

STUDIES REGARDING THE INFLUENCE OF PEDOCLIMATIC CONDITIONS OF 2009 YEAR ON VARIOUS QUALITY INDEX FOR SOME CORN POPULATIONS

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Abstract

Agricultural sectors can cause environmental contamination, and various pollutants are involved including organic compounds and heavy metals, which need to be studied closely, since they are generally toxic to animals and plants. The main risk is contamination of the water supply or food chain via crops. Impact on agriculture is also arising from unintended adverse effects of herbicide, pesticides and even fertilizers uses on plant life. This paper studied the influence of pedo-climatic conditions of 2009 year on some quality index of various corn populations. Also, it was studied the influence of various chemical compounds use (e.g. fertilizers) on the some corn populations from Ezareni-Iasi, and the followings quality index were analyzed for 30 corn populations: nitrogen, phosphorus and maw protein. The chemical analyses were done considering the harvested grains from 2009 on which after the flouring, the followings were analyzed: nitrogen was analyzed by Kjendal method, and phosphorus by spectrophotometer method. The results showed that there are some variations of nitrogen and crude protein from one population to another, thus for nitrogen it was measured concentrations within 0.56% and 2.2% N, while for phosphorous within 0.27% and 0.75% P. It was observed that for corn populations with a low concentration of nitrogen, the phosphorous concentration is within usual limits, and this conclude that the agro-fond has a deficit in azoth concentration.

Key words: agriculture, sustainability, quality index, corn populations.

Agriculture can negatively affect the environment through overuse of natural resources as inputs or through their use as a sink for pollution and can cause environmental contamination, various pollutants beeing involved, including organic compounds and heavy metals (HMs) such as cadmium (Cd), chromium (Cr), mercury (Hg), lead (Pb), copper (Cu), nickel (Ni) and zinc (Zn), which need to be studied closely, since they are generally toxic to animals and plants (McNeely and Scjerr, 2003; Popkin B., 1998; Robu, Macoveanu, 2010).

A great part of herbicides used in agriculture field have long lasting remanence, even over three years, and an important part of the active substances of the herbicides pollute the soil and subsequently the waters, sometimes with disastrous effect for the environment. Also, some pollutants can be metabolized by culture plants which, in their turn, by consumption, can adversely affect the people's health.

European organism for agriculture established policies, strategies and best management practices that can converge to sustainable agriculture at European level (Downey R., 1999; California University, 1992; Norse et.al, 2001). The great success of industrialized

agriculture in recent decades has masked significant negative externalities, many of which arise from pesticide overuse and misuse (Gulden and Entz, 2005). The environmental pollution problems resulted from organic compounds (e.g. pesticides, fertilizers) and their residues in food have become important research topics, since healthy food is urgently need, along with improved living standards. Thus, more attention is now being paid to 'green' food and organic food.

MATERIAL AND METHOD

This paper studied the influence of pedo-climatic conditions of 2009 year on some quality index of various corn populations. Also, it was studied the influence of various chemical compounds use (e.g. fertilizers) on the some corn populations from Ezareni-Iasi, and the followings quality index were analyzed for 30 corn populations: azoth, phosphorus and maw protein.

The chemical analyses were done considering the harvested grains from 2009 on which after the flouring, the followings were analyzed: nitrogen was analyzed by Kjendal method, and phosphorus by spectrophotometer method.

Thus, there were analyzed a total of 30 populations of maize grown and harvested in 2009 from Ezăreni-Iasi. Chemical tests were performed on

grains that have been washed, dried and finely milled (5000rpm; grading 0.2-0.3mm), and it was determined the following quality indicators:

- total nitrogen content- Kjendal method;
- phosphorus content-Spectrophotometric method ($\lambda= 715$);
- crude protein content - was determined by calculating the concentration of total nitrogen;
- the total nitrogen determined will be multiplied by a protein factor of 5.90 for the calculation of crude protein from total nitrogen.

The apparatus used to analyse was:

- S104 - WPA Linton-Cambridge spectrophotometer;
- Grindomix GM 200 electric grinder;
- Parnas-Wagner distillation apparatus.

RESULTS AND DISCUSSIONS

In the current stage of mobilization to obtain maximum yields and high stable quality, the industrial fertilizers are produced and applied efforts great value and energy crop fertilization organizing economic principles become a necessity. The nitrogen fertilizer consumption restrictions are determined that their production requires large amounts of energy.

The negative effects of inadequate fertilization on the environment and higher costs fertilizers, nitrogen nutrition, require optimization of the corn crop.

