VARIATION OF NUCLEIC ACID AMOUNT AT TWO CULTIVARS OF TWO-ROW BARLEY (*HORDEUM VULGARE* L. CONVAR. *DISTICHON* (L.) ALEF.) AFTER SIMAZINE TREATMENT

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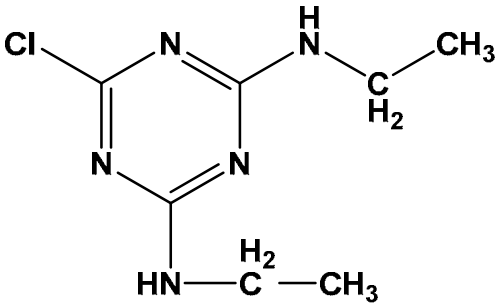
Keywords: nucleic acids, two-row barley, pesticide, simazine

Abstract: The synthesis of nucleic acids (DNA and RNA) displayed modifications in the plantlets of Andra and Flora two-row barley cultivars, as a result of the treatment with Simazine herbicide, at 0.1%, 0.2%, 0.5%, and 1% concentrations, applied for 24 hours and 48 hours. The DNA amount is superior to that of control, the only exception being registered for Flora cultivar, at the variant treated for 24 hours with tested herbicide. RNA synthesis evolved almost in the same manner in the two cultivars: it increases in 24 h treated variants, and decreases in 48 h treated variants. The ratio between nucleic acids (RNA/DNA) decreases consecutively to Simazine increasing concentration, excepting Flora cultivar (24 h treated variant).

INTRODUCTION

The Simazine herbicide, synthesized since 1956, is a heterocyclic compound, with 3 nitrogen atoms, and with the following chemical structure:



This herbicide controls almost 45 weed species, both monocotyledonous and dicotyledonous, having a spectrum similar to Atrazine (Şarpe et al., 1976). The means of action in controlling the weed growth is based on photosynthesis inhibition. The efficiency and remanence duration very much depends on soil type, humidity, temperature, and especially on the applied dose, a fact that determines difficulties in crop rotation (Şarpe, 1987).

The aim of this investigation is to emphasize the possible changes in nucleic acid synthesis, issued after the treatment with Simazine herbicide on two cultivars of two-row barley (*Hordeum vulgare* ssp. *vulgare* convar. *distichon* (L.) Alef.).

MATERIALS AND METHODS

The biological material, represented by 10 days old plantlets obtained from caryopses of Andra and Flora two-row barley cultivars (I.C.A. Podu Iloaie provenance, 2004 harvest), was prepared as follows:

- caryopsis from all variants were 3 hours soaked, in water;
- the germination and plantlets growth were assured in Petri dishes, on filter paper, moistened with distilled water (control), or with Simazine solutions: 0.1%, 0.2%, 0.5%, and 1% concentrations.

The variants were kept for 24 h and 48 hours in pesticide solutions. Afterwards, they were placed on filter paper moistened with distilled water (as in the case of controls), for 10 days. Petri dishes were placed in a phytotron, to assure the optimum humidity degree, during the whole period of experiment.

The determination of total acid nucleic amount was performed by Spirin method (1958), adapted for plant tissues (Buşneag şi colab., 1997).

RESULTS AND DISSCUSIONS

a) Andra cultivar

1. *DNA determination*

As shown in Figure 1, it is visible the stimulant effect of Simazine on DNA level, both in 24 h, and 48 h treated variants. The DNA level increase is proportional with the herbicide concentration increase, being 5 times greater in 24 h Simazine treated variants (3,27 mg/g fresh matter – 1% variant), comparatively with control (0.63% mg/g fresh matter).In the variants treated for 48 h with Simazine, the stimulation of DNA synthesis was fluctuant, a maximum being registered in variant treated with 0.5% Simazine, where DNA content was double comparatively to control (4.38 mg/g fresh matter to 1.89 mg/g fresh matter).

The duration of Simazine treatment also induced variations of DNA total amount. The 24 h treatment determined an increase 5 times greater (1% Simazine variant), while after a 48 h treatment this parameter is only 1.6 times greater than control. One could sustain that the treatment extension has as effect the DNA synthesis diminution. A similar behaviour was evidenced too in some *Leguminosae* species (Grama-Ţigănaş et al., 2004, 2005).

