OBSERVATION OF AMINO ACIDS AND VITAMIN B1 IN WHEAT GRAIN AFTER MINERAL FERTILIZATION

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Abstract: *The research from the topic announced was conducted in an experimental field of Soil Sciences discipline which is located in B.U.A.S.M.V. "King Michael I of Romania" in Timişoara Didactic Station from Timişoara and after that in the research laboratory of the Agrochemistry Department from the Faculty of Agriculture. The purpose of the paper is to observe specific variations in the determination of amino acids and vitamins B1 of wheat grain, following differentiated mineral fertilization with nitrogen, phosphorus and potassium. The field experiments have a factorial design with two factors, with wheat – maize- sunflower rotation. Each plot is sub-divided in four replicates, linear, with the size of 10 x 3 m (30 m2). The experiment was made about wheat using the zoned variety in the West Plain of the country, namely Alex Variety. The mineral fertilization has the best efficacy if is merged harmonious, and under analytic agrochemical control with the other agrophytotechnical measures which enhances the results of fertilizers application. The period of experimentation, agricultural years 2012-2013 and 2013-2014, were characterized by variable climatic conditions, slightly reduced rainfall from the annual average and high temperatures.*

Keywords: *wheat, chemical fertilizers, experiment, amino acids, vitamin B1.*

INTRODUCTION

The presence of nutritive elements in plants has not to be regarded at a simple accumulation, but their concentration must be linked with their physiological and biochemical purposes in plants metabolism.

All the essential nutritive elements have crucial roles in plants life, each one of them fulfils a role that they cannot replace. Wheat contains a large amount of starch (65-70%), the main component of grain, and some fermentable sugars (maltose, sucrose). All of this has a very important role in energy.

Wheat is rich in proteins (7-22%), which are represented by the provitamins (35-45%), glutenin (35-40%), globulin (15-20%) and albumin (2-5%). They ensure growth and development of the body and play an important biocatalytic and energetic purpose. Wheat contains almost the full range of essential amino acids; however, of these, lysine, methionine, threonine, and tyrosine are found in an insufficient amount for human needs.

Of all agricultural crops, wheat was always accounted for, and in the future will be the most important cultivated species.

MATERIALS AND METHOD

The experience has a two factorial design (4x5) with four replicates, and is placed in sub-divided plots.

Factor fertilization with phosphorus and potassium fertilizer (annually)

a_1 -P_0K_0 - Martor
a_2 -$P_{50}K_{50}$ - (P_2O_5 kg/ha, K_2O kg/ha)
a_3 - $P_{100}K_{100}$ - (P_2O_5 kg/ha, K_2O kg/ha)
a_4 - $P_{150}K_{150}$ - (P_2O_5 kg/ha, K_2O kg/ha)

Factor B -fertilization with nitrogen (annually)

b_1 - N_0 - Martor

b_2 - N_{50}- (N kg/ha)

b_3 - N_{100}- (N kg/ha)

b_4 - N_{150}- (N kg/ha)

b_5 - N_{200}- (N kg/ha)

Fertilizers used in the experiments are complex mineral fertilizer and ammonium nitrate 15:15:15.

Experiments once conducted were kept under observation in terms of changes that may emerge in the plant. From the field experiences, were gathered plant samples for laboratory analysis to diagnose changes as an effect of treatments applied.

Laboratory analysis methods are as commonly used in agricultural chemistry laboratory work:

- Amino acids were determined after hydrolysis with 6M HCl by ion chromatography with HPLC apparatus DIONNEX;.
- Vitamin B1 was determined by liquid chromatography using HPLC- MS Schimadzu.

RESULTS AND DISCUSSIONS

Following fertilization research in experimental zear, 2013 on wheat crop we found the following:

Table 1.

The influence of chemical fertilizers on the amino acids content from the wheat grain, in 2013-2014 agricultural year

Variant		*Arginine*	*Histidine*	*Isoleucine*	*Leucine*	*Lyzine*	*Methionine*	*Phenilalanine*	*Tryptophan*	*Valine*
Unfertilized		3,5	1,6	2,8	3,7	2,1	0,2	3,4	0,3	2,8
P_{50} K_{50}	N_{50}	3,9	1,9	3,1	4,0	2,5	0,3	3,7	0,2	2,9
	N_{100}	4,1	2,0	3,1	4,2	2,3	0,3	3,8	0,3	3,0
	N_{150}	4,5	2,2	3,2	4,3	2,2	0,4	4,0	0,5	3,2
	N_{200}	4,6	2,2	3,5	4,7	2,1	0,5	4,2	0,4	3,3
$P_{100}K_{100}$	N_{100}	4,5	2,3	3,3	4,5	2,2	0,3	4,0	0,5	3,2
	N_{150}	4,7	2,6	3,5	4,8	2,1	0,5	4,3	0,6	3,4
	N_{200}	4,8	2,7	3,7	5,0	1,9	0,5	4,4	0,5	3,6
$P_{150}K_{150}$	N_{150}	4,9	2,7	3,5	4,9	2,0	0,6	4,4	0,7	3,5
	N_{200}	5,0	2,9	3,8	5,2	1,9	0,5	4,5	0,6	3,7

The lower amount of amino acid was determined for methionine and tryptophan, with the highest in the case of arginine, leucine and phenylalanine.

