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DEVELOPMENT OF PHOTOSYNTHETIC PROCESSES AND GRAIN PRODUCTIVITY OF WINTER WHEAT UNDER BIOLOGIZED FERTILIZER SYSTEMS

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Under field experiment conditions, the influence of biologized fertiliser systems on the content of chlorophylls (a + b) in upper leaves, net photosynthesis productivity (NPP) of crops, and grain productivity of winter wheat was studied.

Keywords: biologized fertiliser systems, winter wheat, chlorophyll content, net photosynthesis productivity, grain productivity.

Розвиток фотосинтетичних процесів та зернова продуктивність пшениці озимої за біологізованих систем удобрення

В умовах польового досліду вивчали вплив біологізованих систем удобрення на вміст хлорофілів (a + b) у верхніх листках, чисту продуктивність фотосинтезу (ЧПФ) посіву та зернову продуктивність пшениці озимої.....

Ключові слова: біологізовані системи удобрення, пшениця озима, вміст хлорофілів (*a* + *b*), чиста продуктивність фотосинтезу, зернова продуктивність.

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Introduction. Grain production in Ukraine is a strategic and most effective sector of the national economy, as it forms the basis of the country's food supply and security. The state of grain production in recent years has been significantly affected by changes in natural and climatic conditions and insufficient material and technical support. Therefore, there is a need to develop new approaches to grain production based on both resource-saving technologies and rational use of zonal natural and climatic conditions [13, 14, 19, 20]. Today, research devoted to finding alternative, biologized means of increasing plant productivity, which are based on the activation of their natural metabolic processes, comes to the forefront [5, 12].....

Materials and methods. The research was conducted in 2021–2022 in a winter wheat field (*Triticum aestivum* L.) of the Benefis variety, sown after peas, under the conditions of a stationary experiment to study the scientific foundations of productivity management of short-rotation crop rotations in the Carpathian region.....

Results and discussion. Meteorological indicators during the research years had certain characteristics. Winter and spring-summer vegetation periods of winter wheat differed in the amount of precipitation. During winter and summer, it was 473.6 mm in 2021 and 318.3 mm in 2022, compared to the average long-term values of 458.0 mm (Table 1).

Table 1. Meteorological conditions during the research period (2021–2022)

Months	Опади				Air temperature, °C			
	mm		% norm		monthly average		difference from the norm	
	2021	2022	2021	2022	2021	2022	2021	2022
January	47.9	52.3	120	130	-1.5	-0.7	3.1	3.9
February	95.8	25.3	222	59	-2.8	-1.8	0.9	5.3
March	43.1	17.3	98	40	1.7	2.6	1.2	2.1
April	39.9	82.0	78	160	6.0	6.5	1.4	-0.9
May	55.4	24.3	65	29	13.1	13.9	0.2	1.0
June	97.3	31.3	104	32	19.3	19.7	3.0	3.4
July	94.2	85.8	92	84	22.2	19.5	4.7	2.0

Note: "–" – values below the norm.

A certain moisture deficit was noted in 2022 during March, May, and June. This deficit proved to be non-critical and did not significantly affect plant development and crop formation. Heat supply for winter wheat in the mentioned years was favourable for plant growth and development.

The chlorophyll content in winter wheat leaves does not provide a complete characterisation of the photosynthetic activity of crops. At the same time, photosynthetic potential can be expressed through net photosynthesis productivity (NPP, g/m² per day), which gives a more complete picture of the photosynthetic function of the crop. Under conditions of using variants formed on the basis of pea straw + $N_{90}P_{60}K_{60}$ (variants 3, 4, 5), during the flowering phase (F), net photosynthesis productivity indicators were within 5.22–6.08 g/m² per day (Fig. 1), which exceeded the corresponding value in the control variant.

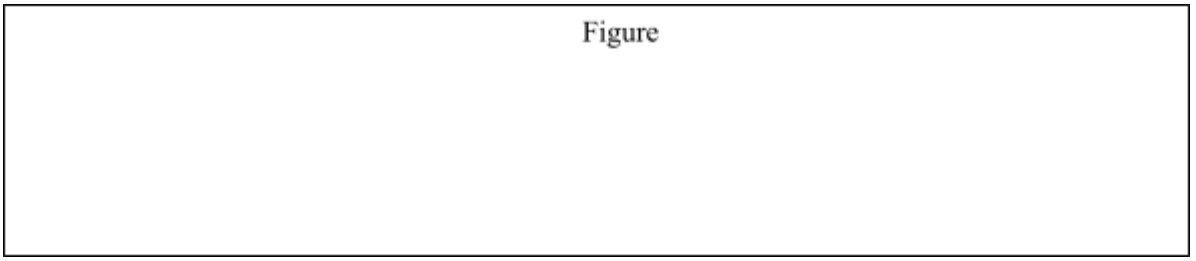

Fig. 1. Influence of biologized fertilizer systems on net photosynthesis productivity

During the milk-wax ripeness period, a decrease in net photosynthesis productivity was noted (Fig. 1) against the background of a slight decrease in the sum of chlorophylls (*a* + *b*) in winter wheat leaves (Table 2) in variants 3–5.

Conclusions. Thus, it was found that the use of biologized fertiliser systems positively affected the content of chlorophylls (*a* + *b*), net photosynthesis productivity, and winter wheat yield.

The content of the sum of chlorophylls (*a* + *b*) was highest during the flowering and milk-wax ripeness phases (variants with pea straw + $N_{90}P_{60}K_{60}$ + BS + HD or plant treatment with ChF) – 3.62–3.38 and 3.78–3.64 mg/g fresh weight. This caused an increase in the number of grains per spike and 1000-grain weight to 36.1–40.5 g, which resulted in an increase in grain productivity of the crop to 4.60–5.54 t/ha.

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