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ESTIMATION OF CHEMICAL AVAILABILITY INDEXES OF SOIL NITROGEN

Mirjana Kresović[1], V. Ličina[1] and Svetlana Antić Mladenović[1]

Abstract: The researches were performed on brown forest soil used within stationary experiment with a certain fertilizing system for more than 40 years. Researches were made on experiment variants where the increasing dosage of nitrogen fertilizer was applied. The aim of the research was to establish which plant and soil parameters (pots and/or field) might be considered reliable to evaluate values of applied chemical methods (hot water method and easily hydrolyzing nitrogen), being methods used to evaluate potentially mineralized nitrogen in soil. We also wanted to establish the most favorable time to evaluate the values of applied methods (March, July and October). On the basis of established correlation dependences, the plant and soil parameters, either from pots or fields should be used to evaluate the reliability of the hot water method and the reliability of mentioned methods can be estimated in March, July and October. As for the evaluation of easily hydrolyzing nitrogen, we can use both plant and soil parameters in controlled conditions and in the field and the most suitable time is in spring (March) and in fall (October).

Key words: method, hot water, easily hydrolyzing nitrogen, nitrogen availability.

Introduction

For the purpose of evaluation of potentially mineralized nitrogen in soil, two groups of methods are used: biological and chemical (biological and chemical indexes of nitrogen availability) (Goh and Haynes, 1986, Brown, 1996, Bogdanovic et al. , 2005).

Utilization of chemical methods has certain advantages referring to biological ones that are mostly based on a higher speed and accuracy. There are certain doubts concerning the application of these methods that refer to the impossibility

[1] Mirjana Kresović, PhD, associate professor, Vlado Ličina, PhD, associate professor and Svetlana Antić-Mladenović, PhD, assistent professor, Faculty of Agriculture, Belgrade - Zemun, Nemanjina 6, Serbia

of finding the extraction matter that could imitate the affect of micro organisms and release of available nitrogen to the plants (Goh and Haynes, 1986). Regardless shown doubts, a large number of chemical methods were used, even in a longer time interval referring to the biological methods.

Within these researches, two chemical methods were applied: hot water method and easily hydrolyzing nitrogen method.

Plant parameters from controlled conditions were mostly used to evaluate the values of chemical methods for the purpose of estimation of potentially mineralized nitrogen in soil (Keeny and Bremner, 1966 a, b, Stanford and Legg, 1968, Curtin et al. 2006).

The aim of our research was to determine which of used plant and soil parameters (controlled conditions and/or field) might be considered reliable for evaluation of values in used methods to estimate potential mineralizing nitrogen in soil. We also wanted to find the most favorable time to estimate potential mineralizing nitrogen in soil (October, March or July) by using before mentioned methods.

Material And Methods

Researches were performed on a stationary experiment on brown forest soil with determined crop rotation and fertilizing system that has been used for 40 years.

The soil samples were taken in October, March and July (0-30 cm depth), from the experiment variants where the increasing doze of nitrogen was applied.

Methods for soil chemical properties determination

General chemical properties of investigated were established in soil samples taken in March by the following methods:

- Soil reaction (pH-H_2O and 1 M KCl)
- Organic carbon and humus (Tjurin, Modification Simakova, 2001 a)
- Total nitrogen (Semimikro Kjeldahl, Bremner 1996)
- Available phosphorous and potassium (Al-method, Egner-Riehem, 1960)

Experiment in pots

Plastic pots with 2 kg of soil were used to make the experiment in controlled conditions (green house). The soil samples were taken in spring (in March, 0-30 cm depth) from selected field experiment variants, with three repetitions.

Before the oat seeding, the soil was mixed with NH_4 NO_3, KH_2 PO_4 and KCl. Used ammonium nitrate was marked with stable isotope ^{15}N (11. 8%).

Vegetation experiment was made with two variants: PK and NPK. For PK variant, 50 mg of P_2O_5 and K_2O/kg of soil was used and for NPK variant also 50 mg of N, P_2O_5 and K2O/kg of soil.

The experiment was made with oat plants, 10 plants in each pot and the plants were cultivated to the jointing stage. Soil moisture during the experiment was kept at the level of 60 – 80% WHC.

Experiment in field

Selected experiment variants in field were those where the increasing dose of nitrogen fertilizer was applied, namely: control; $N_1P_2K_2$ (N_1-60, P_2-120, K_2-120 kg/ha; $N_2P_2K_2$ (N_2-90kg/ha); $N_3P_2K_2$ (N_3-120kg/ha) and $N_4P_2K_2$ (N_3-150 kg/ha). Each of mentioned field experiment variants was repeated three times.

