INFLUENCE EXERTED BY BACTERIAL INOCULATION OF THE LEGUME WITHIN THE ASSOCIATION ON TOTAL NITROGEN CONTENT IN TEMPORARY PASTURES

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Abstract: *The researches were performed during 2006-2008, at USAMVB Timişoara, at the Research Centre for Pastures and Forage Plants, on a salty chernozem, moderately gleyed, with pH pH (H_2O) of 6.21 on the depth of 0-13 cm. The experimental display was consisted of a bifactorial experience, with the following graduations: A – bacterial inoculation of the alfalfa within the association (a_1 – not bacterized, a_2 - bacterized); B – nitrogen-fertilization doses (b_1 - N_0, b_2 - N_{30}, b_3 - N_{60}, with application after each cutting). During the experimental period, the biggest total nitrogen amount was obtained in the second year of vegetation (240 kg/ha), and in the first and the third years of vegetation, the results were similar (207 kg/ha and 209 kg/ha). Every year of vegetation, the bacterized variants produced total nitrogen amounts that were much bigger than in the not-bacterized variants, 17.8%-fold bigger in the first year of vegetation, 28.1% in the second and 21.2%-fold bigger in the third year. The interaction of the factors studied proved that, on the average for the utilization period of the pasture consisted of Dactylis glomerata + Medicago sativa, the biggest total nitrogen content, 248 kg/ha, was achieved in the variant with bacterized alfalfa and N_{60}-fertilization, namely 45%-fold bigger than in the variant that was not bacterized and nitrogen-fertilized.*

Key words: *bacterial inoculation, alfalfa, orchard grass, total nitrogen*

INTRODUCTION

Nitrogen-based fertilization represents a direct method of pasture intensification, providing a direct relationship between Nitrogen doses applied, moment of application, dry matter yield and plant N content (CHERNEY, 1994; KADDZIULIENE, 2001; VELLINGA, 2006).

In the temporary pasture ecosystems, the total N content of the yield achieved is determined by the N-fertilization level and also by the participation percentage of the legumes that fix symbiotically big nitrogen amounts (DRAGOMIR CARMEN, 2009; NESHEIM AND OYEN, 1994).

This work attempts to determine the total Nitrogen content and amount of a pasture association consisted of *Dactylis glomerata* (40%) + *Medicago sativa* (60%), under conditions of fertilization with different N doses and alfalfa bacterial inoculation.

MATERIALS AND METHODS

The researches were carried out during 2006-2008, in the experimental field belonging to BUASVM Timisoara, on a lick chernozem-type soil, moderately gleyed, with pH=6.21.

The experimental arrangement comprised the following experimental factors: A – Bacterial inoculation of the alfalfa within the association (a_1 – not bacterized; a_2 – bacterized), B – N fertilization doses (b_1 – not fertilized; b_2 – N_{30}, b_3 – N_{60}). The N fertilization doses were applied every vegetation year, successive to each cutting. For seeding, we used the following mixture: *Dactylis glomerata* (40%) + *Medicago sativa* (60%). Before seeding, the alfalfa seeds were bacterized with a specific *Sinorhizobium meliloti* strain.

The total nitrogen content (N_t) determination was performed with the Kjeldhal method, in the forage obtained at each cutting every vegetation year. We obtained 3 yields each year, and the total nitrogen content and amount were calculated as annual mean of the determinations performed.

RESULTS AND DISCUSSIONS

In the case of pasture perennial gramineae mono-crops, fertilized with N-based chemical fertilizers, the total N content in plants increases proportionally with the N dose applied. In the gramineae and legume crops planted in association, the N content in the forage biomass is influenced by the N dose applied and also by the legumes' proportion of participation in the floristic composition.

According to the data presented in Table 1, we may observe that, in the association consisted of *Dactylis glomerata* + *Medicago sativa*, the forage N content is bigger in the first vegetation year and decreases in the next two years. Also, in the not-bacterized variants, the N-based fertilization influences positively the increase of N_t content only in the first vegetation year (from 3.26% in not fertilized to 3.47 in the N_{60} variant), compared with the next two vegetation years, when the N-based fertilization causes a total N content decrease. This decrease is generated by the reduction of alfalfa plants proportion from the floristic composition, as a result of N fertilization.

