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BIOLOGICAL NITROGEN SHARE IN LUCERNE PLANTS NUTRITION DEPENDING ON THE ACTIVENESS OF NODULE BACTERIA STRAIN

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In terms of vertical zoning of "alpine" nodule bacteria adapted to the harsh environmental conditions of habitat, it can show their competitive quality in a more favorable "plain" conditions. In the course of the research revealed the most competitive strain of nodule bacteria in conditions of vertical zoning of the Republic of North Ossetia-Alania. The maximum activity of the symbiotic system distinguished options using strains of nodule bacteria from the heights of 1600 and 2000 meters above sea level. Highly competitive, "alpine" strains of rhizobia allowed alfalfa form symbiotic apparatus greatest size, and the size of nitrogen fixation reach 500 kg / ha and more that 1.5 times exceeded the figures control variant using local indigenous races of nodule bacteria. Rhizobia strains, symbiotic showed the greatest activity, satisfy more than 75% of the needs of plants in nitrogen. In an embodiment, strain 1600, the figure has exceeded 78%, while in the embodiment, strain 2000 share of atmospheric nitrogen in plant nutrition was 79.4%.

Key words: biological nitrogen fixation, nodule bacteria, alfalfa, vertical zoning.

The sources of nitrogen in plant nutrition are mineral nitrogen of the soil, nitrogen fertilizers and biological (symbiotically fixed from the atmosphere) nitrogen. It is of great scientific and practical interest share of each of these sources in the diet of legumes. Given that the cost of production, transportation and application of nitrogen fertilizer can reach 40% of the cost of cultivation of agricultural crops, it is expedient reduction of nitrogen fertilizer application to reduce the cost of production [1]. In addition, mineral forms of nitrogen are known to frequently result in the accumulation of nitrate and poor product quality. Using valuable properties eat legumes atmospheric nitrogen using bacteria of the genus Rhizobium nodule helps solve the above problems [1, 3].

Local strains of nodule bacteria usually are efficient factory activity of the strain rysotorphine [4]. At the same time, in conditions of vertical zoning of "alpine" nodule bacteria adapted to the harsh environmental conditions of habitat, can show their competitive quality in a more favorable "plain" conditions. In this context, the aim of our research was put identification on the territory of North Ossetia-Alania of the most active and competitive strains of nodule bacteria of the genus Rhizobium, which will increase the efficiency of nitrogen fixation, that is, increase the share of the participation of atmospheric nitrogen in plant nutrition and thus will reduce the cost of products, improving its quality and sustainability.

Research conducted over the years (2008, 2009, 2010 years) on chestnut soils state land Mozdok (North Ossetia-Alania, Mozdok district, Trinity). The objects of research were sinehybrid alfalfa (Medicago varia Mart). Zoned in the North Caucasus region Nadezhda varieties and local races nodule bacteria of the genus Rhizobium. The strains of nodule bacteria for research were selected from rhizosphere of roots of wild species of alfalfa blue inhabiting different elevations in different ecological conditions: 130 meters above sea level – II agroclimatic area (p. Trinity, Mozdok District), 400 m asl – III agroclimatic area (p. Brutus, bank districts), 1000 m above sea level – A mountainous area (p. Upper Saniba, Prigorodny District), 1600 m above sea level – A mountainous area (p. Lamardon, Suburban area) and 2000 m asl – A mountainous area (p. Tib, Alagirsky district).

Conducted experience:

1. Control – inoculation rysotorphine made from local races nodule bacteria (Mozdok – 130 m).

2. Strain 400 – inoculation rysotorphine made from nodule bacteria, selected at an altitude of 400 m above sea level

3. Strain-1000 – inoculation rysotorphine made from nodule bacteria taken at an altitude of 1000 m above sea level

4. Strain-1600 – inoculation rysotorphine made from nodule bacteria taken at an altitude of 1600 m above sea level

5. Strain-2000 – inoculation rysotorphine made from nodule bacteria taken at an altitude of 2000 m above sea level

6. Strain 425a – inoculation strain rysotorphine factory mark 425a (Saint-Petersburg).

Studies maximum activity symbiotic system distinguished options using strains of nodule bacteria from the heights of 1600 and 2000 meters above sea level [2]. Highly competitive, "alpine" strains of rhizobia allowed alfalfa form symbiotic apparatus greatest size, and the size of nitrogen fixation reach 500 kg / ha and more, which is 1.5 times more than in the control variant using local indigenous races of nodule bacteria. In our studies of mineral nitrogen fertilizers were not applied, and therefore, in the nutrition of plants were only two sources of nitrogen – soil and atmospheric.

