RESEARCHES CONCERNING THE INFLUENCE OF SOME SULFUR FERTILIZERS UPON SOME PHYSIOLOGICAL INDEX, CROP QUALITY AND QUANTITY OF MAIZE

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Abstract: *The goal of this experiment was to tested the influence of some sulfur based fertilizers on some physiologica index, production and quality characteristics in maize. Sulfur is involved in protein synthesis in chloroplasts, sulfur amino acids, photosynthesis and glutathione products having a role in redox reactions. Sulfur catalyzes chlorophyll biosynthesis. In the absence of sulfur, leaves are chlorotic with pale veins. A sunflower hybrid was used (KWS 2376 - FAO 370) and two fertilizing variants were applied: : N-P-K (20-20-0) – 228 kg fertilizer/ha- brutto - 45,6 kgN/ha active compound, V1 N-P-K – MgO – Na – SO3 (23-0-5-5-1 + 22) – 198,4 kg fertilizer/ha-brutto- 45,6 kgN/ha active compound. The second application of fertilization was realized in phenophase BBCH 4.7 (vegetative stage), to complete the nitrogen application to 130 kg of active substance per hectare, with 283 kg/ha NH_4NO_3 at control plots and 246 kg/ha NH_4NO_3 in V_1 variant plots.The experiment was located the Experimental Teaching Resort at USAMVB Timisoara on a total surface of 2016 m2 , in plots of 504 m2 and having 4 repetitions (GPS coordinates Lat/Long: 45,782; 21,211 Timisoara, Romania). Measurements of plant physiological features were realized in three different development stages: Stage of 7-10 leaves (vegetative stage), BBCH 4.7; Flowering stage, BBCH 6.5;Ripening, dough stage, BBCH 8.5.In these stages we measured the total leaf area of plants (cm^2/pl.), the dry matter and chlorophyll content of leaves. Also the quantity and quality (starch, protein, lipid and humidity content - OMEG ANALYZER G BRUINS INSTRUMENTS) of crop was assessed. Regarding the quality of maize kernels, we assessed the following characters: water, protein, starch and lipid content. Results show that there are no statistically significant differences between the experimental variants. The experiment has shown that the variant fertilized with sulfur has obtained a significant production increment in comparison to the witness variant.*

***Key words*:** maize, sulf fertilizer, crop quantity, crop quality

INTRODUCTION

Maize (*Zea mays* L.) is one of the most valuable crop species, its contribution to agriculture being worth billions of euros. The great adaptability and ecological plasticity displayed by this species, together with its high yield capacity, have resulted in it being used in a lot of ways, both as food for humans, animals, and in industry. That is why the cultivated areas and the yields have been growing continuously. Besides its important contributions to agriculture and economy, maize is a model species for genetic research as well. (2,3)

Sulfur is an essential element for vegetable organisms, as it has several structural and functional purposes. It can be found in plants in quantities of between 0, 02 and 1, 8% of the dry matter, depending on the species, the metabolic activity of the tissue, accumulating mostly in the seeds and leaves and less in the roots. Sulfur is part of several amino acids (cysteine, cysteine, methionine) and some vitamins (B1, biotin, coenzyme A, thiamine), sulfuric esters, glycosides, alkaloids, etheric oils etc., insures the vegetative growth of plants and increases the plants' resistance to cold. (1,5)

MATERIAL AND METHODS

Field trials were established at agricultural fields of the Banat's University, cambic chernozem soil type, 504 m^2 plots were used in 4 repetitions. The same maize hybrid (KWS 2376 - FAO 370) was used, in densities of 60.000 plants/ha. Sawing took place at 3rd May 2012 and plant emergence at 9th May 2012.

The experimental variants consisted in treatments with two fertilizers applied at sawing by incorporating into the soil at 3 cm below the seed:

- Control N-P-K (20-20-0) – 228 kg fertilizer/ha- brutto - 45,6 kgN/ha active compound,

- V1 - T121 N-P-K – MgO – Na – SO_3 (23-0-5-5-1 + 22) – 198,4 kg fertilizer/ha- brutto- 45,6 kgN/ha active compound.

The second application of fertilization was realized in phenophase BBCH 4.7, to complete the nitrogen application to 130 kg of active substance per hectare, with 283 kg/ha NH_4NO_3 at control plots and 246 kg/ha NH_4NO_3 in V_1 variant plots.

