EFFECT OF MINERAL NITROGEN APPLIED TO A CROP OF RED CLOVER AND THE FACTORS THAT CONTRIBUTE TO HIS RECOVERY

Stanciu Alina Ştefania*, Vidican Iuliana Teodora*, Lazăr Andra Nicoleta*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: as1stanciu@yahoo.com
*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: iuliateodora68@yahoo.com
*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: ienciuandra@yahoo.com

Abstract

Utility of perennial legume crops fertilization with fertilizer it is o problem much discussed and frequently contradictory.In this paper are presented the increase in dry substance and crude protein which are archieved for 1 kg nitrogen applied to a red clover crop, important indicators relating to fertilizers opportunity of this cropswith mineral nitrogen. Determination of nitrogen recover coefficient from plant biomass yield represents, also one estimate mean of utilization indicative of chemical fertilizers with nitrogen by the plants and to estimate quantitative balance of this element in agro/ecosystem reprezented by red clover crop.

Key words: mineral nitrogen, red clover crop , perennial legume, recover coefficient, plant biomass, crude protein.

INTRODUCTION

The need fertilization with nitrogen-based crop of red clover raises many questions and contradictory discussions. In this research carried out in recent decades in our country, in different growing areas of red clover showed that this legume produces large amounts of nitrogen biologically differently, depending on the year of vegetation: the first year, between 120 and 150 kg / ha; in the second year between 160 and 280 kg / ha; in the third year (the last year of production), between 70 and 100 kg / ha. Weighted average, the duration of use of culture red clover is 147 kg / ha. This is enough nitrogen for plant nutrition, without having to apply nitrogen fertilizer. (Moga et al.,1983, Răsmeriţă et al.,1973, Dragomir et al.,1984, Rotar et al.,1993, Todoran,1999).

To learn more about the phenomenon of symbiotic nitrogen production at Fundulea researchs were initiated in the house of vegetation, using experimental method referred to alfalfa. It has been found that when red clover plants are sown on a sand layer of sterilized ensure its symbiotic nitrogen requirements are about only 55% of that for the production of the maximum yields; This situation is explained by the high temperatures, especially at harvest II and III. From these data revealed that red clover

gives high yields and year when the temperature is high, provided the water necessary to ensure biologically active soil layer (Fabian, Moga,1980, Moga, 1993, Puia et al., 1993)

Also during the active growing season (May to September), red clover fixes more than 80 percent of the total biological nitrogen product, with a daily rate of nitrogen fixation between 1.5 and 8.0 mg / day / plant .

In any system of farming, export of nitrogen in the soil is achieved by yields. Thus, some of the exported amount of N may be substituted by applying mineral or organic fertilizers. Therefore it is necessary to know the quantity of SU and PB is done in 1kg N applied as it can constitute an important indicators relating on the opportunity of this type of fertilization red clover crops with this kind fertilizer .Through this it can be predicted reserves of nitrogen in crop rotations based legume, knowing the quantities of N fixed by symbiosis and nitrogen balance in these growing systems.

Also, determination of the recovery of nitrogen in crop phytomass as a way of assessing the use of chemical fertilizers with nitrogen by plants and assessing the quantity of nitrogen balance in the agro represented the culture of clover.

MATERIAL AND METHOD

The research was undertaken between 2012 - 2015 under the experimental conditions Crisurilor Plain to Agricultural Research and Development Station Oradea in a silted soil (luvosol), a weakly acidic, poorly supplied with humus, low-middle-stocked total nitrogen, phosphorus and well stocked in mobile potassium.

The first year of vegetation (2012) was considered year establishing all that apply the same system of fertilization and use, and in subsequent years (2013-2015) are representative of years of use to which the data to be presented in the paper . As biological material was used seed elite of the variety Napoca Tetra.

Experimental factors were: sowing distance between rows with three graduations: 12.5, 25.0, and 50.0 cm and doses of nitrogen fertilizers applied annually No, N_{100} and N_{200}. The quantity of DM and CP made to the unfertilized control the amount of nitrogen applied was done by dividing the gain of DM and CP unfertilized made to the amount of nitrogen fertilizer applied per graduation.

