

The Impact of Nitrogen Fertilisation on the Evolution of Floristic Composition in Mixtures of *Festuca rubra* L.

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Abstract

Festuca rubra L. is a good competitive species that makes up the floristic structure of temporary meadows and that are used for grazing or mixed use (haymaking field – grassland) together with *Festuca pratensis* L., *Phleum pratense* L., *Poa pratense* L., *Trifolium repens* L. and *Lotus corniculatus* L. The paper aims at pointing out the evolution of the floristic composition of the vegetal cover in different mixtures based on (creeping) red fescue (*Festuca rubra* L.), Dutch / white clover (*Trifolium repens* L.) and bird's-foot trefoil (*Lotus corniculatus* L.). Analysis of mean results concerning the structure of the floristic composition of mixtures based on *Festuca rubra* L. (60%) shows that in all 9 types of mixtures there was balance between the degree of participation of (creeping) red fescue and the share of the other two legume species studied. In the control variants, in the two simple mixtures, the share of Dutch / white clover was 48% and that of bird's-foot trefoil was 44%. These values decreased, on the average, with 10% when applying a rate of N₅₀ and with 14% when applying a rate of N₁₀₀. In the complex mixture, there was a mean value of the degree of participation of the two species of legumes of 46% (with a higher share of the bird's-foot trefoil) in the control variant, of 34% in the variant treated with N₅₀ and of 30% in the variant treated with N₁₀₀.

Keywords: *Festuca rubra* L., floristic composition, mixtures, nitrogen fertilisation

1. Introduction

Setting temporary meadows is one of the best solutions to improve fodder basis: it is increasingly becoming more and more popular in countries with advanced agriculture. In Romania, temporary meadows cover larger areas as a result of the development of very productive grasses and perennial legumes with very high fodder value: they can be cultivated in different types of mixtures and for different uses [1-4].

The paper points out the effect of applying nitrogen rates on mixtures of *Festuca rubra* L. and meadow perennial legumes.

2. Materials and methods

The researches were carried out at Grass Research-Development Station Timișoara, during 2004-2007, on a brown eumesobasic soil, moderately gleyed, with pH = 5.6.

The experience was of bifactorial type, displayed in field according to the method of subdivided parcels.

The experimental factors were: Association type: A1- *Festuca rubra* (100%); A2 - *Festuca rubra* (60%) + *Trifolium repens* (40%); A3 - *Festuca rubra* (60%) + *Lotus corniculatus* (40%); A4 - *Festuca rubra* (60%) + *Trifolium repens* (20%) + *Lotus corniculatus* (20%); Nitrogen doses: B1 – N₀; B2 – N₅₀; B3 – N₁₀₀

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Planting was performed in the spring of 2004, with the *Festuca rubra* variety – Pastoral. The nitrogen-based fertilization was performed early in the spring, and phosphorus and potassium were applied in the autumn.

3. Results and discussion

Measurements to determine floristic composition started in the second year of vegetation, i.e. in the first production year. In the first vegetation year, we only made maintenance works, i.e. we mowed twice to destroy weed species in the vegetal cover. The variants sowed in pure culture with *Festuca rubra* L. had, in all production years, a degree of coverage of 100%, with no vegetation gaps, and with an insignificant presence of weed species. In the first production year, as well as in the other years, the floristic structure of the vegetal cover presented some changes in the variants fertilised with nitrogen. Thus, in the mixture of *Festuca rubra* L. 60% + *Trifolium repens* L. 40%, compared to the control variant (with a share of Dutch/white clover of 42%), in the variant fertilised with N₅₀ the share of Dutch/white clover was 38%, and when applying a rate of N₁₀₀ it decreased to 35% (Figure 1).

