hydrosoluble vitamins destroyed by these differs to some extent, in relation to the number of insects that infested and attacked the wheat sample. After a month from the initial attack we could see that the insects from species *Rhizoperta dominica* F. degrade in a higher proportion vitamins B₂ and B₆. 25 insects destroy about 1.39% B₁, 3.98% vitamin B₂ and 7.84% vitamin B₆, and the 100 insects 44.95% more vitamin B₂ and 14.15% more vitamin B₆ than 25 insects.

Keywords: wheat, infestation, *Rhizoperta dominica*, changes, hydro soluble

INTRODUCTION

Vitamins A and E are found in the grain embryo, and vitamin B₁ and some vitamins in the complex B₂ are found in the coat and embryo of the grain. Since almost all the vitamins are distributed in the peripheral parts of the grain, after milling they usually remain in the coat of the grains. (Hoseney, 1970).

Eating grains by the insects results in weight and nutrient losses and in nutrients being turned into low nutritious substances.

Proskuriakov et al. (1942) carried out some research concerning the fundamental requirements in vitamins of the insect *Rhizoperta dominica* and of other pests of stored cereals. According to these authors, all insects need vitamins from the group B.

These authors claim that some insects specific to stored produce have lower demands than others, maybe due to the presence in their body of intracellular micro-organisms that supply them with these nutrients.

*Rhizoperta dominica* F. is a cosmopolitan species developing inside the wheat grain and thus constituting the “hidden infestation” of a cereal mass. Larvae inside the grains push out their granules together with some particles of starchy endosperm, through the entrance holes. (Petanec, 2004).
MATERIALS AND METHODS

In laboratory conditions, we infested wheat samples from Dropia breed with a variable number of pests belonging to the species *Rhizoperta dominica* F.

The insects were raised in laboratory conditions, at the necessary parameters for their development (temperature of 26°C and relative humidity of 65%).

We introduced 100 grams of wheat in jars; we infested them with 25, 50, 75, and 100 insects respectively in 3 repetitions. (Fig. 1). The observations were made after seven and thirty days respectively. The period of time in which the insects had contact with the grains was of 4 weeks.

![Fig. 1. Wheat samples infested and prepared for the attack period](image1)

After that, each wheat sample was ground with the help of a mill, and the grounding that resulted was sieved through a sieve with openings of 0.1 diameter. Then it was packed in airtight plastic bags and stored –20°C until they were analysed. In order to determine the vitamin content in the wheat samples we used a chromatographic equipment for liquids (figure 2), model Shimadzu 10 AD-VP, made of a pump, model LC-10 AT-VP; degasor, model DGU-14A; column oven, model CTO-10 ASVP; UV-VIS detector, with a series of diode, model SPD-M10 Avp and a soft (LC-Solution, var.2.0), necessary for calculating the arias of the drops. Vitamin concentrations in the samples were determined by the standard curve method. (Micu, 2008).

![Fig. 2. HPLC aparat](image2)
RESULTS AND DISCUSSION

Achieving a quantitative comparison between the values of vitamins B1, B2 and B6 of the sample infected with 25 species of insects *Rhizoperta dominica* F. (Tab. 1) and the vitamins B1, B2 and B6 of the witness sample. One month after attack were obtained the following results: the quantity of vitamin B1 of 1.39% was degraded by insects, the amount of vitamin B2 of 3.98% was degraded by insects, the amount of vitamin B6 of 7.84% was degraded by insects.

<table>
<thead>
<tr>
<th>100 insect infestation</th>
<th>Vitamin B₁ [mg/100 g dry wheat]</th>
<th>Vitamin B₂ [mg/100 g dry wheat]</th>
<th>Vitamin B₆ [mg/100 g dry wheat]</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>0.404</td>
<td>0.105</td>
<td>0.338</td>
</tr>
<tr>
<td>R2</td>
<td>0.402</td>
<td>0.104</td>
<td>0.340</td>
</tr>
<tr>
<td>R3</td>
<td>0.407</td>
<td>0.105</td>
<td>0.345</td>
</tr>
<tr>
<td>Media</td>
<td>0.404333</td>
<td>0.104667</td>
<td>0.341</td>
</tr>
<tr>
<td>Deviation</td>
<td>0.002517</td>
<td>0.000577</td>
<td>0.003606</td>
</tr>
</tbody>
</table>

After a month of attack, the 25 species of insects *Rhizoperta dominica* F. have damaged a larger amount of vitamin B6 (7.84%), vitamin B1 and vitamin B2 that were damaged in a proportion of cca.1, 39 % and 3.98%.

<table>
<thead>
<tr>
<th>100 insect infestation</th>
<th>Vitamin B₁ [mg/100 g dry wheat]</th>
<th>Vitamin B₂ [mg/100 g dry wheat]</th>
<th>Vitamin B₆ [mg/100 g dry wheat]</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>0.330</td>
<td>0.053</td>
<td>0.245</td>
</tr>
<tr>
<td>R2</td>
<td>0.340</td>
<td>0.058</td>
<td>0.245</td>
</tr>
<tr>
<td>R3</td>
<td>0.336</td>
<td>0.056</td>
<td>0.240</td>
</tr>
<tr>
<td>Media</td>
<td>0.335333</td>
<td>0.05667</td>
<td>0.243333</td>
</tr>
<tr>
<td>Deviation</td>
<td>0.005033</td>
<td>0.002517</td>
<td>0.002887</td>
</tr>
</tbody>
</table>

After a month of attack, the 100 species of insects *Rhizoperta dominica* F. destroyed a large amount of vitamin B2 (48.93%), and less degraded was vitamin B1 (18.22%). In the degradation of vitamin B6, it amounted to a value of cca.34 24%. (Tab. 2).

Fig. 3. Proportion of vitamins metabolized by insects after a month of attack
The 100 species of insects *Rhizoperta dominica* F. destroyed a large amount of vitamin B2 (48.93%), and less degraded was vitamin B1 (18.22%). In the degradation of vitamin B6, it amounted to a value of cca.34 24%.(Fig. 3).

CONCLUSIONS

After a month of attacks, insects of the species *Rhizoperta dominica* F. degrades to a greater vitamin B2 and B6.
- 25 insects destroy about 25. 1.39% B1, 3.98% vitamin B2 and 7.84% vitamin B6;
- 50 metabolized by about insects., 1.22% more vitamin B1 than 25 insects, with approx. 9.17% more vitamin B2 and 7.3% more vitamin B6;
- 75 degrades insects around. 5.04% more vitamin B1, with 25.08% more vitamin B2 and approx. 12.25% more vitamin B6 than the quantity of vitamins destroyed by the 25 insects.
- 100 insects with 44.95% more vitamin B2 and 14.15% more vitamin B6 than 25 insects.

After a month of attack to the species *Rhizoperta dominica* is a high metabolites of vitamin B2 (from 3.98% to 48.93%) and vitamin B6 (from 7.84% to 34.24%) contained samples infected with 25, 50, 75 or 100 insects.

REFERENCES

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