IN VITRO DETERMINATION CONCERNING THE TOLERANCE OF HERBICIDES WITH PREEMERGENT APPLICATION FOR SYMBIOTIC NITROGEN BACTERIA

DETERMINĂRI IN VITRO PRIVIND TOLERANȚA LA ERBICIDELE CU APLICARE PREEMERGENTĂ A FIXATORILOR SIMBIOTICI DE AZOT

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Abstract. *In this paper work, we present the results of our studies concerning the effects of the herbicides linuron, dimetenamid and treflan upon the symbiotic nitrogen bacteria applied in seeds. We have tested herbicide action for 4 concentrations: normal concentration – the normally recommended herbicide dose, double concentration (2x normal dose), triple concentration (3x normal dose), and half of the recommended dose (1/2x normal dose). The results achieved made evident that strains have different reaction to linuron and dimetenamid, and these reactions are not correlated with the concentration. We may explain this situation through the different strain capacity of tolerance under the action exerted by these herbicides.*

Rezumat *În prezenta lucrare facem cunoscute rezultatele cercetărilor noastre care au urmărit efectul erbicidelor linuron, dimetenamid şi treflan asupra fixatorilor simbiotici de azot care se aplică la sământa . S-a testat actiunea erbicidelor pentru patru concentrații: concentratia normala, reprezentând doza normală de erbicid recomandată, concentratia dubla (2x doza normală), concentratia tripla (3x doza normală), concentrația pe jumatate din cea recomandată (1/2 x doza normală). Rezulatele obtinute au scos în evidență faptul că față de linuron şi dimetenamid tulpinile reactionează diferit, reacții ce nu corelează cu concentrația. Acest lucru se explică prin capacitatea diferită a tulpinilor de a tolera cele două erbicide.*

Key word: *tolerance, herbicides, Bradyrhizobium, Rhizobium*
Cuvinte cheie: *toleranta, erbicide, Bradyrhizobium, Rhizobium*

INTRODUCTION

The assurance of an efficient symbiosis between the leguminous species and the specific bacteria involved in this process may represent a non-pollutant cheap alternative (HERA et al, 1984) under conditions of durable, sustainable agriculture. The preemergent application of herbicides with a high volatilization coefficient, through incorporation, exposes the seed bacteria directly to the action exerted by herbicides (SINGH G. WRIGHT, 2002).

MATERIAL AND METHODS

The species taken into study were *Rhizobium leguminosarum* var *cicer*, with the following strains NT 1, NT 3, NT 7, NT9 and *Bradyrhizobium lupini* with the strains LP 53, LP 73, LP 78, and LP 83, taken from the Laboratory for Soil Biology, National Institute for Research-Development in Agriculture Fundulea. The selected herbicides have as common feature the method of administration, respectively before seeding, through incorporation into soil. The tolerance to herbicides was tested for linuron (Afalon), dimetenamid (Frontier) and rifluralin (Treflan), using four concentrations: c3 normal concentration – the normally recommended herbicide dose (according with Codex), c2 double concentration (2x normal dose), c1 triple concentration (3x normal dose), and c4 half of the recommended dose (1/2x normal dose).

The „in vitro" determinations have relied upon the method of paper rounds imbued with herbicides. The cultivation medium was YMA and the inoculation technique – the „turf" one (ZARNEA GH. and all, 1992). After 20-24 hours of incubation at 23-25^{0}C, we have read the results. This reading consisted of measurements of the diameters of the bacterial-inhibition area, with the help of a rule.

RESULTS AND DISCUSSIONS

Tests upon the behaviour of *Rhizobium leguminosarum* var *cicer* stains under herbicides. According to the results achieved and presented in figure 1, we may remark the high sensibility of the strain Nt 7 at the concentration c1 of Afalon (linuron), the differences compared to the results achieved in the other strains being statistically assured. At a smaller herbicide concentration (c4), the strain Nt 7 did not prove sensibility; the increase of this culture near the round imbued with herbicide suggests the positive effect exerted by the herbicide upon the bacterial increase – such processes being used within the bacterial metabolism.