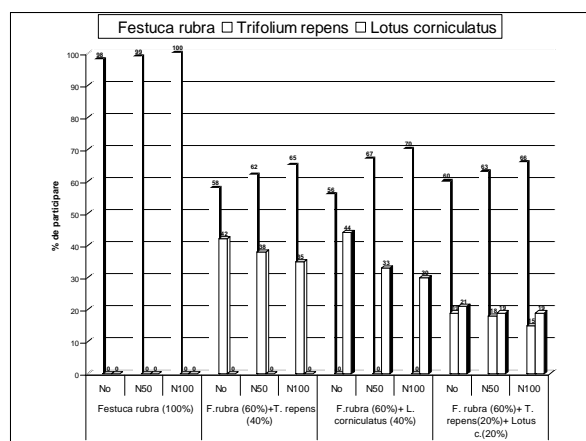


Figure 1. Floristic structure in the first production year

In the mixture of *Festuca rubra* L. 60% + *Lotus corniculatus* L. 40%, compared to a share of 44% of the legume in the control variant, when applying a rate of N₅₀ the percentage of the legume decreased to 33%, while in the variant fertilised with N₁₀₀ there was a stronger decrease, i.e. to 30%.

In the variants sowed with a complex mixture, the share of legumes decreased from 40% (control variant) to 37% in the variant fertilised with N₅₀ and to 34% in the variant fertilised with N₁₀₀. In all the cases, there was proportional increase of the share of (creeping) red fescue with 3-10% with the decrease of legume share.

In the second production year, the share of the species of the first production year remained constant on the whole, except for the variants fertilised with N₁₀₀, where legume species decreased much more (Figure 2).

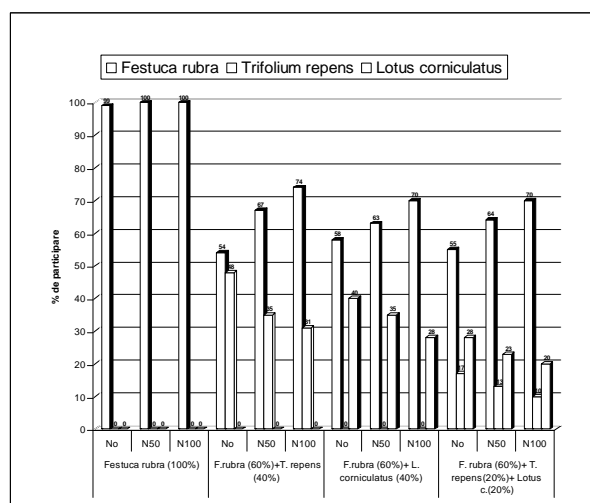


Figure 2. Floristic structure in the second production year

Thus, in the mixture of *Festuca rubra* L. 60% + *Trifolium repens* L. 40% the share of Dutch / white clover decreased from 48% in the control variant to 31% (and 17%, respectively) in the variant fertilised with N₁₀₀, compared to a decrease of only 7% in the first production year. In the same fertilisation variant (N₁₀₀), in the mixture of *Festuca rubra* L. 60% + *Lotus corniculatus* L. 40%, the share of bird's-foot trefoil decreased with only 12%, being almost identical with the decrease of the first production year.

In the variant cultivated with a complex mixture, there was decrease of the share of legume species with 15% in the variant fertilised with N₁₀₀ compared to the control variant, compared to only 6% in the first production year. The differences between the two legume species were not significant.

Floristic measurements in the third production years show that in the mixture control variants the share of legume species compared to the first production years increased (Figure 3).

In the mixture of *Festuca rubra* L. 60% + *Trifolium repens* L. 40%, in the control variant, the share of Dutch / white clover was 54% compared to only 42% in the first production year and of 48% in the second production year. Likewise, in the same type of mixture, the share of Dutch / white clover decreased to 40% when fertilised with N₅₀, and to 37% when fertilised with N₁₀₀.