Assessment of soil properties took place at flowering and dough stage, in dynamics. Measurements of plant physiological features were realized in three different development stages: Stage of 7-10 leaves (vegetative stage), BBCH 4.7; Flowering stage, BBCH 6.5; Ripening, dough stage, BBCH 8.5. (4,5) In these stages we measured the total leaf area of plants (cm^2/pl.), the dry matter and chlorophyll content of leaves; we analyzed the NPK content of leaves, the microbial activity of soil. The chemical properties of soil were determined before the sawing, and in phenophases BBCH 6.5 Flowering and 8.5 Kernels in milk stage (pH, total N, humus content, P, K, sulphates, Na, Ca, Mg content). Also the quantity and quality (starch, protein, lipid and humidity content - OMEG ANALYZER G BRUINS INSTRUMENTS) of crop was assessed.

RESULTS AND DISCUSSIONS

Chlorophyll content

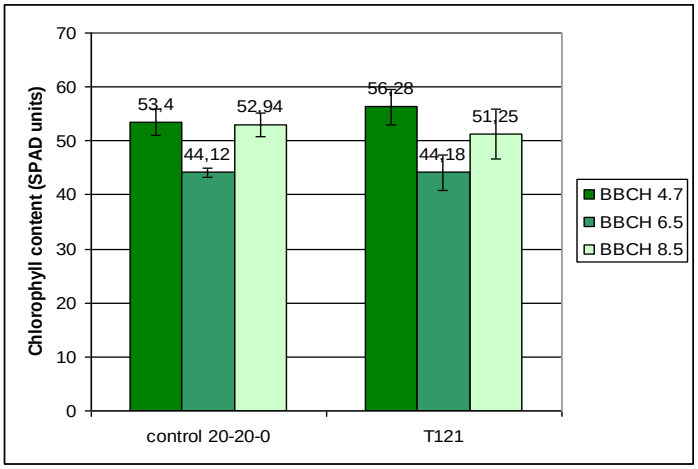

Figure 1. Chlorophyll content in the three BBCH stages.

The analysis of variance for the chlorophyll content character in BBCH 4.7 development stage demonstrates that there are significant differences between the variants, thus

the T121 variant has higher values (56,20 SPAD) than the control variant (41,41 SPAD). At the next development stages (BBCH 6.5, BBCH 8.5) there were no significant differences between the variants. In dynamics the values of chlorophyll content tend to become uniform when plants reach generative stage.

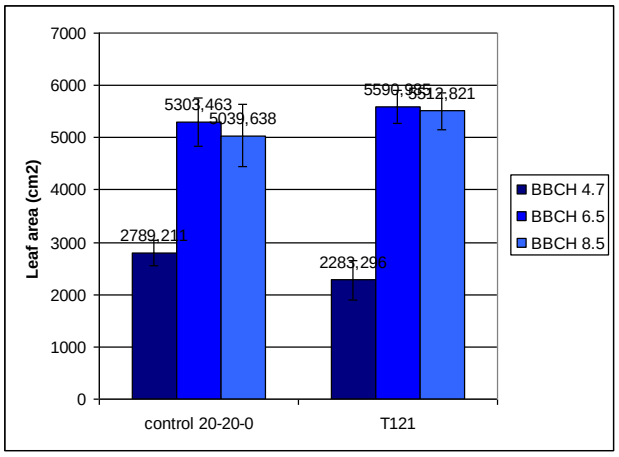

Figure 2. Leaf area in the three BBCH stages.

Regarding the leaf area, in phenophase BBCH 4.7 there were statistically significant differences between variants, meanwhile in the following phenophases (BBCH 6.5 and BBCH 8.5) the differences were not significant. Though the control plants presented slightly higher values in vegetative stage (4.7 BBC), in generative stages (6.5 BBCH, 8.5 BBCH) plants fertilized with T121 product had the highest values. In time, the dynamics of the leaf show that the leaf area increases until the vegetative development stage, when the highest values are reached.