Among the usual fertilizer, the nitrogen content determine the variation of the protein and the important changes in its composition. As can be seen in Table 1. The amino acid content increases as the dose of nitrogen fertilizers increases, regardless of the fertilizers with phosphorus and potassium. The exception is the lysine content of which is negatively influenced by increasing the dose of nitrogen fertilizers.

Although phosphorus does not affect to an extent so great as the nitrogen content of amino acids, it supports the effect of nitrogen and attenuates mainly the negative influence of high doses of nitrogen to the amount of amino acids, resulting in a better metabolic forms of nitrogen absorbed.

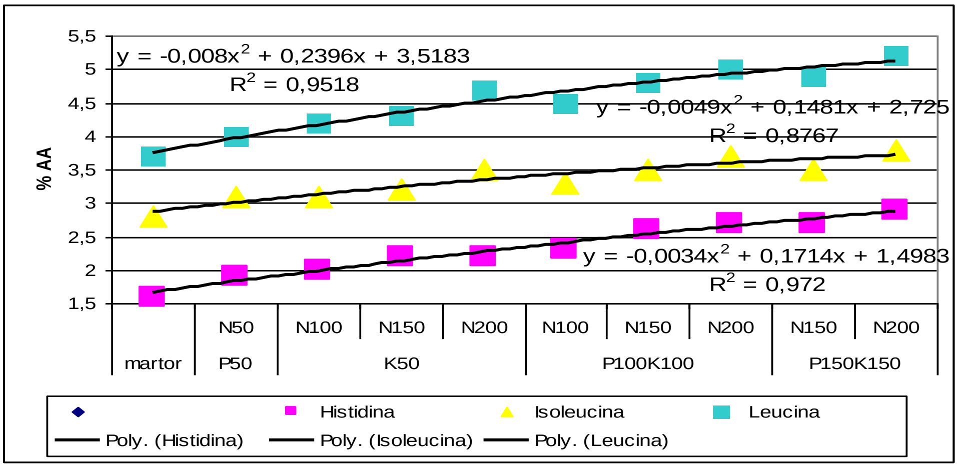

Figure 1. The response curve of the content of histidine, isoleucine, and leucine at the application of mineral fertilizers.

Of the three amino acids shown in Figure 1 it is noted that increasing the dose of fertilizers greatly influences the content of histidine in the proportion of 97.2%, while the content of isoleucine is less influential to the extent of the ratio 87.67%.

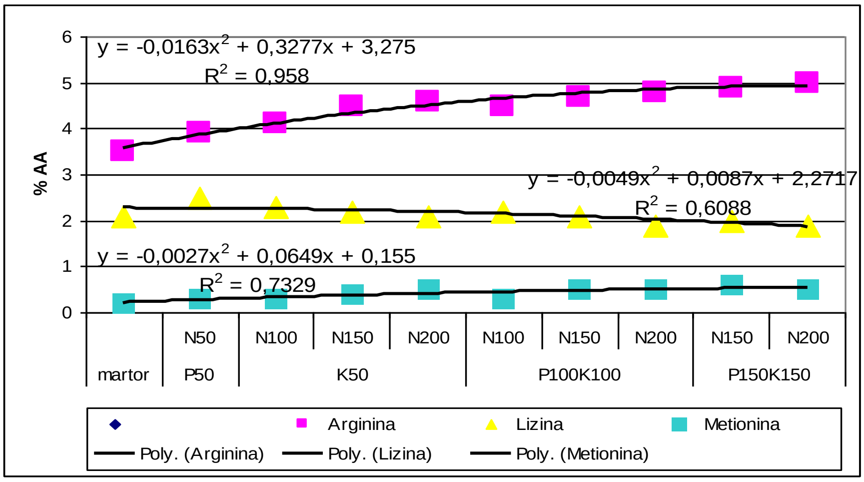

Figure 2. The response curve of the content of arginine, lysine and methionine at the application of mineral fertilizers

From Figure 2 we can see the upward trend in the arginine content of 95.8%, as the increase the dose of fertilizer.

The response curve of lysine content in the application of mineral fertilizers has a decreasing trend, the correlation coefficient is at the lowest value: 0.6088.

Methionine content in wheat grain is reduced, the application of complex mineral fertilizers modifying it only in proportion of 73.29%.