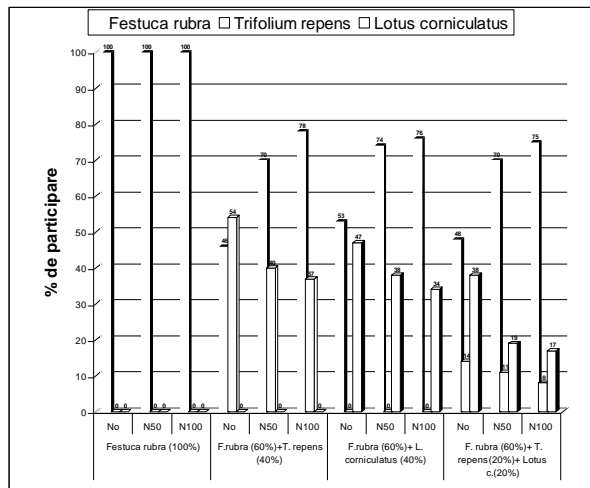


Figure 3. Floristic structure in the third production year

The mixture of *Festuca rubra* L. 60% + *Lotus corniculatus* L. 40% resulted in an increase of the share of bird's-foot trefoil to 47% compared to only 44% in the first production year and to 40% in the second production year. However, that third production year, after applying nitrogen fertilisers, the share of bird's-foot trefoil decreased to 38% when applying a rate of N₅₀ and to 34% when applying a rate of N₁₀₀.

In the complex mixture, the share of legumes increased to 52% compared to only 40% in the first production year and to 45% in the second production year. By fertilizing with nitrogen, the share of legumes decreased to 30% when applying N₅₀ and to 25%, when applying N₁₀₀.

The analysis of mean results concerning the structure of the floristic composition of the mixtures based on *Festuca rubra* L. 60% shows that in all 9 types of mixtures there was balance between the share of (creeping) red fescue and the share of the two legume species studied (Figure 4).

In the control variants, in the two simple mixtures, the share of Dutch/white clover was 48% and that of bird's-foot trefoil was 44%. These values decreased, on the average, with 10% when

fertilised with N₅₀ and with 14%, when applying a rate of N₁₀₀.

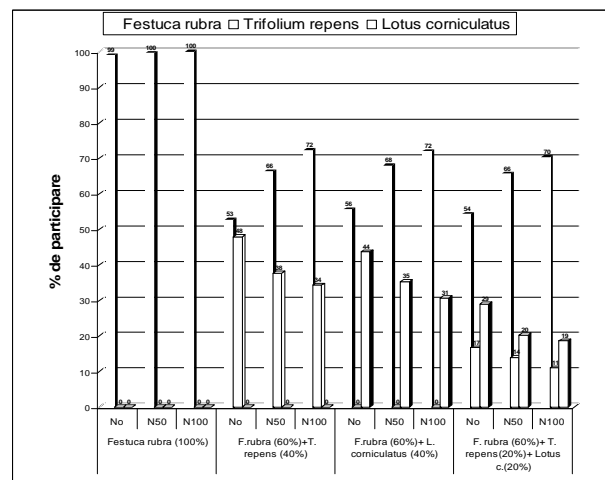


Figure 4. Floristic structure (multiyear average)

In the complex mixture, there was a mean value of the share of the two legume species of 46% (with a larger share of bird's-foot trefoil) in the control variant, of 34% in the variant fertilised with N₅₀, and of 30%, in the variant fertilised with N₁₀₀.

4. Conclusions

-In the first production year, as well as in the other years, the floristic structure of the vegetal cover showed some changes in the variants fertilised with nitrogen. In all the types of mixture, the share of (creeping) red fescue increased with 3-10%, proportionally with the decrease of the share of legumes.

-In the second production year, the share of the species in the first production year is maintained on the whole, except for the variants fertilised with N₁₀₀, where legume species decreased much more.

-Floristic measurements in the third production year showed that in the variants cultivated with mixtures and not fertilised the share of legumes increased compared to the first two production years.

-Analysis of mean results concerning the structure of the floristic composition of the mixtures based on *Festuca rubra* L. 60% show that in all 9 types of mixtures there was balance between the share of (creeping) red fescue and the share of the two legume species studied. In the control variants, in the two simple mixtures, the share of Dutch/white

clover was 48% and that of bird's-foot trefoil was 44%. These values decreased, on the average, with 10% when fertilised with N₅₀ and with 14% when fertilised with N₁₀₀. In the complex mixture, there was a mean value of the share of the two legume species of 46% (with a larger share of the bird's-foot trefoil) in the control variant and of 34% in the variant fertilised with N₁₀₀.

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