THE INFLUENCE OF FERTILIZER DOSES ON THE PRODUCTION OF POTATOES IN SFANTU GHEORGE, COUNTY OF COVASNA

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ABSTRACT

The purpose of the fertilization experiments, described in this paper, is to establish some optimal and economical doses of NPK fertilizers, while taking into consideration the soil's supply in fertilizing elements, with the purpose of determining the influence of different doses of fertilizer on the production and efficiency of potato crops.

In this context, the amount of the administered chemical fertilizer was between 250 to 550 kg of active substance/ha, out of which the nitrogen doses were of 0, 100, 200 and 300 kg of active substance/ha.

This paper only focused on carrying out some research on the physical and chemical conditions of agricultural lands, and can be further developed around this subject.

INTRODUCTION

The potato, Solanum tuberosum, is one of the most famous plants that can take advantage of the natural fertility of the soil and of a satisfactory fertilization, especially when the other vegetation factors are provided at optimum level.

In order to have a large tuber productions, the potato consumes large quantities of nutrients, provided by the soil or by the chemical and organic fertilizers. For 1000 Kg of tubers and related epigean biomass, the specific consumption of nutrients is of 5-6 Kg N; 1.8-2.3 Kg P_2O_5; 7-8 Kg K_2O; 2.2 Kg CaO and 1.6 Kg MgO (after V. Bârnaure, 1991).

Nitrogen (N) has an important effect on the development of the crop, as it is used by the plants during the vegetation period. The use of nitrogen has better results if the plants have a properly developed foliage. For example, with 1 kg of nitrogen, around 90-104 kg of tubers can be produced.

Nitrogen, therefore, contributes to the increase of the production, the development of the foliar apparatus and the increase of the number and size of the tubers. The potato reaches the highest nitrogen demand and consumption (150-200 kg N/ha) by the time of the maximum foliar bush formation, with a smaller quantity being consumed after that. By the end of the vegetation period, the required quantity of nitrogen is progressively reduced.

The excess of nitrogen leads to the rapid and abundant formation of the foliar apparatus at the cost of tuberization. The stems lengthen and fall quickly. This favors the attack of mildew and aphids transmitting viruses and decreases the

dry matter content of the tubers. An important aspect to take into consideration is the fact that, in accordance with CHIRILEI, H. et al. (1957), potatoes prefer ammonium nitrogen over other forms.

Phosphorus (P_2O_2) is absorbed during the growth period, especially through the foliage. It is especially important in the early stages of growth. For the seed potatoes and the early potatoes, the soil must be well supplied with mobile phosphorus, while taking care to not fertilize in excess. At the time of the maximum growth of the foliage, the phosphorus content of the vegetal part is at 0.7% of the dried substances or even more so in the tubers.

The total amount of P_2O_2 absorbed by a well-developed crop is approximately 60 kg/ha out of which 50 kg represent the amount removed with the matured tubers at harvest.

With 1 kg of P_2O_2, around 45-56 kg of tubers can be produced, on soils provided with medium quantities of nitrogen and potassium. Phosphorus deficiency is shown by poor foliar development and dark green colored foliage, upward twisting of leaves, lack of gloss and marginal drying of leafs, leaf senescence and generally by an unsatisfactory level of overall growth and the appearance of internal lesions on tubers.

Potassium (K_2O) stimulates early potato growth, increases the vigor of the stems and the leaf surface, without reducing the longevity of the leaves. A good supply of potassium increases the resistance of plants to pathological and physiological diseases, as well as to drought, it enhances protein synthesis and respiration, helps the plant to grow in dry periods, and contributes to the increase in the number and size of the tubers.

Potassium deficiency is shown through a dwarf habitus, a pale dark greenish-blue color and a discolored bronzing of the leaves, which, at maturity, become yellowish with dried edges and tips and with a chlorosis look between the nervures. At an advanced stage, the leaf can become necrotic.

MATERIAL AND METHOD

The lands owned by the company SC SOLFARM SRL, from Sfântu Gheorghe, where the experiments took place, are comprised of two types of soils: *Argic Phaeozem* and *Luvisol*. The agrochemical mapping of the arable land was realised periodically (every 3 years), at the scale of 1:10,000, by the Office of Pedological and Agrochemical Studies – Brașov (OSPA Brașov).

Following the analysis of soil samples collected from the lands of SC SOLFARM SRL, on a surface of 210 ha, it appears that most of the soils are moderately acidic, with a pH between 5.1-5.8.

In regards to the supply with nutrients, the soils are well supplied with phosphorus (P = 36.1 - 72.00 ppm) and with potassium (K = 132.1 - 200.0 ppm), as well.

The experiments were made on a soil with the following characteristics: pH - 5.5; Nitrogen index (IN) - 2.96; P-Al - 90.8 ppm and K-Al - 309.8 ppm. The measurements carried out focused mainly on establishing the different doses required on some production elements.