Wheat was cultivated on the stationary experiment when these researches were performed.

Methods for estimation of potentially mineralizing nitrogen - Hot water extraction

This method was applied on the soil samples taken from the stationary experiment, from before mentioned experiment variants (three repetitions) in October, March and July.

Soil samples were boiled in distilled water with back-up cooler for 60 minutes. After that, 10% of K_2SO_4 was added and the samples were digested with concentrated H_2SO_4 in the presence of catalyst mixture ($CuSO_4$: Se – 1:0. 1). Distillation was made with 10 M NaOH and the distillate was taken in boric acid. Titration was performed with 0. 0025 M H_2SO_4 (Livens, 1959).

Easily hydrolyzing nitrogen

Easily hydrolyzing nitrogen was also determined for all three terms of sample takings, i. e. in October, March and July. Its content was determined by the Tjurina and Kononova method (2001b).

Analysis of plant material

Nitrogen content in oat plants, as well as in the wheat kernel and straw was determined by the distillation method (Munsinger and McKinney, 1982).

Method of statistical analysis

A simple linear correlation analysis was applied for the plant and soil parameters in controlled conditions and in the field, i. e. the applied methods for evalu-

ation of potentially mineralizing soil nitrogen for all three terms of taking soil samples.

Application of this statistical analysis enabled the determination of correlation coefficient values (Pirson) concerning the degree of similarity, i. e. dependence of two compared values.

On the basis of correlation coefficient values, the percentage of correlation dependences was calculated for r=0. 05 – 0. 99, with significance at the probability level of 0. 05-0. 01 and for r≥0. 70 with significance at the probability level of 0. 01.

This calculation on the basis of these data was made in order to determine which group of used plant and soil parameters (pots and /or field) might be considered as the most suitable to evaluate the reliability of applied methods, as well as to determine the most reliable time to make such evaluation (October, March or July).

As a criterion, we have take into consideration the fact that the most reliable parameters for the evaluation of values in used methods might be considered those that gave in more than 50% of the cases the correlation dependence with the correlation coefficient value r=0. 50-0. 99, with significance at the probability level of 0. 01-0. 05 and when in more than 50% of the cases the established correlation coefficient value was r>0. 70, with significance at the probability level of 0. 01. Identical criterion is valid also for determination of most suitable time to evaluate the soil nitrogen availability by the applied methods.

Results and Discussion

Significant chemical properties are presented in Table 1.

T a b. 1. – Chemical properties of investigated soil

Field variants	pH		Humus (%)	Total nitrogen (%)	C/N	Available	
	water	n KCl				P_2O_5 (mg/ 100g)	K_2O (mg/ 100 g)
Control	5. 40	4. 60	1. 43	0. 098	8. 5	6. 4	16. 2
$N_1P_2K_2$	5. 10	4. 30	1. 67	0. 111	8. 7	18. 0	21. 8
$N_2P_2K_2$	5. 00	4. 20	1. 81	0. 113	9. 3	14. 4	21. 8
$N_3P_2K_2$	4. 90	4. 15	1. 85	0. 113	9. 5	16. 0	25. 0
$N_4P_2K_2$	5. 00	4. 05	1. 88	0. 116	9. 4	12. 5	21. 8

Investigated soil belongs to a category of acid, i. e. very acid soils.

As per humus content, the soil is poorly humus and as per total nitrogen content it is on the limit of poor content. The C/N relation is somewhat lower from usual values for cultivable soil (below 10).

Content of available phosphorus was unequal in variants of field experiments, from poor to average available.

The soil is well provided with available potassium and in a control variant has an average availability.

In order to establish which parameters of plants and soils might be considered reliable for evaluation of applied methods, being one of the aims of these researches, the parameters of plants and soils were determined from the experiments in pots (controlled conditions and in field). Their values are presented in Tables 2, 3, 4, 5 and 6. Results are presented as mean values of three repetitions.