The bacterial inoculation of alfalfa within the association, in the variants not fertilized with N, influences positively the forage biomass total N content, by enhancing this from 3.26% (in the not bacterized variant) to 3.43% (in the bacterized variant), in the first vegetation year, from 2.96% to 3.59% in the second year and from 2.52% to 2.87% in the third year of vegetation.

The mean of the vegetation years shows the importance of bacterial inoculation of alfalfa seeded in association with orchard grass, by increasing the N_t content from 2.85%, in the not bacterized variant, to 3.12% in the bacterized variant, respectively 10.5% more. Also, if we only take into consideration the unilateral influence exerted by N-based fertilization, we may observe a slight N_t decrease, from 3.10%, in the not fertilized variant, to 2.90% in the N_{60}-based fertilization. This decrease was influenced by the reduction of alfalfa proportion within the pasture.

The separate presentation of the total N content for the pasture gramineae and legume associations and of the total nitrogen content is very important because the determination of the N_t content includes the DM yield, too, which changes the influence exerted by the factors studied.

During the experimental period, the biggest N_t amount was achieved in the second vegetation year (240 kg/ha); in the first and third years, the results were similar (207 kg/ha and 209 kg/ha). Also, during the entire experimental period, in the bacterized and not bacterized variants as well, the N_t amount increases proportionally with the N fertilization dose. In this viewpoint, compared with the reduction of total N content under conditions of N fertilization, which was generated by the reduction of alfalfa proportion within the association, the increase of total N content may be due to the increase of orchard grass proportion; so, the orchard grass became more competitive (Table 2).

Every vegetation year, the bacterized variants produced bigger mean N amounts compared with the not bacterized variants, with 17.8% in the first year, 28.1% in the second year and 21.2% in the third year of vegetation.

The interaction of the factors studied shows that the biggest mean N_t amount achieved from the pasture consisted of *Dactylis glomerata* + *Medicago sativa* was obtained in the

bacterized variant fertilized with N_{60} (248.7 kg/ha), which is 45% bigger that in the not bacterized – not fertilized variant, and 5% bigger than the bacterized – not fertilized variant.

CONCLUSIONS

Successive to the bacterial inoculation of alfalfa, planted in association with orchard grass, we obtained a mean N_t content increase from 2.85%, in the not bacterized variant, to 3.12%, in the bacterized variant.

The mean effect exerted by alfalfa bacterial inoculation showed an increase of the forage biomass N_t content from 198.2 kg/ha, in the not bacterized variant, to 238.8 kg/ha, in the bacterized variant (respectively 20.5% more).

Table 1

Influence on alfalfa bacterial inoculation and nitrogen-fertilization on total nitrogen content in forage, in the association *Dactylis glomerata+Medicago sativa*, during the vegetation period

Variants		First year		Second year		Third year	
Cultivation method of alfalfa in association	Nitrogen doses	Nt(%)	%	Nt(%)	%	Nt(%)	%
No inoculation	N_0	3.26	100	2.96	100	2.52	100
	N_{30}	3.32	101.8	2.83	95.6	2.37	94.0
	N_{60}	3.47	106.4	2.77	93.5	2.21	87.6
Mean	x	3.35	100	2.85	100	2.37	100
Inoculated	N_0	3.43	105.2	3.59	121.2	2.87	113.9
	N_{30}	3.39	104.0	3.42	115.5	2.69	106.7
	N_{60}	3.44	105.5	3.18	107.4	2.40	95.2
Mean	x	3.42	102.1	3.39	118.9	2.65	111.8
General mean		3.39	x	3.12	x	2.51	x

Table 2

Influence on alfalfa bacterial inoculation and nitrogen-fertilization on total nitrogen content in forage, in the association *Dactylis glomerata+Medicago sativa*, during the vegetation period

Variants		First year		Second year		Third year	
Cultivation method of alfalfa in association	Nitrogen doses	Nt (kg/ha)	%	Nt(kg/ha)	%	Nt(kg/ha)	%
No inoculation	N_0	140	100	183	100	192	100
	N_{30}	194	138.5	212	115.8	189	98.4
	N_{60}	250	178.5	236	128.9	188	97.9
Mean	x	195	100	210	100	189	100
Inoculated	N_0	196	140.0	272	148.6	243	126.5
	N_{30}	201	143.5	260	142.1	231	120.3
	N_{60}	258	184.2	276	150.8	212	110.4
Mean	x	218	117.8	269	128.1	229	121.2
General mean		207	x	240	x	209	x

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