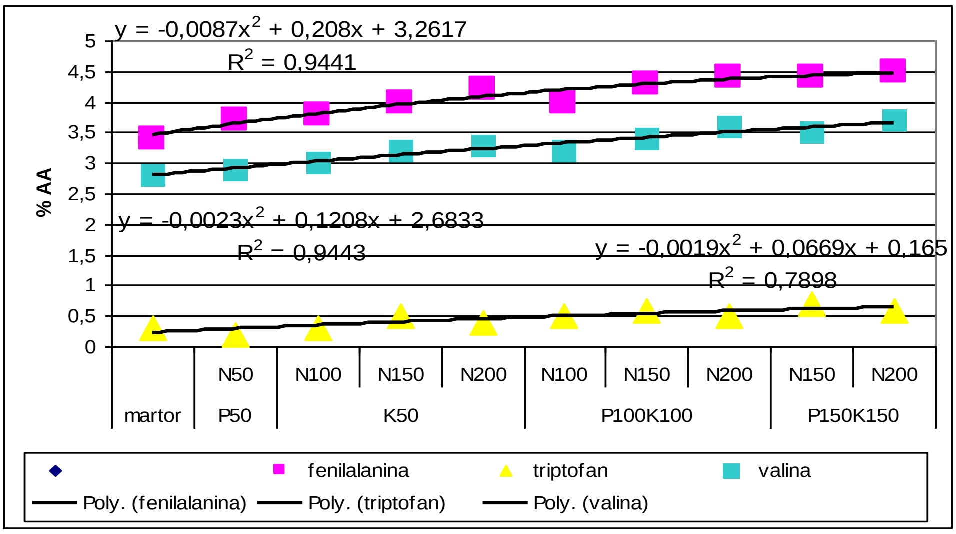

Figure 3. The response curve of the content of phenylalanine, tryptophan and valine at the application of mineral fertilizers

Response curves content of phenylalanine and valine have an increasing trend, correlation coefficients with values very close, 0.9441 for phenylalanine and 0.9443 for valine.

Tryptophan is found in small amounts in the grain of wheat, its content is modified by fertilization with increasing doses of fertilizers at a rate of 78.98%.

Table 2.

The content of vitamin B1 of the grain of wheat after mineral fertilization

Variant		***B1 mg/100g product***
Unfertilized		0,387
$P_{50}K_{50}$	N_{50}	0,395
	N_{100}	0,399
	N_{150}	0,403
	N_{200}	0,404
$P_{100}K_{100}$	N_{100}	0,419
	N_{150}	0,425
	N_{200}	0,438
$P_{150}K_{150}$	N_{150}	0,466
	N_{200}	0,485

B1 vitamin content in wheat grain after fertilization complex is between 0.387 mg / 100g - in unfertilized variant and 0.485 mg / 100g in application of 200 kg N / ha and 150 kg P2O5 and K2O / ha.

There is an increase vitamin B1 content as increasing doses of fertilizer.

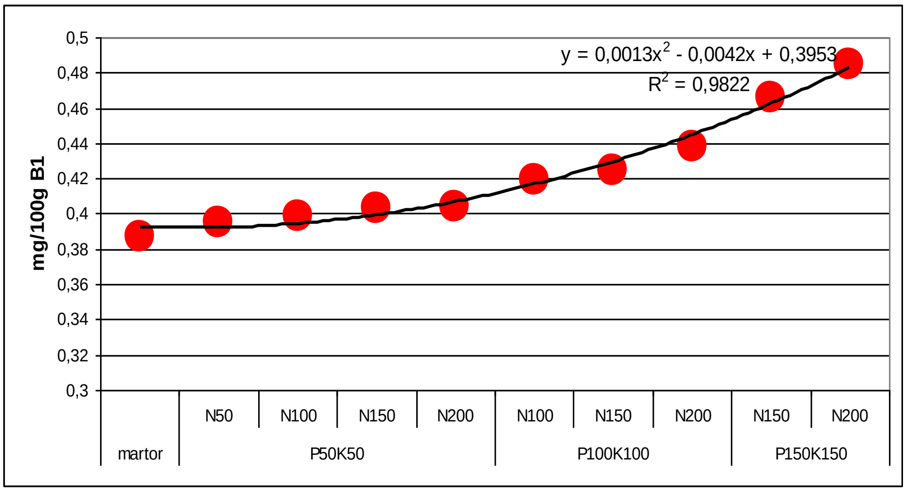

Figure 4. The content of vitamin B1 of the grain of wheat after mineral fertilization

The response curve to the application of nitrogen fertilizers, on various phosphorus and potassium agrofunds has an upward trend, the correlation coefficient with a new readout close to 1. The application of increasing doses of nitrogen fertilizers influence the content of vitamin B1 in a ratio of 98 22%.

CONCLUSIONS:

Regarding the study on the influence of mineral fertilization on wheat culture, we can draw the following conclusions:

The lower amount of amino acid was determined for methionine and tryptophan, with the highest in the case of arginine, leucine and phenylalanine.

Amino acid content increases as the dose of nitrogen fertilizers increases, regardless of the fertilization with phosphorus and potassium. The exception is the lysine content which is negatively influenced by increasing the dose of nitrogen fertilizers.

Although phosphorus does not affect to an extent so great as the nitrogen content of amino acids, it supports the effect of nitrogen and attenuates mainly the negative influence of high doses of nitrogen to the amount of amino acids, resulting in a better metabolic forms of nitrogen absorbed.

The growth of the vitamin content is more pronounced when increasing the dose of nitrogen fertilizer and less to increasing the dose of phosphate and potash fertilizers.

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