

## **Bacterial Inoculation of the Leguminous in the Temporary Grassland, under Nitrogen Fertilization**

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**Abstract.** The paper highlights the influence of bacterial inoculation of the leguminous and of nitrogen fertilization on production and floristic composition at a temporary meadow formed by *Dactylis glomerata* (40%) and *Medicago sativa* (60%).

By bacterial inoculation of lucerne seed a production is obtained which is almost equal to that where a dose of N<sub>30</sub> has been applied (after each mowing).

If through the fertilization with nitrogen the proportion of lucerne from the grassland decreases by 10-24% compared with the fertilized variant, at the inoculated variants an increase of 24-38% was observed, compared to the unbacterized and unfertilized variant.

**Keywords:** temporary grassland, bacterial inoculation, production, floristic composition

### INTRODUCTION

The production capacity and nitrogen fixation in lucerne can be enhanced also by bacterial seed inoculation with improved strains by *Sinorhizobium meliloti*, especially in conditions of poor soils infested with nitrogen fixing bacteria.

Through the bacterial inoculation there is an increase of morphological and productive parameters of lucerne and an improvement of the fodder quality by increasing the protein content and of some nutrient elements (Dauka and Xenoulis, 1995; Elnesairy *et al.*, 2006; Rebah *et al.*, 2002; Stavarache *et al.*, 2010; Tufenkci *et al.*, 2006).

The present paper presents the results obtained regarding the influence of lucerne bacterial inoculation, sown in mixture with Cocksfoot, on the production and floristic composition in terms of nitrogen fertilization.

### MATERIALS AND METHODS

The research was conducted in USAMV Timisoara, within the Research Center for Grassland and Fodder, on a cambic chernozem soil, clay-loamy, weak in acidity.

The experiment was composed of a temporary meadow of *Dactylis glomerata* (40%) and *Medicago sativa* (60%), with the following experimental factors: A. Bacterial inoculation of mixed lucerne (a<sub>1</sub>=unbacterized, a<sub>2</sub>=bacterized) and B. Doses of de nitrogen fertilization (b<sub>1</sub>=N<sub>0</sub>, b<sub>2</sub>=N<sub>30</sub>, b<sub>3</sub>=N<sub>60</sub>).

The inoculation of lucerne seeds was made with top bacteria *Sinirhizobium meliloti*, multiplied in liquid environment, from an improved strain (LC-310), obtained from ICDA Fundulea (National Agricultural Research and Development Institute–NARDI)

The seedbed preparation was applied with a general agrofond of fertilization (P<sub>50</sub>K<sub>70</sub>), and the doses of nitrogen fertilization were applied in each year of vegetation after each mowing.

The results highlight the influence of bacterial inoculation and nitrogen fertilization on dry matter production and the proportion of lucerne plants in the floristic composition of grasslands.

## RESULTS AND DISCUSSION

By analyzing the unilateral effect of bacterial inoculation of lucerne seed with bacterial strains of *Sinirhizobium meliloti* shows that this treatment may be an important technological factor to increase production also with the growing of lucerne mixed with grasses.

Thus, the results presented in *Figure 1* reveal that at the mixture of *Dactylis glomerata* (40%) and *Medicago sativa* (60%), bacterizing the legume seeds leads to achieving a production of 7.6 t/ha DM, 0.5 t/ha (7%) higher than in unbacterized control variant.

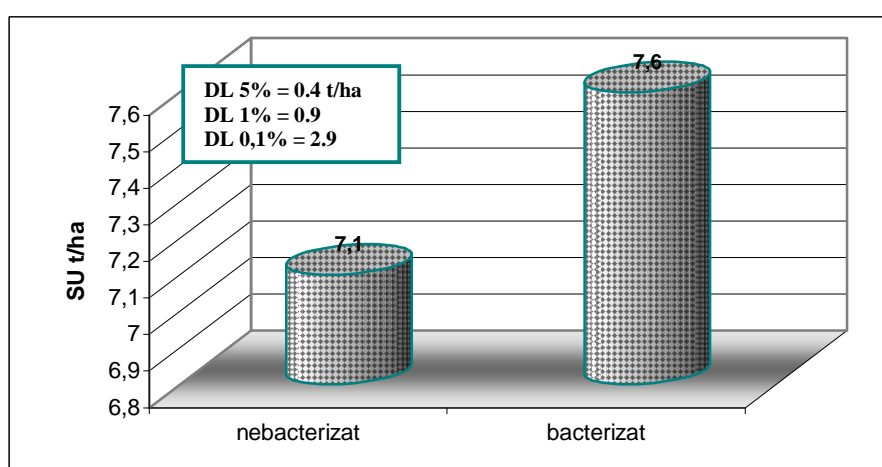


Fig. 1. Influence of legume bacterial inoculation on DM yield in the association *Dactylis glomerata* + *Medicago sativa* (mean of the vegetation years)

The effect of bacterial inoculation of lucerne is very much influenced by nitrogen fertilization of temporary pastures (Fig. 2). Thus, in the conditions of uninoculated variants, nitrogen fertilization increases dry matter production compared to the variant fertilized with 18.3% at a dose of N<sub>30</sub> and by 35% at the N<sub>60</sub> dose.