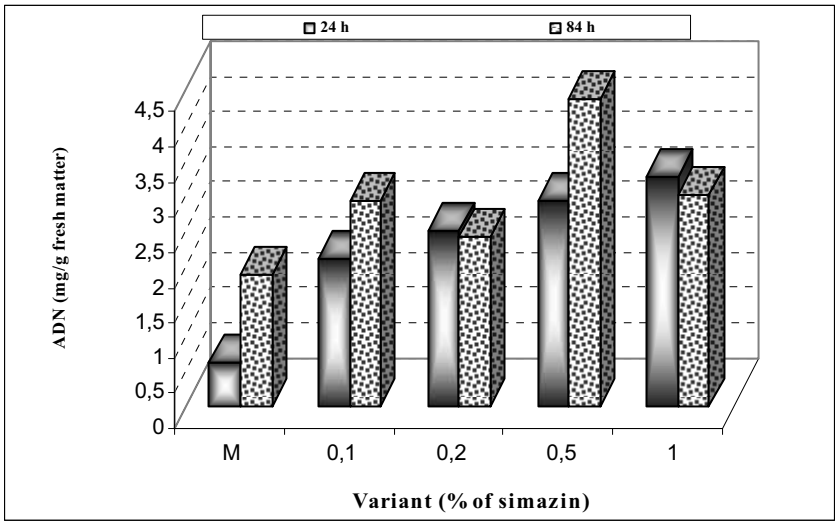


Figure 1. Variation of DNA content in two-row barley – Andra cultivar after Simazine treatment

2. *RNA determination*

After the Simazine treatment, RNA synthesis was realized in a different manner, depending on herbicide treatment duration. Thus, after a 24 h treatment, RNA content proportionally increased with Simazine concentration, while after 48 h treatment, a diminution of this parameter takes place in treated variants comparatively to control (Figure 2).

Because the RNA level is in relation to protein synthesis and growth (Dell'anno et al., 1998), one could sustain that a short herbicide exposition induces a faster growth rate, respectively a higher protein synthesis rate, while a prolonged time of exposition to pesticide determines their decrease.

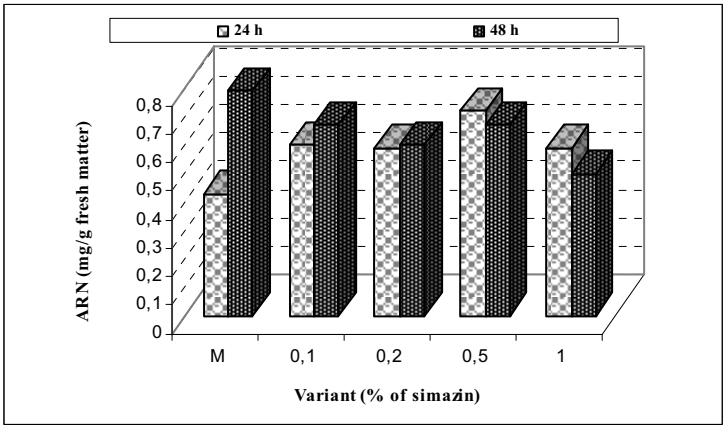


Figure 2. Variation of RNA content in two-row barley – Andra cultivar after Simazine treatment

3. *RNA/DNA ratio*

This ratio represents an indicator of somatic growth of organisms, of proteosynthsesis capacity/cell and offers an estimation of growth rate and metabolic state.

At Andra cultivar, both for 24 h and 48 h variants, this indicator is much lower comparatively to control, the lowest value being registered at the greatest tested herbicide concentration (1%), in which the diminution was more 3 times higher (Figure 3).

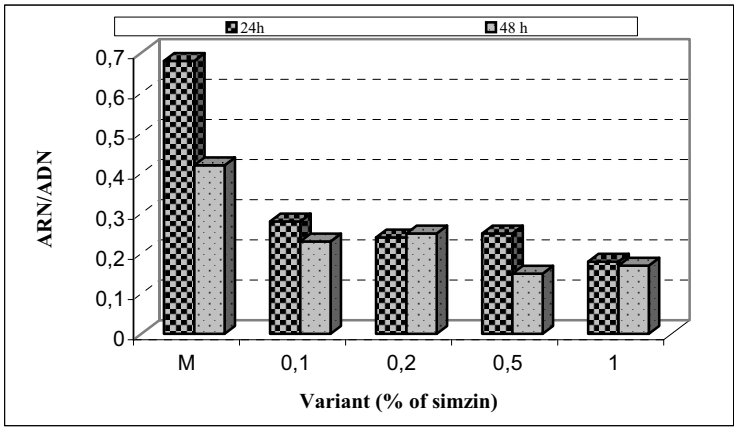


Figure 3. RNA/DNA ratio in two-row barley – Andra cultivar –after Simazine treatment

b) Flora cultivar

1. *DNA determination*

In this cultivar, DNA synthesis varied according to the duration of Simazine treatment. In 24 h treated variant, an increase of DNA content was evidenced only at minimum applied concentration of Simazine (0.1%), while the other variants presented values inferior to those

registered for control. The treatment for 48 h with Simazine induced an increase of DNA level proportionally to pesticide concentration increase (Figure 4).