Tab. 2. – Parameters of plants in pot (g/pot)

Field variants	Yield NPK	Yield PK	Relative increase in yield (%) PK=100	Difference in yield (g/pot) NPK-PK	Relative increase in yield (%) ∅ = 100		Difference in yield	
					NPK	PK	NPK-∅	PK-∅
Control	10. 26	2. 25	456	8. 01	100	100	-	-
$N_1P_2K_2$	10. 84	3. 58	303	7. 26	106	159	0. 58	1. 33
$N_2P_2K_2$	10. 86	4. 18	260	6. 68	106	186	0. 60	1. 93
$N_3P_2K_2$	11. 22	4. 69	239	6. 53	109	208	0. 96	2. 44
$N_4P_2K_2$	11. 10	6. 36	174	4. 74	108	283	0. 84	4. 11

Tab. 3. – Parameters of soil in pot (mg/pot)

Field variants	Total uptake of nitrogen NPK	Uptake of soil nitrogen NPK	Uptake of fertilizer nitrogen NPK	Uptake of soil nitrogen/ fertilizer	Total uptake of nitrogen PK
Control	90. 0	58. 1	31. 9	1. 8	18. 5
$N_1P_2K_2$	105. 8	72. 4	33. 4	2. 2	22. 9
$N_2P_2K_2$	118. 0	83. 8	34. 2	2. 4	30. 3
$N_3P_2K_2$	110. 1	78. 0	32. 1	2. 4	30. 1
$N_4P_2K_2$	115. 1	84. 4	30. 7	2. 7	48. 5

Tab. 4. – Parameters of plants in field ($t \cdot h^{-1}$)

Field variants	Yield of grain	Yield of straw	Total yield
Control	0. 95	1. 21	2. 16
$N_1P_2K_2$	3. 90	6. 08	9. 98
$N_2P_2K_2$	4. 38	6. 30	10. 68
$N_3P_2K_2$	4. 96	6. 20	11. 16
$N_4P_2K_2$	5. 13	6. 77	11. 90

Tab. 5. – Parameters of plants in field

Field variants	Relative increase in yield∅=100	Difference in yield NPK-∅	% N Grain	% N straw
Control	100, 0	-	1, 239	0, 209
$N_1P_2K_2$	408, 9	29, 5	1, 463	0, 261
$N_2P_2K_2$	458, 9	34, 2	2, 015	0, 272
$N_3P_2K_2$	520, 6	40, 1	2, 172	0, 424
$N_4P_2K_2$	537, 8	41, 8	2, 359	0, 426

Tab. 6. – Parameters of soil in field (kg/ha)

Field variants	Uptake of nitrogen (grain)	Uptake of nitrogen (straw)	Total uptake of nitrogen
Control	11, 82	2, 53	14, 35
$N_1P_2K_2$	57, 07	15, 88	72, 95
$N_2P_2K_2$	88, 22	17, 15	105, 37
$N_3P_2K_2$	107, 88	26, 33	134, 21
$N_4P_2K_2$	121, 04	28, 85	149, 89

Taking into consideration the fact on most frequently used parameters as well as the recommendations of Saposnjikov (1973), parameters used to evaluate the applied methods are divided into two groups, i. e. parameters in controlled conditions (pots) and parameters in field. They are further grouped as plant parameters and soil parameters. All parameters used in these researches are shown in Table 8.

Nitrogen quantities in soil established by the hot water method are shown in Table 7 as mean values of three repetitions.

Tab. 7. – Nitrogen quantities established by the hot water method (ppm)

Field variants	March	July	October
Control	34. 3	38. 9	35. 2
$N_1P_2K_2$	44. 3	52. 7	42. 9
$N_2P_2K_2$	55. 8	56. 7	46. 0
$N_3P_2K_2$	44. 3	57. 9	53. 2
$N_4P_2K_2$	70. 9	59. 3	52. 0

Hot water belongs to a group of weak extraction means (Haynes, 1986) and this procedure is used to determine the available nitrogen content (NH4-NO3-N) and a part of soil organic nitrogen (the most unstable fractions).

Hot water method was mostly estimated by using the soil parameters and parameters of plants cultivated in pots. Parameters used for its evaluation were the yield and adopted nitrogen (Keeney and Bremner, 1966a, Keeney and Bremner, 1966b, Gasser and Kalembasa, 1976).

Data on nitrogen quantities in soil established by the hot water method were compared to the parameters of plants and soil (pots and field) and the correlation coefficient values are presented in Table 8.

