THE EFFECT OF MICROBIOLOGICAL FERTILIZERS ON THE PIGMENT CONTENT IN PEANUT PLANTS

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Annotation:
This study investigates the effects of the microbiological fertilizers PlantaStim, Fosfomaks, and Baktomin on the content of chlorophyll a, chlorophyll b, and carotenoids in peanut (Arachis hypogaea L.) varieties. According to the obtained results, all preparations increased the pigment content, with the highest values recorded in the Mumtoz variety treated with PlantaStim. The Salomat variety exhibited lower activity in pigment accumulation. Overall, the PlantaStim biological fertilizer can be recommended as the most effective means for enhancing photosynthetic activity.

Keywords: *PlantaStim*, *Fosfomaks*, *Baktomin*, microbiological fertilizer, budding, peanut, chlorophyll, carotenoid.

The peanut (Arachis hypogaea L.) is one of the important leguminous crops primarily cultivated for consumption, rich in proteins, fats, vitamins, and minerals [1]. The productivity and physiological activity of peanut plants are closely linked to their photosynthetic capacity, which, in turn, depends on the content of pigments such as chlorophyll a, chlorophyll b, and carotenoids. These pigments play a critical role not only in the photosynthesis process but also in protecting plants from various stress factors (drought, high temperatures, and nutrient deficiencies in the soil) [2].

In recent years, the use of microbiological fertilizers has been recognized as a key factor in ensuring ecological sustainability and improving plant nutrient efficiency. Beneficial microorganisms that fix nitrogen or solubilize phosphorus enhance plant nutrient supply, thereby stimulating pigment synthesis. In particular, under the influence of microbiological fertilizers, the content of chlorophyll and carotenoids in leaves increases, leading to enhanced photosynthesis and improved stress tolerance [3, 4]. Consequently, microbiological fertilizers are considered a natural and effective agronomic solution for important crops like peanuts.

The data obtained during the study showed that microbiological fertilizers significantly influenced the pigment content in peanut varieties, with variations depending on the fertilizer type and variety characteristics.

In the control group, where no microbiological fertilizers were applied, the highest chlorophyll a content was observed in the Lider variety (1.41 mg/g), indicating its naturally high

photosynthetic potential. The lowest result was recorded in the Salomat variety (1.17 mg/g). For chlorophyll b, the Mumtoz variety showed the highest value (0.66 mg/g), while the Vetnam-1126 sample had the lowest (0.44 mg/g). Regarding carotenoid content, the Senegal-685 sample exhibited the highest value (0.73 mg/g), while the Salomat variety had the lowest (0.51 mg/g). These results indicate that different varieties exhibit varying levels of activity in pigment synthesis due to their genetic characteristics.

Among the samples treated with the PlantaStim microbiological fertilizer, pigment content significantly increased compared to the control. Specifically, the highest chlorophyll a content was recorded in the Mumtoz variety (1.65 mg/g), demonstrating not only the high photosynthetic activity of this variety but also the high efficiency of PlantaStim in stimulating chlorophyll synthesis. In contrast, the Salomat variety showed a lower value of 1.31 mg/g. For chlorophyll b, the Mumtoz variety again had the highest value (0.78 mg/g), while the Salomat variety recorded 0.59 mg/g, indicating its relatively weaker response in pigment synthesis compared to other varieties. The total chlorophyll content was highest in the Mumtoz variety (2.43 mg/g) and lowest in the Salomat variety. Carotenoid content was highest in the Vetnam-1126 sample (0.72 mg/g) and lowest in the Salomat variety (0.53 mg/g). Based on these data, it was established that the PlantaStim biological preparation exhibits high biological activity in stimulating pigment synthesis, particularly in the Mumtoz variety, where its effect was most pronounced.

In samples treated with the Fosfomaks fertilizer, the highest chlorophyll a content was observed in the Senegal-685 sample (1.53 mg/g), while the Lider variety had the lowest (1.25 mg/g). This fertilizer also positively influenced pigment synthesis, though its effect was more pronounced in certain varieties. For chlorophyll b, the Lider variety showed a high value (0.69 mg/g), while the Vetnam-1126 sample had 0.51 mg/g. The total chlorophyll content was highest in the Mumtoz variety (2.07 mg/g) and lowest in the Vetnam-1126 sample (1.87 mg/g). Carotenoid content was 0.66 mg/g in the Lider variety and 0.56 mg/g in the Senegal-685 sample. Overall, Fosfomaks showed moderately high results in stimulating pigment synthesis but was slightly less effective than PlantaStim.

In peanut varieties treated with Baktomin, an increase in pigment content was observed, though to a lesser extent compared to PlantaStim. For chlorophyll a, the Mumtoz variety showed the highest value (1.41 mg/g), while the Toshkent-112 and Vetnam-1126 samples had lower values (1.23 mg/g). For chlorophyll b, the Senegal-685 sample had a high value (0.61 mg/g), while the Lider variety had the lowest (0.49 mg/g). The total chlorophyll content was highest in the Senegal-685 sample (2.02 mg/g) and lowest in the Toshkent-112 variety (1.77 mg/g). Carotenoid content was highest in the Vetnam-1126 sample (0.62 mg/g) and lowest in the Lider variety (0.51 mg/g). These results indicate that Baktomin was relatively effective in certain varieties, particularly Senegal-685, but its overall impact was lower than that of PlantaStim.

Based on the overall analysis, it can be concluded that all microbiological preparations enhanced pigment synthesis. The highest results were observed in the Mumtoz variety treated with PlantaStim, indicating its effectiveness in stimulating the photosynthetic system of this variety. Additionally, the Vetnam-1126 sample showed a weaker response to pigment synthesis, suggesting lower adaptability to these biological preparations.

These results provide opportunities to regulate the physiological activity of peanut varieties using microbiological fertilizers, enhancing agrobiological efficiency through increased photosynthetic pigment synthesis.

List of References

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