RESULTS AND DISCUSSION

Legumes get their nitrogen required in most of the symbiotic attachment, but also from the reserve nitrogen in the soil.

The contribution of nitrogen fertilizers brought through in vitro fertilization, crop increases determines which varies by plant seed, soil water supplies, the total nitrogen content in soil, etc.

Table 1 shows the harvest SU and PB performed on 1 kg N applied.

The data in Table 1 is found realization of bigger SU 1 kg N administered higher doses of 100 kg / ha N, then improve yields start to decline towards the maximum graduation fertilization. Nitrogen rates were applied to a agrofond P2O5 - 50 kg / ha annually, K2O - 100 kg / ha.

Spacing affects less harvest SU and PB 1 kg N administrated. If the first graduations of distance sowing amount of SU and PB per unit area is similar in terms of size, the distance of 50 cm between rows amount SU is on average higher than in other graduations of space which is mainly due to better exposure to sunlight leading to greater accumulation of biomass. In fact underlined by Cruz and Lamiare (1986) explaining that the distance sowing largest mineral nitrogen is better capitalized due to greater exposure to sunlight, leading to improved work processes biochemical synthetic organic matter from the leaf.

Table 1

DM harvest and made CP 1 kg N applied (average of the years 2013-2015)

Species	Distance between rows cm	N Doses applied kg/ha					
		N_0		N_{100}		N_{200}	
		SU	PB	SU	PB	SU	PB
Trifolium pratense	12,5	6,82	1,73	5,72	1,4	5,35	1.0
	25,0	8,21	1,81	6,45	1,5	5,26	1,2
	50,0	8,83	1,95	8,52	1,7	7,34	1,4

Also during the active growing season (May to September), red clover fixes more than 80 percent of the total biological nitrogen product, with a daily rate of nitrogen fixation between 1.5 and 8.0 mg / day / plant . The data presented are questionable, especially in the case of high doses of nitrogen, because some investigations carried out by the method abundance of 15 N in the soil, shows that under the conditions in which the natural abundance in the soil of 15 N is sufficiently large (doses of nitrogen applied to less than N200), the amount of N fixed by the legume symbiosis is estimated to be over 95% of the accumulated nitrogen. (Reiter et al., 2002, Moga, et al., 1996). In any agricultural system based on legumes, nitrogen balance must take into account the flow of N carried by species of legumes. So at harvest legume species, some amount of N fixed is contained in the

shoots, leaves, stems and seeds, and another part is found in the roots in soil (rhizodepozit) and stubble or fallen leaves.

The amount of N pulses fixed species is considered as a reserve amount of N, which in the crop made is removed from the balance nitrogen. Thus, the authors cited above have shown that results obtained in the research field, (peas, red clover, white clover) differ from the results of studies conducted in controlled laboratory conditions (greenhouses and climate chambers). From this point of view, the balance N was lower in cultures of red clover and alfalfa, which were extracted from the soil by biomass production, larger amounts of N. In these kinds of pulses, with a harvest index N > 0.7, it is considered that 70% of the total amount of N in the roots of the plants and soil-borne. Given that there is an increased uptake of N from the soil and decrease the amount of N fixed, leguminous crops recorded a negative balance of N.

The maximum nitrogen recovery is performed at all the graduations given distance sowing, the amount of nitrogen of 100 kg / ha, the percentage of nitrogen recovered is between 47-52%.

Table 2

The yield of N (kg / ha) and the percentage of nitrogen fertilizer to be recovered from the species Trifolium pratense sown at different distances between rows

Species	Distance between rows cm	N Doses applied kg/ha		
		N_0	N_{100}	N_{200}
Trifolium pratense	12,5	420	465 (52)	468 (25)
	25,0	425	459 (46)	445 (21)
	50,0	387	418 (47)	400 (21)

From the economic point of view does not justify application of nitrogen fertilizer to a crop of perennial legume crop if growth 1 kg / ha nitrogen applied is below 10kg SU.

Harvest nitrogen obtained in a clover field is between 280-400 kg / ha annually, our results are higher due to higher US yields, climatic conditions and high protein content of the variety used.