As can be seen from Table 1, the share of atmospheric nitrogen in the diet of alfalfa plants in all years of experience and in all cases was over 50%. At the same time, the minimum participation of biological nitrogen in the diet (50%) observed in 2008 in the first year plantings control variant. 1.5% were more indicators have variants Strain 400. In 2009, the share of atmospheric nitrogen in plant nutrition was the first year in these cases 57,2-58,8%, due, apparently, to the best conditions of moisture this year, and the nodule bacteria are known to be demanding that environmental factor.

Table 1 – Share of the atmospheric nitrogen in plant nutrition alfalfa%

Life year	Year	Control	Strain 400	Strain 1000	Strain 1600	Strain 2000	Strain 425a
Year of sowing	2008	50,0	51,5	68,0	75,1	75,3	67,9
	2009	57,2	58,8	74,4	81,0	81,9	75,8
Second year of life	2009	54,6	56,5	71,8	74,0	74,8	66,4
	2010	65,6	66,9	78,6	80,3	81,6	71,9
Third year of life	2010	75,7	76,7	83,0	81,3	83,2	78,2

The crops of the second year of life in 2009 and 2010, studied figure rose in the control variant 4.6 and 8.4%, and in a variant strain of 400 – by 5.0 and 8.1%. In the third year of life plants the proportion of atmospheric nitrogen in plant nutrition has reached 75,7-76,7%. It should be noted that in all these years of research options excelled lowest interest rates of atmospheric nitrogen in the nutrition of alfalfa plants, which confirms the low symbiotic activity of local native strains from the heights of 130 and 400 meters above sea level in comparison with the "high mountain".

Strain-1000, to take a more active symbiotic activity in the year of sowing provided 68,0-74,4% of atmospheric nitrogen in plant nutrition alfalfa. Roughly at the same level were indicators of the sixth embodiment with the strain of the factory marks 425a. In the second year of use of crops in the variant strain – 1000 plants consumed 71,8-78,3% nitrogen from the air, and in a variant strain 425a – on 5,4-6,7% less. In crops, the third fraction of atmospheric nitrogen in plant nutrition has reached 83% in the variant strain 1000 and 78.2% in the embodiment using the strain 425a.

The maximum share of atmospheric nitrogen in plant nutrition distinguished options Strain-Strain 1600 and 2000 in all the years of research: the first year of life plants, it was 75,1-81,9%, in the second year – and 74,0-81,6% in the third year – 81,3-83,2%.

For a more visual and accurate comparison of variants of the experiment in Figure 1 shows the share of sources of nitrogen in plant nutrition alfalfa, calculated on the average of all time stu-

dies. As can be seen from the figure, rysotorphine strains, showed the greatest symbiotic activity satisfy more than 75% of the needs of plants in nitrogen. In an embodiment, strain 1600, the figure has exceeded 78%, while in the embodiment, strain 2000 in the proportion of nitrogen in the air feeding the plant was 79.4%. Therefore, the activation of symbiotic nitrogen fixation can significantly increase the interest of atmospheric nitrogen in plant nutrition alfalfa, thus will reduce the cost of the resulting hay and protect the environment from the adverse effects associated with the use of mineral nitrogen fertilizers.