To achieve this, the chernozem of Ezăreni were performed 2009 irrigated corn research, aiming at specific objectives:

- Monitoring of short and long term changes in soil fertility;
- Determination of the maize crop response to fertilizer application which contributed to determining the optimal dose of efficiency maintaining and improving economic and soil quality;
- Purchase nitrogen fertilizer efficiency;
- Production in various production and quality management schemes fertilizers;
- Interrelations between different systems of tillage, irrigation schemes and fertilization.

Maize populations analyzed come from two areas with soil type chernozem with different morphologies and characteristics. These population figures were numbered 1 to 15 for the first field and 16 to 30 for the second area. Variation of nitrogen content of maize crops on the two plots can be traced in (fig. 1; a and b).

The existence of nitrogen in plants is closely related to mineral nitrogen in soil and the fertilization mode. Existing mineral nitrogen in

soil is provided by spring fertilization with manure and fertilizer complex.

Mobilization of soil mineral nitrogen had smaller changes compared with changes found on physical, mainly depending on the changing climate in winter.

Effects of prolonged irrigation with high standards of watering intervals of time on soil physical traits are more pronounced than the effects of reduced work soil.

Efficiency of nitrogen acquisition as a relation between the availability of nitrogen estimated and nitrogen extracted by fertilizer production is higher with doses ranging from 120 – 180kg N/ha and by carrying out the work of the soil.

Administration of organic fertilizers leads to a better efficiency in plant nitrogen acquisition, and is known superiority of manure. Study graphs based on experimental data obtained from tests on the corn crop looks like the first field holding a larger amount of nitrogen from those on the second area. This would explain a better mineralization of soil that comes into the first field.

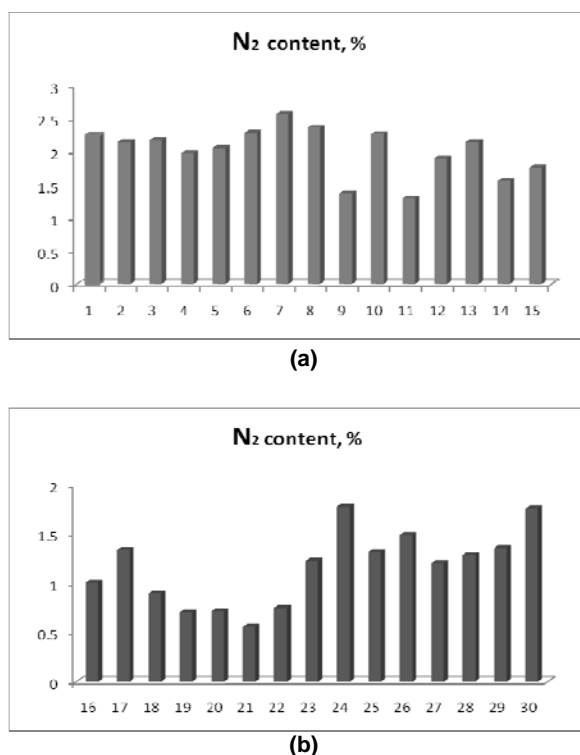
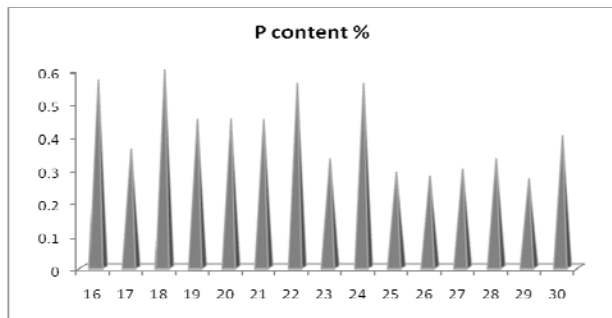
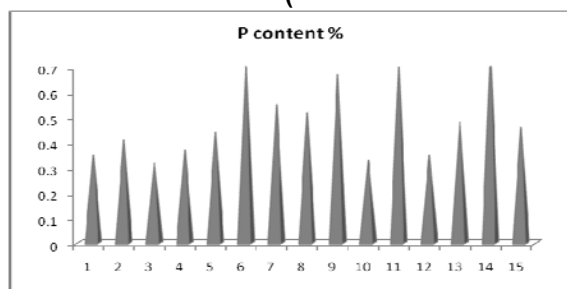


Figure 1 The nitrogen content of maize population from (a) first area; (b) second area

Figure 3 (a and b) show the phosphorus variation in the amount of maize populations under examination.



(a)



(b)

Figure 3 The phosphorus content of maize population from (a) first area; (b) second area

Intense absorption of nitrogen resulting from the early stages, until physiological maturity. Due to the particularities insufficient nitrogen at any stage of corn growth, preventing the biosynthesis processes, and reduce grain yield up to 70%.

Insufficient phosphorus frequency in the early stages of growth, cause poor root development, a delay of vegetation.