CONCLUSIONS

Recovery of applied nitrogen is highest at moderate doses of chemical fertilizers and 52%, decreasing with increasing doses of nitrogen applied and sowing increasing distance. Although yields SU are great, do not exceed 10 kgSU / kg N applied, estimated lowest value in economic terms, what makes us stress once again that the application of nitrogen fertilizers on a crop of red clover is only justified when it is grown in mixtures with perennial grasses.

Acknowledgments

This paper was suported by de project "Increasing the competitivity of the didactic station of University of Oradea", project code CNFIS – FDI – 2016 – 0036, project founded in the frame of the call Institutional Development Found – FDI 2016

REFERENCES

1. Cardaşol,V.,Motcă,GH.,Pavel,C.,Simtea,N.,Ionel,A.,Lăpuşan,A.,Ţucra,I.,Dragomr N.,ConstantinaChiper,Capşa,I.,Stela,Capşa,Razec,I.,Panait,V.,Iacob,T.,Petcu,N.,Di ncă,Fl.,Ştefan,D.,1988, Efectul aplicării îngrăşămintelor chimice asupracalităţii unor pajişti permanente şi temporare din R.S.România.Lucrări ştiinţifice ale ICPCP Măgurele-Braşov, vol.XIII,pp.1-13.
2. Dragomir, N., Popescu, Ana, 1984 - Influenţa unor măsuri tehnologice asupra producţiei şi calităţii culturilor furajere perene în condiţiile solurilor podzolice din Nord-Vestul ţătii. Analele Iccpt, Vol. Li
3. Fabian, I., Moga, I., 1980, Aspecte fiziologice ale fertilizării culturilor leguminoase. Probleme de agrofitotehnie teoretică şi aplicată, vol. Ii, nr. 4: 412-430.
4. Moga, I., 1993, Cultura leguminoaselor perene. Editura Ceres, Bucureşti.
5. Moga, I., Schitea, Maria, Mateiaş, C.M., 1996 – Plante furajere. Editura Ceres, Bucureşti
6. Puia,I:,Erdelyi,Şt.,Rotar,I.,Eugenia,Chircă,Alina,Şuteu, 1993 – Circuitul azotului în pratoecosisteme, Simpozion Agro-Expo93,Tipo Agronomia,pp.163-170.
7. Resmeriţă, I., Puia, I., Boşeiau, N., Csüröş, St., 1973 – Monografia trifoiului din România. Editura Acadmiei RSR, Bucureşti.
8. Reiter RJ, Tan DX, 2002, Melatonin: an antioxidant in edible plants. Ann N Y Acad Sci 957: 341–344.
9. Rotar,I.,Aurelia,Moldovan,Eugenia,Chircă,Alina,Şuteu,1992, Efectul azotului mineral aplicat unei culturi de lucernă şi factorii care concură la recuperarea lui, Notulae Botanici Hort.- Agrobot.,Cluj.
10. Rotar,I.,1993, Cercetări privind coacţiile de competiţie în culturi pure şi asociate de M.sativa şi D.glomerata în condiţii de fertilizare diferenţiată cu azot.Teză de doctorat USAMV Cluj Napoca.
11. Rotar,I., Savatti,M.,1996, Possibilites d`augmentation de la production des fourrageres proteiques dans les cultures des prairies semes.Symposium Phare V,pp.39/57.

12. Şuteu, Alina,1997, Cercetări privind influenţa fertilizanţilor chimici cu azot asupra unor culturi asociate de graminee şi legminoase perene furajere.Teză de doctorat,USAMV Cluj Napoca.
13. Timirgaziu, C., 1984, Influenţa îngrăşămintelor azotate asupra producţiei şi calităţii amestecului de golomăţ (Dactylis glomerata L.) şi trifoi alb Ladino, în cultură irigată. Analele ICCPT, vol. LI.
14. Todoran, D., 1999, Cercetări privind elementele tehnologice ale culturii amestecului intensiv de trifoi roşu cu raigrasul hibrid în condiţiile din partea estică a Câmpiei Transilvaniei. Teză de doctorat susţinută la U.S.A.M.V. Bucureşti.
15. Toma, I., 1999, Cercetări asupra evoluţiei amestecurilor de Medicago sativa şi Dactylis glomerata pe cernoziomul cambic din Banat. Teză de doctorat susţinută la U.S.A.M.V. Bucureşti.