Thus, the quantities of administered chemical fertilizers were between 250 and 550 kg of active substance/ha, out of which the nitrogen doses were 0.100, 200 and 300 kg active substance/ha. Therefore, the experimental variants were:

V_1- N_0 P_{90} K_{160} (total of 250 kg PK active substance/ha);

V_2- N_{100} P_{90} K_{160} (total of 350 kg NPK active substance/ha);

V_3- N_{200} P_{90} K_{160} (total of 450 kg NPK active substance/ha);

V_4-N_{300} P_{90} K_{160} (total of 550 kg NPK active substance/ha).

The experiment was made on areas planted with the SANTE variety, that is regarded as an elite biological category. The variants were made in 4 repetitions, each variant having an area of 51 m width (68 rows) x 15 m length = 765 sqm and the repetitions were superimposed. This arrangement and the dimensions of the experiment were needed in order to execute the conditions for production. The planting was done mechanically, with a 6 SAD-75 machine.

As observation, during the vegetation period (July 1st-August 26th), dynamic harvests were made every 10 days (on 1st, 10th, 20th of the month), on 10 square meters, in three repetitions, for determining the culture density and the number and weight of the main stems. The dynamic of attaining the production as per the fertilization variants was determined through the harvests made during the vegetation period.

RESULTS AND DISCUSSIONS

The analysis of the influence of these fertilizer doses on the production shows that the highest total production (34.4 t / ha) was achieved in the variant fertilized with N_{100}, P_{90}, K_{160}, and the smallest production in the one with N_0, P_{90}, K_{160} (29.2 t/ha).

Table 1.

Results regarding the influence of fertilizer doses on production

Doses	Total production (t/ha)	Seed production (t/ha)
N_0 P_{90} K_{160}	29,2	15,5
N_{100} P_{90} K_{160}	34,4	16,9
N_{200} P_{90} K_{160}	33,3	15,1
N_{300} P_{90} K_{160}	32,1	17,9

The highest seed production (tubers 30-55 mm), was obtained, however, in the variant with N_{300}, P_{90}, K_{160} (17.9 t/ha), followed by the variant with N_{100}, P_{90}, K_{160} (16.9 t/Ha). For these variants, the seed proportion represented 55.8%, respectively 49.1% of the total production, being the highest values of all the variants.

Among the studied variants, the one fertilized with N_{100}, P_{90}, K_{160} is highlighted, because both the total production and the production of seed and consumption potatoes, proved to be significantly higher than in the other variants.

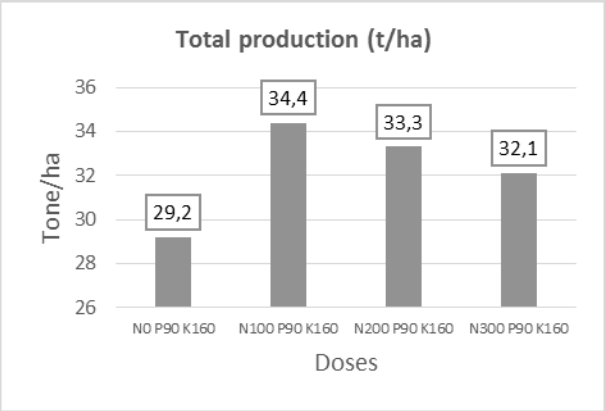

Figure 1. The influence of fertilizer doses on the total production

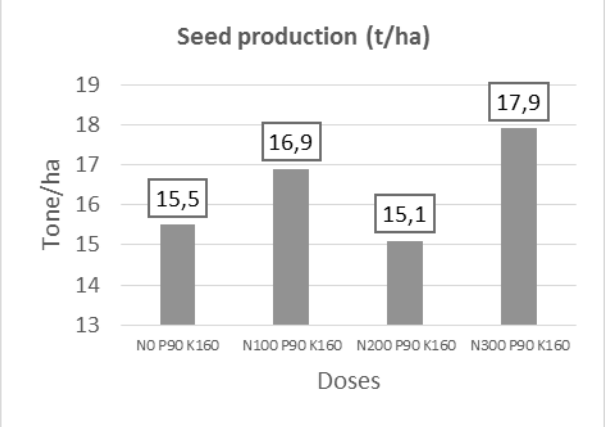

Figure 2. The influence of fertilizer doses on seed production

CONCLUSIONS

1. The potato (Solanum tuberosum) - while being the main vegetable of Poland, Europe and the whole world, and one of the basic cultures, it is also of great economic and social importance also for the agriculture of the Covasna County, especially due to the ecological conditions that are more favorable to this crop and less favorable to other agricultural species, and due to its higher, compared to other cultures.

2. The doses of fertilizers used for potato cultivation can be optimized by improving the fertilization system.

3. Due to the high fertility of the land the experiments were made on, the natural production potential is over 30-35 t/ha, but at the same time, the water deficit limits the maximum production potential to 20t/ha. Thus, high doses of fertilizers are not justified for increasing production beyond the limit of 30 t/ha under non-irrigation conditions. The most effective doses are around N100, P90, and K160, of course calculated separately for each plot, according to agrochemical indices.

4. We consider that the results of the research initiated at SC SOLFARM SRL in Sfântu Gheorghe, presented in this paper, made with the purpose of rationalizing the potato fertilization in accordance with the planned production, will ensure the achievement of higher and more profitable productions.

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