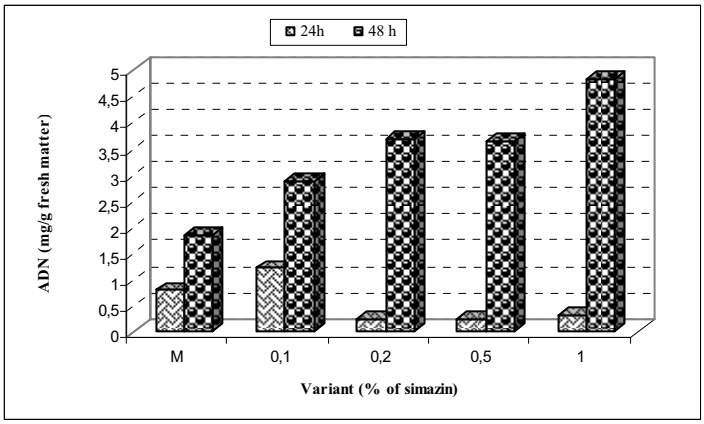


Figure 4. Variation of DNA content in two-row barley – Flora cultivar after Simazine treatment

Comparing the two cultivars, one could see that, after treatment with Simazine, a stimulation of DNA synthesis took place in all variants of exposition time and herbicide concentration (24 h and 48 h, 0.1%, 0.2%, 0.5%, and 1% Simazine).

2. *RNA determination*

From the point of view of RNA content, the behaviour of Flora cultivar is similar to Andra cultivar. Thus, the treatment of biological material with Simazine, for 24 hours, determined an increase of this parameter for all treatment variants, comparatively to control, while at variants treated for 48 hours with Simazine, RNA level decreased at the same time with the increase of Simazine concentration (Figure 5). The protein biosynthesis is, also in this case, more intense for a shorter exposition to herbicide, while a longer contact of plantlets with herbicide considerably diminishes the proteosynthesis process.

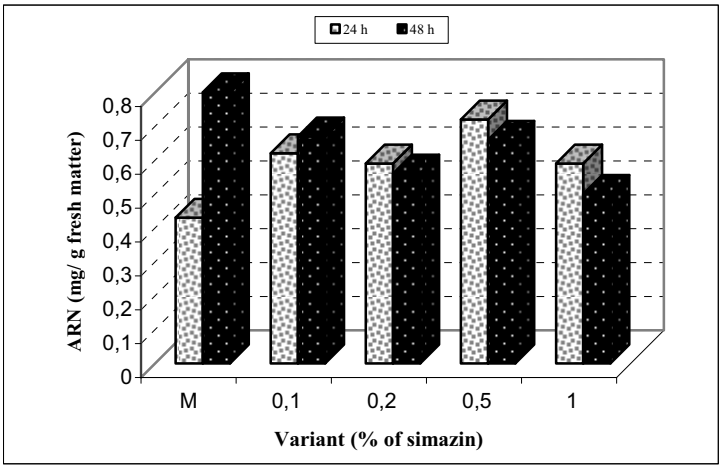


Figure 5. Variation of RNA content in two-row barley – Flora cultivar after Simazine treatment

3. *RNA/DNA ratio*

If the quantitative determinations of DNA and RNA revealed a very different behaviour at pesticide administration, RNA/DNA ratio also displays enough important variations. Thus, in 24 hours treated variants, this ratio is approximately 6 times greater at maximum tested concentration (1% Simazine), while a period of 48 hours of herbicide administration determines a significant decrease in all treatment variants (Figure 6).

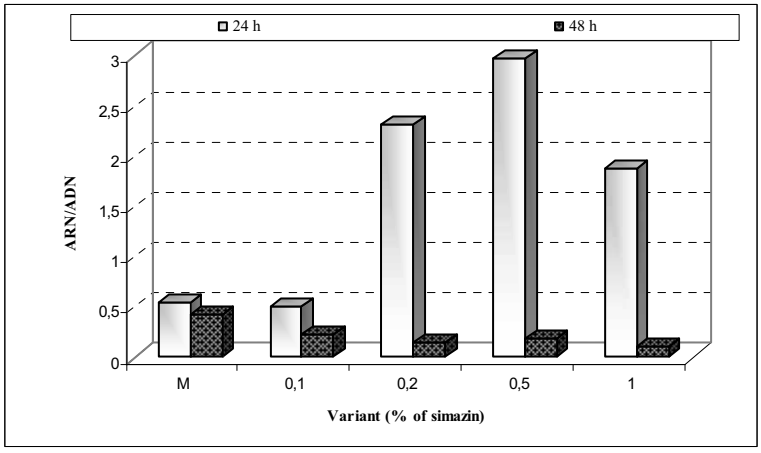


Figure 6. RNA/DNA ratio in two-row barley – Flora cultivar –after Simazine treatment

The determination of ratio between the two nucleic acids in the two two-row barley cultivars revealed a similar behaviour (its diminution with the increase of Simazine concentration) the only exception being registered at Flora cultivar 24 h treatment.

CONCLUSIONS

DNA content increased, comparatively to control, in all in all variants of exposition time and herbicide concentration, at Andra cultivar, while at Flora cultivar this parameter increased only in 48 hours treated variant.
RNA content varied in a similar way in the two studied cultivars. For 24 hours, this parameter is greater for all variants, comparatively to control, while for 48 hours it was registered a descendant line in the same time with the increase of Simazine concentration.
Ratio RNA/DNA is lower for treatment variants of both cultivars, excepting Flora cultivar, 24 hours.

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