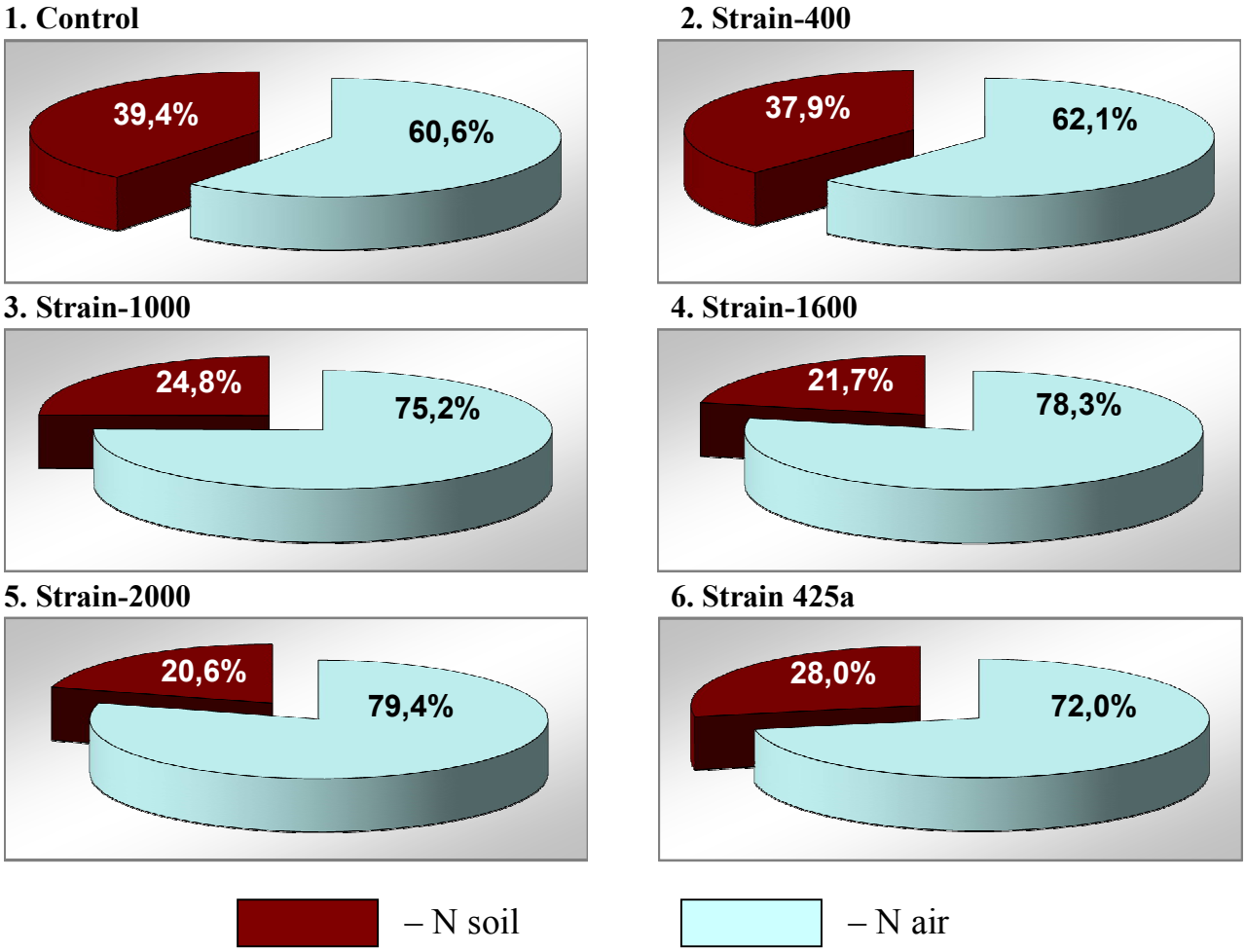

Fig.1 – **Nitrogen sources in alfaalfa plants nutrition**, % (average between 2008-2010s)

References

1. Agroecology: Textbook for high schools / edited by V.A. Chernikov, A.I. Chekeres. M., 2000.
2. Doev D.N., Kozyrev A.H. Active strains of nodule bacteria of alfalfa depending on the vertical zonation // Proceedings of Gorsky State University of Agriculture. Volume 51, Part 1. Vladikavkaz, 2014.
3. Kozyrev A.H. Scientific substantiation of realization of biological potential of alfalfa in the central part of the North Caucasus // Abstract of diss. Ph.D. of agricultural sciences. Vladikavkaz, 2009.
4. Alborova P.V., Farniev A.T. The effectiveness of local strains of nodule bacteria clover / Ecology and reproduction phytocenoses in North Ossetia-Alania: Materials of interuniversity conference. -Vladikavkaz, the North Ossetian branch of the Russian Botanical Society, 2002.