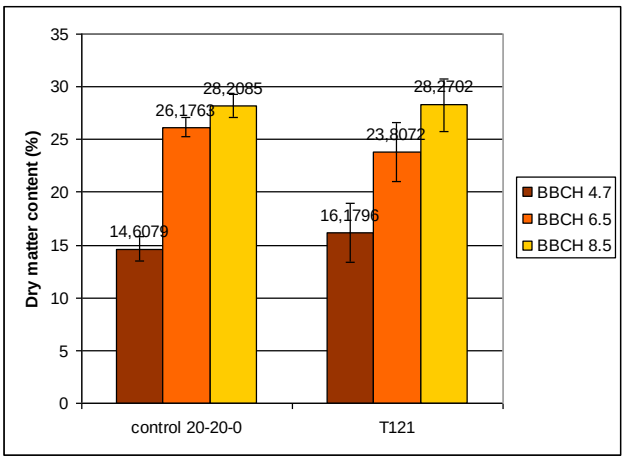

Figure 3. Dry matter content in the three BBCH stages.

Regarding the dry matter content (from an average sample composed of stem and leaf fragments), analysis of variance shows that there were no significant differences between the variants in phenophase 4.7 BBCH, however the highest rates of dry matter content was measured at T121 variant. Differences are significant in 6.5 BBCH, the highest values being at control plants, meanwhile in ripening stage the differences are not significant again, with the highest values at T121 variant. In time, dry matter content of plants is increasing, with the highest average values at T121 variant (28,27 %).

Crop quantity and quality

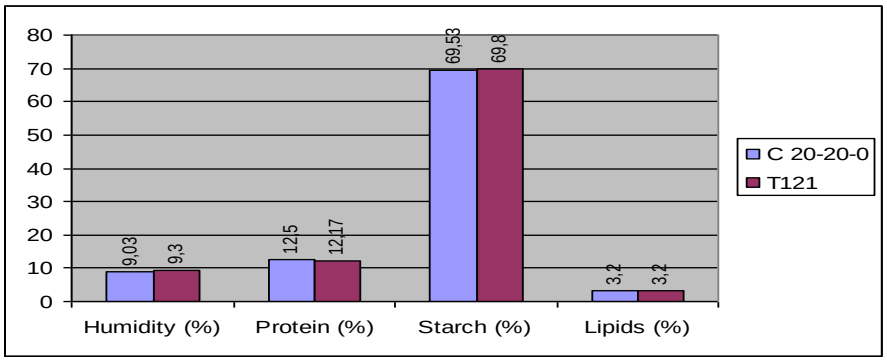

Figure 4. Crop quality.

Regarding the quality of maize kernels, we assessed the following characters: water, protein, starch and lipid content. Results show that there are no statistically significant differences between the variants.

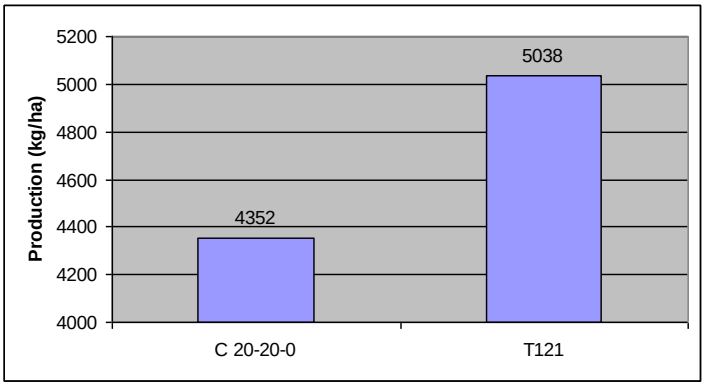

Figure 5. Crop production

Regarding the kernel production, there were significant differences between the variants, thus fertilization with T121 product produced higher yields (**5038 kg/ha**) than the control variant (**4352 kg/ha**).

CONCLUSIONS

- Analysis of variance revealed that **chlorophyll content** in BBCH 4.7 phenophase presents significant differences between the variants, thus the higher chlorophyll content in leaves was observed at variant treated with the T121 fertilizer (56,20 SPAD units), compared to control variant (41,41 SPAD).

- Regarding the **dry matter content** of plants (using an average sample, obtained from leaf and stem fragments), it could be observed that there are no significant differences between the variants (based on analysis of the variance test) in phenophases 4.7 BBCH and 8.5. BBCH. However the highest dry matter content was observed at the variant fertilized with T121 product. In BBCH 6.5 there were statistically significant differences variants, with the highest values at the control variant.

- Regarding the **bio-productivity** of plants, there were significant differences between variants, thus the highest yield was observed at T121 variant **(5038 kg/ha**), meanwhile control variants produces lower productions **(4352 kg/ha**).

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