



DYNAMICS OF NUTRITION ELEMENTS IN FODDER CROPS AGROCENOUSES

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ABSTRACT

Rapeseed and rapeseed and millet mixtures are cultivated, the supply of chernozem with nitrate nitrogen is low and medium, the supply of ammonium nitrogen is high. The availability of mobile phosphorus is reduced by the end of the growing season. The availability of exchange potassium for these crops is very high.

KEY WORDS: *plant nutrients, nitrate nitrogen, ammonium nitrogen, mobile phosphorus, fodder grasses, rape, millet, binary crops.*

INTRODUCTION

Biologization of crop rotations is important condition for the stable functioning of agrocenoses and increasing soil fertility [2,5]. The plant residues are source of humus substances and plant nutrients, because they enter to the soil during the cultivation of highly productive crops. The study of the nutritional elements dynamics in chernozems in the cultivation of rape and rape and millet mix is the goal of our study. The research was carried out in 2015-2016 in the Krasnoyarsk forest-steppe in the educational sector "Minderlinskoye" of the Krasnoyarsk State Agrarian University. The spring rape (100% , Nadezhny 92 grade) and binary crops of spring rapeseed (40%, Nadezhny 92 grade) and millet (60%, Kinelskoe 92 grade) are research objects. The soil cover of the research areas is represented by a complex of chernozems of leached and ordinary medium-humus medium loams. The main agrochemical indicators in soil samples were determined by standard methods [1]. The mineral forms of nitrogen (ammonium and nitrate) are appearing in the soil solution when decomposing

organic matter and plant residues. At the first stage, the process of decomposition of organic compounds takes place. This is the result of enzymatic hydrolysis and the decomposition of nitrogen-containing organic substances to ammonia (ammonification process). This involved anaerobic and aerobic ammonifying microorganisms. The ammonia is absorbed by soil colloids, and can also be absorbed by plants in the anaerobic conditions. But in aerobic conditions, ammonia is passes into nitrite and then oxidizes to nitrates (nitrification) under the influence of specific microorganisms. Nitrate form of nitrogen is most accessible to plants [3]. In July 2015, in pure rape crops, the maximum content of ammonium and nitrate nitrogen is 3.2 and 1.6 mg / 100 g, respectively. In August, the content of ammonium nitrogen decreases to 2 mg / 100 g, and nitrate to 0.77 mg / 100 g. Dynamics of nitrate and ammonium forms of nitrogen connected with the activity of microorganisms. Microorganisms decompose plant remains and mobile organic matter in the soil more intensively in the middle of vegetation period. The

weather conditions were facilitating in this period. July 2015 was quite warm and humid (SCC was 1.1). In August, all the mineral nitrogen is assimilated by plants or washes out of the soil by precipitation (the SCC in August 2015 was 1.2), so its content drops sharply in the soil. In addition, the predominance of ammonium nitrogen is noticeable in comparison with nitrate nitrogen in agrochernozem, which is typical for soils in Siberia [4]. In 2016, in binary crops of rapeseed and millet, the content of nitrate nitrogen decreases from June to

August from 1.2 mg / 100 g to 0.6 mg / 100 g. The content of ammonium nitrogen, on the contrary, tends to increase at the end of the growing season, so its content in June was 1.2, and in August - 1.8 mg / 100 g. Such a difference in the dynamics of forms of nitrogen, compared with the pure crops of rapeseed, is associated with the biological characteristics of crops. Millet is a meadowlike culture, which at the beginning of the growing season needs nitrogen, in the period of tillering the plant intensively uses nitrogen, phosphorus and calcium.

Table 1. The content of nutrients in agrochernozem, mg / 100 g

Term of selection	Elements of a food			
	N-NO ₃	N-NH ₄	P ₂ O ₅ (By Chirikov)	K ₂ O (By Chirikov)
	Rape (2015 r)			
May	1,11	2,13	26,9	44,1
July	1,66	3,20	25,1	27,8
August	0,77	2,00	17,2	26,5
Mean ± error of mean	1,18±0,39	2,45±0,81	23,1±7,7	32,7±10,9
Standard deviation	0,41	1,29	6,2	9,8
The coefficient of variation,%	34,8	52,0	26,0	29,0
Rape + Millet (2016 r)				
June	1,22	1,19	42,2	63,2
July	0,97	1,39	33,4	61,4
August	0,63	1,77	28,5	62,4
Mean ± error of mean	0,94±0,38	1,45±0,59	34,7±14,2	62,4±20
Standard deviation	0,26	0,62	10	8,9
The coefficient of variation,%	28,1	42,9	31,5	14,2

Accumulation of ammonium nitrogen can be associated with the introduction into the soil of plant residues not only of rape, but millet. Vegetable residues of bluegrass cultures contain more carbon, have a broad C: N ratio, and, therefore, decompose more slowly. This was facilitated by the weather conditions of the growing season of 2016, when arid conditions were observed in the middle of the vegetation period (the SCC in June was 0.5, in July 0.9). In addition to various forms of nitrogen, in the decomposition of plant residues and soil organic matter, mineral forms of phosphorus accessible to plants enter the soil solution. A significant part of the mineral compounds of phosphorus is introduced by the soil-forming rock. Phosphorus is relatively stable in the soil and is not lost as easily as nitrogen as a result of volatilization and leaching. The high stability (low solubility) of phosphorus in soils is the direct cause of the lack of soil phosphorus for plants.

The dynamics of the content of mobile phosphorus was similar in agrocoenoses of rapeseed and binary crops of rapeseed and millet. The phosphorus content gradually decreased by the end of the vegetation, so in May 2015 it was 26.9 mg / 100 g, and in August - 17.2 mg / 100 g; In June 2016 - 42.2 mg / 100 g, and in August - 28.5 mg / 100 g. The decrease in the content of mobile phosphorus in the soil is due to the intensive use of this element by herbs during the growing season. In general, in the studied agrocoenoses, the supply of soils with nitrate nitrogen is low and medium and belongs to the second and third classes, the supply of ammonium nitrogen is high and belongs to the fifth and sixth classes. The availability of mobile phosphorus decreases by the end of the growing season from the sixth to the third class. The availability of exchange potassium in agrochernozem for these crops is very high.

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