Tab. 8. – Correlation coefficient values between plant and soil parameters and nitrogen quantities established by hot water method

Parameters of plants and soil (pot)	March	July	October
Yield (NPK)	NS	0. 69**	0. 66**
Yield (PK)	0. 89**	0. 85**	0. 88**
Relative increase in yield (PK=100)	-0. 83**	-0. 94**	-0. 91**
Relative increase in yield (NPK) (∅=100)	NS	NS	NS
Relative increase in yield (PK) (∅=100)	0. 82**	0. 78**	0. 73**
Difference in yield (NPK-PK)	-0. 85**	-0. 68**	-0. 74**
Difference in yield (NPK-∅)	NS	NS	NS
Difference in yield (PK-∅)	0. 82**	0. 78**	0. 73**
% N in plants (NPK)	0. 66**	0. 72**	0. 54
% N in plants (PK)	NS	NS	NS
Total uptake of nitrogen (NPK)	0. 70**	0. 85**	0. 69**
Uptake of soil nitrogen (NPK)	0. 79**	0. 90**	0. 78**
Uptake of fertilizer nitrogen (NPK)	NS	NS	NS
Uptake of soil nitrogen/fertilizer	0. 93**	0. 91**	0. 88**
Soil nitrogen uptake (PK)	0. 94**	0. 72**	0. 76**
Parameters of plants and soil (field)			
Yield of grain	0. 74**	0. 90**	0. 84*
Yield of straw	0. 64**	0. 87**	0. 78**
Total yield	0. 68**	0. 88**	0. 81**
Relative increase in yield (∅=100)	NS	NS	NS
Difference in yield (NPK-∅)	0. 61**	0. 62**	NS
% N in grain	NS	NS	NS
% N in straw	0. 97**	0. 97**	0. 94**
Uptake of nitrogen-grain	0. 88**	0. 76**	0. 80**
Uptake of nitrogen-straw	0. 86**	0. 81**	0. 84**
Total uptake of nitrogen	0. 80**	0. 81**	0. 81**

** - significant of probability level 0. 01
* - significant of probability levels 0. 05
NS - no statistic value

In March, parameters of plants in field gave lower correlation coefficients with applied method in relation to these parameters in pots. Soil parameters in field gave high correlation coefficients with a high degree of statistical significance.

In July, as in March, parameters of plants and soil in controlled conditions, with applied method gave mostly high correlation dependences. For the same parameters of experiments in pots, nor in July as well as in March, no statistically significant correlation dependence was established. Yield parameters in field, as well as the relative parameters and difference parameters derived from the yield, gave higher correlation coefficient values than in March when hot water method was used. Adopted nitrogen by cultivated wheat gave lower correlation coefficients compared to those found in March.

Parameters of plants and soil (pots and field) in October, together with nitrogen quantity established by the hot water method, gave the same or nearly the same correlation dependences as in March and July.

From parameters used to evaluate the values of applied method, yield and adopted nitrogen were dominant in PK variant of experiment and adopted nitrogen in PK variant of experiment in pots, everything being in accordance to the results of Keeney and Bremner (1966b) and Gasger and Kalembas (1976). Nevertheless, it should be emphasized that created yield and adopted nitrogen in the plants cultivated in the field also gave high correlation dependences with high degree of statistical significance. This is important because these are the parameters that could be established much easier and simple referring to the parameters of plants cultivated in controlled conditions.

The percentages of correlation dependences for given criteria (rμ values) were established in order to define more precisely which of used plant and soil parameters (pots and/or field) can be considered reliable for estimation of values in hot water method. These percentages are presented in Table 9.

*Tab. 9. – Percentages of correlation dependences for r=0. 50-0. 99 (** and *) and for r >0. 70** between parameters of plants and soil and nitrogen content established by the hot water method in brown forest soil (March, July, October)*

Parameters	Percentage of correlation dependences for r=0. 50-0. 99 (** and *)	Percentage of correlation dependences for r ≥ 0. 70
	MARCH	
Plant and soil parameters in pots	66. 7	60. 0
Plant and soil parameters in field	80. 0	50. 0
	JULY	
Plant and soil parameters in pots	73. 3	60. 0
Plant and soil parameters in field	80. 0	70. 0
	OCTOBER	
Plant and soil parameters in pots	73. 3	53. 3
Plant and soil parameters in field	70. 0	70. 0

On the basis of established correlation dependences for both given criteria it might be concluded that the estimation of hot water method as a procedure to determine potentially mineralizing nitrogen can be made in spring (March), summer (July) and fall (October).

Taking into consideration the fact that nearly the same percentage of correlation dependences was established for all used parameters (pots and field), we can recommend the application of parameters either from pots or from field to evaluate the values of applied method.

Besides the hot water method, easily hydrolyzing nitrogen method was applied in all researches and the nitrogen quantities established by this procedure are presented in Table 10.