As shown in figure 2 the amount of phosphorus absorbed by plants grown on the first field is large and uniform in all components. In terms of crude protein, the results are presented in table 1.

Friedman (1996) pointed out that proteins are an essential component of the diet needed for survival of animals and humans. Protein's basic function is to provide adequate supply of amino acid.

The protein quality depends on its amino acid content and on the physiological utilization of the specific amino acid after digestion, absorption, and minimal obligatory rates of oxidation. Availability of amino acids varies with protein source, processing treatment, and interaction with other components of the diet.

Table 1

Corn population and crude protein

Population	Crude protein	Population	Crude protein
1	14,06	16	6,3
2	13,43	17	8,37
3	13,65	18	5,6
4	12,37	19	4,42
5	12,87	20	4,4625
6	14,35	21	0,35
7	16,10	22	4,725
8	14,81	23	7,68
9	8,57	24	11,03
10	14,17	25	8,25
11	17,32	26	9,31
12	11,91	27	7,525
13	13,43	28	8,05
14	9,8	29	8,5
15	11,0	30	11,03

The results showed that there are some variations of nitrogen and crude protein from one population to another, thus for nitrogen it was measured concentrations within 0.56% and 2.2% N, while for phosphorous within 0.27% and 0.75% P. It was observed that for corn populations with a low concentration of nitrogen, the phosphorous concentration is within usual limits, and this conclude that the agro-fond has a deficit in azoth concentration.

CONCLUSIONS

Through integrated management of soil tillage and fertilization regime irrigation is highly significant correlations obtained positive between yields obtained and quality. Moderate amounts of fertilizer nitrogen and phosphorus having an high technological and economic efficiency growth by providing corn crop irrigation production per unit area and contribute to the improvement of culture. Establishing requirements fertilizers to a level close to the production potential of crops and ground contribution ratio of special importance in ensuring the effectiveness their recovery and avoid increasing the coefficient of soil and water pollution.

The main ways to increase the efficiency of nitrogen fertilizers consist spread application, coupled with the evolution of culture and production potential water supply (soil condition and rainfall), their incorporation into the soil. To reduce the need for fertilizer chemical nitrogen has an important role regular application of organic fertilizers (manure) which is also an important source of phosphorus, potassium and micronutrients. Maintaining soil nutrient supply to a level close to agricultural requirements presents no risk of pollution of soil and water their release into mobile forms being in equilibrium with the consumption of plant.

BIBLIOGRAPHY

- Downey, R.K., 1999** - *Risk assessment of out crossing of transgenic brassica, with focus on B. rapa and B. napus*, Proceedings of the 10th International Rapeseed Congress Canberra, Australia.
- Friedman, M. 1996** - *Nutritional value of protein from different food sources*, A review. J. Agric. Food Chem. 44(1):6-29.
- Pretty, J., 2002** - *Agri-Culture: Reconnecting People, Land and Nature*, Earthscan, London.
- Janzen, H.H., Beauchemin, K.A., Bruinsma, Y., Campbell, C.A., Desjardins, R.L., Ellert, B.H., Smith, E.G., 2003** - *The fate of nitrogen in agroecosystems: An illustration using Canadian estimates*, Nutrient Cycling in Agroecosystems, 67, 85-102.
- Gulden, R.H., Entz, M.H., 2005** - *Natural Systems Agriculture*, University of Manitoba, Canada.
- Norse, D., Ji, L., Leshan, J., Zheng, Z., 2001** - *Environmental Costs of Rice Production in China*, Aileen Press, Bethesda.
- Rozmarin, Gh., Popa, V.I. Grovu- Ivanoiu, M., Doniga, E., 1984** - *Chemistry of macromolecular compounds and wood chemistry, Analysis methods*, p. 225, Iasi.
- Robu, B., Macoveanu, M., 2010** - *Environmental assessments for sustainable development*, Ecozone ed., Iasi.
- Walters, D.T., 2005** - *Fertilizer nitrogen source and management impacts on greenhouse gas emissions*, North Central Extension Industry Soil Fertility Conference v21. Des Moines, IA, USA
On line at: http://soilfertility.unl.edu/Materials%20to%20include/Research%20Pubs/Walters_Fertilizer%20nitrogen%20source%20and%20management%20impacts%20on%20greenhouse%20gas%20emissions.pdf.
- Altieri, M.A., 1995** - *Agroecology: The Science of Sustainable Agriculture*, Westview Press, Boulder.
- Hester, R.E., Harrison, R.M. (editors), 2005** - *Issues in Environmental Science and Technology, Sustainability in Agriculture*, The Royal Society of Chemistry, Cambridge, UK.
- ***, 1993** - *NASS, Agriculture Chemical Usage-Vegetables, Summary, United States Department of Agriculture*, National Agriculture Statistics Service, USA.