If the case of inoculated variants production increased by 4.3% in the variant fertilized with N<sub>30</sub> and by 18.3% in the variant fertilized with N<sub>60</sub>. The inoculated variant without nitrogen fertilization, made the same SU production (7.1 t/ha) as in the variant fertilized with N<sub>30</sub> but uninoculated.

If at the variant inoculated but unfertilized with nitrogen the production growth was 18.3% higher, in the other variants inoculated and fertilized with nitrogen, the production increased by only 4.3% in applying the N<sub>30</sub> dose and 3.7% at N<sub>60</sub> dose, compared to uninoculated but fertilized variants.

In conclusion, the increased production in the variants inoculated and fertilized with nitrogen is due, to a greater extent, to the application of nitrogen fertilizers that favor a stronger development of grass plants.

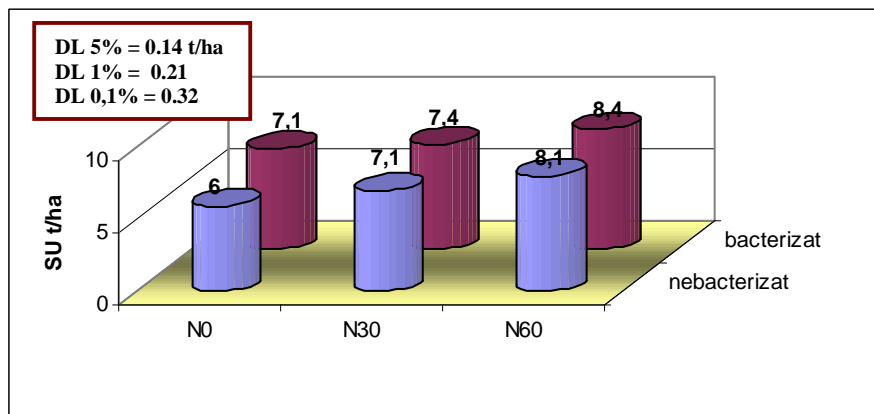


Fig. 2. Influence of bacterization and nitrogen-fertilization on DM yield in the association *Dactylis glomerata* + *Medicago sativa* (mean of the vegetation years)

The participation proportion of lucerne in the botanical composition of the pasture is influenced both by the effect of bacterial inoculation and nitrogen fertilization. From this perspective, the results show increasing proportion of lucerne plants from 43% in uninoculated variant, to 54% at the inoculated variant (Fig. 3).

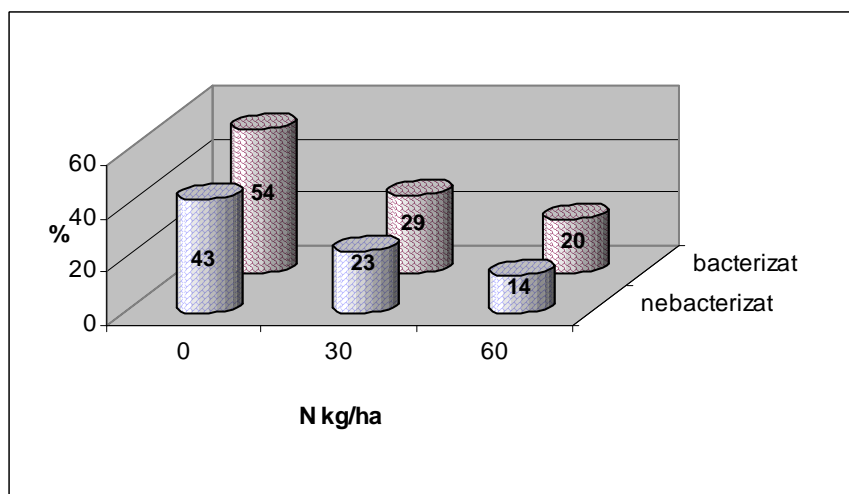


Fig. 3. Mean alfalfa degree of participation in the temporary pasture structure depending on bacterization and nitrogen-fertilization effect

The nitrogen fertilization affected negatively the proportion of lucerne, at both inoculated and uninoculated versions. Thus, if at the uninoculated variants, the nitrogen fertilization reduced the degree of participation of lucerne to 14-23%, depending on the applied dose, at the inoculated variants with nitrogen fertilization the proportion of lucerne plants decreased to 20-29%.

The results of other researches record that by bacterial inoculating of legumes in the mixture, the nitrogen content of the feed increased from 2.85% in temporary grassland to 3.12% and the amount of total nitrogen from 198.2 kg/ha to 238.8 kg/ha (Carmen Dragomir *et al.*, 2010).

## CONCLUSIONS

The lucerne bacterial inoculation, sown in mixture with Cocksfoot can be an important technological measure that can replace chemical fertilizer with nitrogen, when applied to lower fertilizer amounts.

The average results obtained have shown that with the inoculated variants there was an increase of 7% dry matter, and at the fertilized variants of N<sub>30</sub> (after each mowing) the growth was of 9.1%.

At the variants fertilized with nitrogen there was a decrease in the proportion of lucerne plants with 10-24% depending on the doses of nitrogen applied, and at the inoculated variants there was an increase from 43% to 54%.

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