Tab. 10. – Easily hydrolyzed nitrogen content in soil (ppm)

Field variants	March	July	October
Control	42. 2	41. 6	39. 0
$N_1P_2K_2$	46. 5	45. 6	46. 9
$N_2P_2K_2$	46. 5	46. 7	49. 2
$N_3P_2K_2$	57. 7	70. 1	62. 0
$N_4P_2K_2$	80. 4	101. 1	65. 8

Easily hydrolyzed nitrogen content in soil can indicate the capability of soil to provide the available nitrogen to the plants. As per Tjurin and Konovoj, 25-30% of easily hydrolyzed nitrogen might be considered accessible to the plants.

Easily hydrolyzed nitrogen method was evaluated by the parameters of plants and soil from controlled conditions (Keeney and Bremner, 1966a, Poljakov, 1970, Sirota, 1973). For this evaluation we have used the adopted nitrogen by cultivated plants as well as the field parameters (Poljakov, 1970, Sirota, 1973, Davidesku, 1983) where adopted nitrogen and achieved yield.

Data on content of easily hydrolyzing nitrogen in investigated forest brown soil were compared to the parameters of plants and soil (pots and field) and correlation coefficient values are presented in Table 11.

Tab. 11. – Correlation coefficient values between plant and soil parameters and easily hydrolyzed nitrogen in brown forest soil

Parameters of plants and soil (pot)	March	July	October
Yield (NPK)	NS	NS	0. 62*
Yield (PK)	0. 92**	0. 91**	0. 93**
Relative increase in yield (PK=100)	-0. 77**	-0. 76**	-0. 88**
Relative increase in yield (NPK) (∅=100)	NS	NS	NS
Relative increase in yield (PK) (∅=100)	0. 95**	0. 95**	0. 87**
Difference in yield (NPK-PK)	-0. 86**	-0. 86**	-0. 81**
Difference in yield (NPK-∅)	NS	NS	NS
Difference in yield (PK-∅)	0. 95**	0. 95**	0. 87**
% N in plants (NPK)	NS	NS	NS
% N in plants (PK)	NS	NS	NS
Total uptake of nitrogen (NPK)	NS	NS	0. 59*
Uptake of soil nitrogen (NPK)	0. 58**	0. 56*	0. 70**
Uptake of fertilizer nitrogen (NPK)	NS	NS	NS
Uptake of soil nitrogen/fertilizer	0. 84**	0. 82**	0. 88**
Soil nitrogen uptake (PK)	0. 94**	0. 92**	0. 86**
Parameters of plants and soil (field)			
Yield of grain			
Yield of grain	0. 66**	0. 65**	0. 80**
Yield of straw	NS	NS	0. 70*
Total yield	0. 56*	0. 55*	0. 74**
Relative increase in yield (∅=100)	0. 62*	0. 61*	NS
Difference in yield (NPK-∅)	0. 72**	0. 75**	0. 63*
% N in grain	NS	NS	0. 92*
% N in straw	0. 99**	NS	0. 99**
Uptake of nitrogen-grain	0. 91**	0. 89**	0. 88**
Uptake of nitrogen-straw	0. 87**	0. 86**	0. 89**
Total uptake of nitrogen	0. 90**	0. 89**	0. 88**

**- *significant of probability levels 0. 01*
* - *significant of probability levels 0. 05*
NS - *no statistic value*

In March, very high correlation dependences or high negative dependences with a high degree of statistical significance were established between parameters of plants cultivated in controlled conditions and the content of easily hydrolyzing nitrogen in half of applied parameters, while in the other half of applied parameters statistically significant correlation dependences were not found. In applied method, parameters of plants in field gave average correlation dependences, except in content of nitrogen in straw (r=0. 99**). As for the soil parameters in field, very high correlation dependences with a high degree of statistical significance were established.

In July, statistically significant correlation dependences for the same parameters as in March were established between parameters of plants and soil in pots and easily hydrolyzing nitrogen, even the values of correlation coefficients were the same or nearly the same. Identical situation happened for the values of correlation coefficient established between parameters of plants and soil in field and applied method, with a difference that in July, statistically significant correlation dependence between the nitrogen content in wheat straw and easily hydrolyzing nitrogen was not established.

In October, in regard to March and July, in most of the cases, statistically significant correlation dependences between used parameters of plants and soil (pots and field) and the content of easily hydrolyzing nitrogen were established.

On the basis of established correlation coefficients, the percentages of correlation dependences for given criteria were calculated. Their values are presented in Table 12.