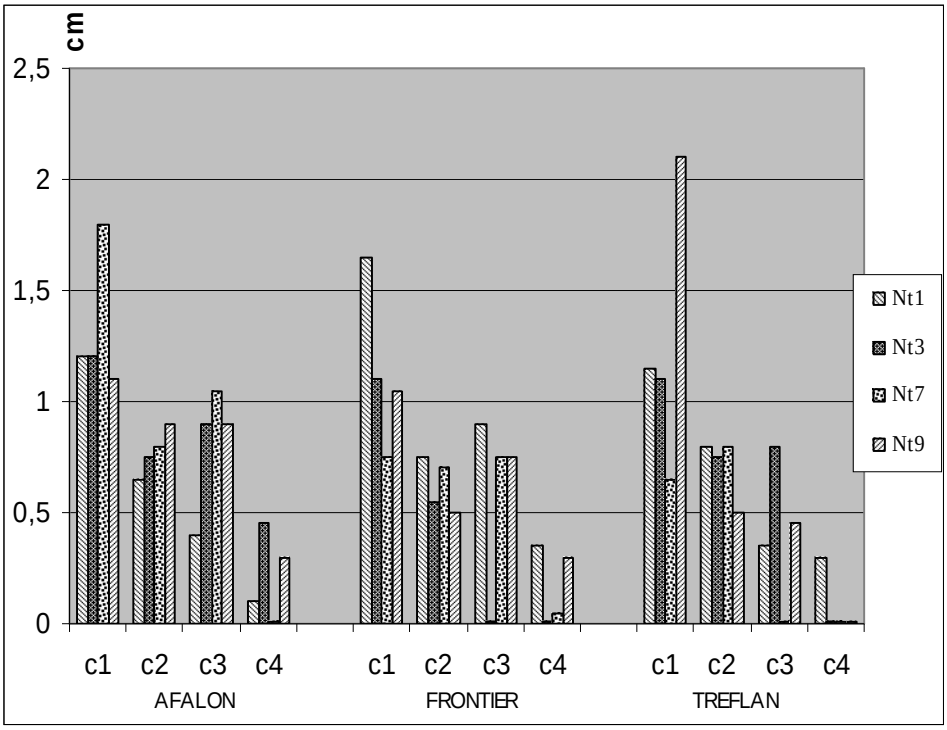

Fig. 1 Results upon the behaviour of *Rhizobium leguminosarum var cicer* strains under herbicides.

In the case of the herbicide Frontier (dimetenamid), we may remark a high sensibility of the strain Nt 1 expressed overall to all concentrations studied, while the strain Nt 7 proves high tolerance, the effect upon this bacteria being null at the normal herbicide concentration.

The strains of *Rhizobium leguminosarum* behave in a similar way to Treflan (trifluralin). Strain sensibility decreases in the same time with the concentration of Trifluralin. A high sensibility may be also remarked in the case Nt 9 at the concentration c1, while Nt 1 proves sensibility even to the lowest concentration (1/2 of the normal recommended dose).

Tests upon the behaviour of *Bradyrhizobium lupini* stains under herbicides. As we may notice in Figure 2, the *Bradyrhizobium* strains behave differently under the action exerted by herbicides.

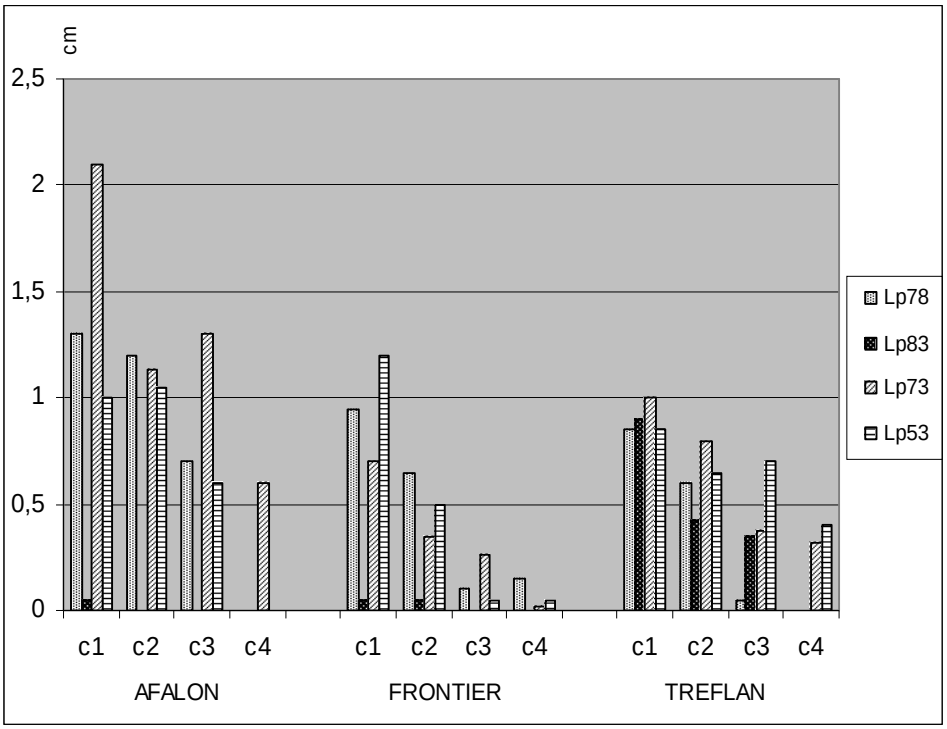

Figure 2. Results upon the behaviour of *Bradyrhizobium lupini* strains under herbicides

Firstly, we may notice the high resistance proved by the strain Lp 83 to Afalon and Frontier at all concentration levels. The strain Lp 73 proves high sensibility to the herbicide Afalon. This sensibility is the same at the lowest concentration, too. A higher tolerance is exerted under Treflan. The effect of growth inhibition increases in the same time with the herbicide concentration. An exception may be observed only in the strains Lp 73 and Lp 53, beginning with the lowest Treflan concentration.

CONCLUSIONS

- Overall, the strains tested prove sensibility only to Treflan, in a positive correlation with its concentration.
- We may observe different strain reactions to Afalon and Frontier, which do not correlate with the concentration. This fact is due to the different capacity of the strains tested to tolerate or metabolize the two herbicides.

- The strain Lp 83 does not present any sensibility to the herbicide concentration tested, proving to be the most tolerant strain to the herbicides applicable before seeding.

LITERATURE

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