*Tab. 12. – Percentages of correlation dependences for r=0. 50-0. 99 (** and *) and for r≥0. 70** between plant and soil parameters and easily hydrolyzing nitrogen in brown forest soil*

Parameters	Percentage of correlation dependences for r = 0. 50-0. 99 (** and *)	Percentage of correlation dependences for r ≥ 0. 70**
	MARCH	
Plant and soil parameters in pots	53. 3	46. 7
Plant and soil parameters in field	80. 0	50. 0
	JULY	
Plant and soil parameters in pots	53. 3	46. 7
Plant and soil parameters in field	70. 0	40. 0
	OCTOBER	
Plant and soil parameters in pots	66. 7	53. 3
Plant and soil parameters in field	80. 0	50. 0

Based on presented results in Table 12, it might be concluded that the most suitable time for estimation nitrogen soil availability with mentioned procedure is in fall (October), although the estimation can be made also in early spring (March).

For the estimation of value concerning the applied method, it is possible to use the plant and soil parameters in controlled conditions, as well as the parameters in field.

Taking into consideration the fact that it is possible to use both parameters (pots or field), there is certainly the recommendation to use field parameters since they can be provided in a simpler and quicker way in contrast to parameters from pots requiring more work and application of expensive procedures and equipment (isotopic marked ^{15}N).

Conclusion

In accessing the soil nitrogen availability by using chemical indexes of nitrogen availability (hot water and easily hydrolyzing nitrogen) for conditions that occurred in investigated brown forest soil, it might be concluded as follows:

- Estimation of reliability of hot water method, being a procedure for establishing potentially mineralizing nitrogen is possible to make in March, July and October.
- Plant and soil parameters either from pots or field should be used to estimate the value of before mentioned method.
- The most suitable time to estimate nitrogen soil availability by the easily hydrolyzing method is mostly in fall (October), although the estimation can be made in early spring (March) as well.
- For the estimation of value concerning easily hydrolyzing nitrogen method, it is possible to use both plant and soil parameters from controlled conditions and plant and soil parameters from field
- It has been established that parameters from pots and from field can be used for both chemical methods (hot water and easily hydrolyzed nitrogen) so that we have a possibility of choosing those that can be easier and quicker to establish. This concerns certainly the field parameters.

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OCENJIVANJE HEMIJSKIH INDEKSA PRISTUPAČNOSTI AZOTA ZEMLJIŠTA

Mirjana Kresović[1], V. Ličina[1] i Svetlana Antić Mladenović[1]

R e z i m e

Istraživanja su obavljena na stacionarnom ogledu, na zemljištu tipa gajnjača, gde se primenjuje određeni sistem djubrenja već 40 godina. Odabrane su varijante ogleda gde se primenjuje rastuća doza azota đubriva.

Za ocenu potencijalno mineralizujućeg azota u zemljištu korišćene su dve hemijske metode (hemijski indeski pristupačnosti azota) i to: metoda vrele vode i lakohidrolizujući azot. Radi utvrdjivanjs parametara kojima će se procenjivati vrednost primenjenih metoda izvedena su dva ogleda i to: ogled u polju i ogled u sudovima (kontrolisani uslovi), gde je korišćen azot koji je bio izotopski obeležen 15N (11. 8%). Hemijski indeksi pristupačnosti azota su utvrđivani u tri vremena (mart, juli i oktobar).

Cilj ovih istraživanja je bio da se utvrdi koji se parametri biljaka i zemljišta (sudovi i/ili polje) mogu smatrati pouzdanim za ocenu vrednosti primenjenih hemijskih metoda, kao i da se utvrdi koje je najpovoljnije vreme za ocenu vrednosti primenjenih metoda (mart, juli i/ili oktobar).

Na osnovu utvrđenih korelativnih zavisnosti za metodu vrele vode se ravnopravno mogu koristiti parametri biljaka i zemljišta iz sudova i iz polja, a vrednost korišćene metode se procenjivati u martu, julu ili oktobru. Za ocenu vrednosti metode lakohidrolizujućeg azota takodje se mogu koristiti parametri biljaka i zemljišta iz kontrolisanih uslova i polja, što pruža mogućnost odabira onih parametara koji se jednostavnije i brže utvrdjuju. Najpogodnije vreme za ocenu vrednosti metode lakohidrolizujućeg azota je proleće (mart) i jesen (oktobar).

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[1] dr Mirjana Kresović, vanredni profesor, dr Vlado Ličina, vanredni profesor i dr Svetlana Antić-Mladenović, docent, Poljoprivredni fakultet, 11081 Beograd - Zemun, Nemanjina 6, Srbija