

- pollination of crops
 - high quality of agricultural products beneficial for human and animal health.
- Healthy soil provides health for the whole food chain: crops - animals - people
- planet Earth.

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INFLUENCE OF BIOGAS DIGESTATE, WOOD ASH AND THEIR MIXTURES ON THE YIELD AND QUALITY OF WINTER WHEAT

Winter wheat (*Triticum aestivum* L.) is considered to be one of the most important grain crops. Due to its high yield potential and grain quality, it is widely grown and used in food products all over the world.

Considerable areas are allocated for winter wheat crops in Ukraine. Thus, in 2020, grain crops were planted on an area of about 15,077 thousand hectares, in particular, 6,595.7 thousand hectares, or 43.7%, were devoted to winter wheat. In 2021, these indicators reached the level of 6,907.6 thousand hectares, or 44.1% in the structure of grain crops.

The geographic position of Latvia is very suitable for the production of winter wheat, which is also reflected in the country's field structure. During the last 10 years, the area under winter wheat has increased by factor 3, and it is no longer possible to use the agricultural area to increase yield output.

The data of the Central Statistical Bureau of the Republic of Latvia for the year 2020 show that the area used for grain crop farming was 750 000 ha, of which 381 000 ha were winter wheat.

The most important measures for improving the productivity and yield quality of winter wheat are soil reaction improvements and plant fertilization.

Currently, for the production of heat and energy, biogas plants and solid fuel

boilers are widely used, generating digestate and wood ash as by-products. In normal circumstances, the by-products need to be stored and disposed, which is a complex task that can often pose various environmental pollution risks. Both wood ash and biomass digestate are used as liming and fertilizing agents in the agricultural sector.

To study the efficiency of the use of wood ash and digestate mixtures in winter wheat fertilization, a trial was established at the Study and Research Farm “Peterlauki” (56°53' N, 23°71' E) of the Latvia University of Life Sciences and Technologies: soil – turf carbonate sand heavy; soil reaction pH_{KCl} 6.7; plant-available phosphorus (P₂O₅) content – 60 mg kg⁻¹; potassium (K₂O) content – 144 mg kg⁻¹; organic matter (OM) content – 2.6%.

A two-factor trial was set up: 1) the mixture of cattle manure digestate (D) (from JSC “Ziedi JP”) and wood ash (P) (from LLC “Green Jelgava”) at different proportions (A1 – D; A2 – D+P 1:1; A3 – D+P 2:1; A4 – D+P 3:1; A5 – D+P 3:1 + NPK 8-20-30 200 kg ha⁻¹; A6 – D+P 3:1 + N 64 kg ha⁻¹; A7 – D+P 4:1);

2) different rates of mixtures used for fertilization norms (B1 – 5 t ha⁻¹; B2 – 10 t ha⁻¹; B3 – 20 t ha⁻¹). For the purposes of the trial, 66 experimental plots were established; the area of each plot – 30 m².

The chemical composition of the mixtures containing digestate and wood ash is shown in Table 1, by which it is possible to determine the amount of nutrients in each particular mixture.

Table 1

Nutrient content of the digestate and wood ash mixtures

Nutrients	Content in dry matter, %				
	D	D+P 1:1	D+P 2:1	D+P 3:1	D+P 4:1
Nitrogen in a natural sample (N)	0.29	0.27	0.30	0.51	0.34
Ammonium nitrogen (N/NH ₄), g kg ⁻¹	1.20	0.43	0.40	0.76	0.37
Phosphorus (P)	0.74	0.90	0.89	0.83	0.83
Potassium (K)	1.70	2.90	2.92	2.73	2.64
Calcium (Ca)	2.41	13.44	13.55	10.48	10.86
pH	9.27	12.19	11.84	11.22	10.91

D – cattle manure digestate; P – wood ash

Winter wheat yield: Collected data shows that the average yield of winter wheat obtained between replications was 6.8 t ha⁻¹ for the control variant. Using any of fertilizer treatments, significantly higher (p<0.05) winter wheat yields were obtained.

The highest average winter wheat yields were obtained in fertilizer treatments D+P 3:1 + NPK 8-20-30 200 kg ha⁻¹ (8 t ha⁻¹), and A6 – D+P 3:1 + N 64 kg ha⁻¹ (9 t ha⁻¹).

Among the fertilizer rates applied, considerably higher ($p < 0.05$) yields were obtained for the variants treated with 10 and 20 t ha⁻¹ mixtures of wood ash and cattle digestate.

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PECULIARITIES OF THE FOREST FLORA OF – GDAŃSK POMERANIA PRESENTED IN FOREST BOTANICAL GARDEN «MARSZEWO»

Forest Botanical Garden «Marszewo» is a young garden, established in 2010 according to the decision of the General Director for Environmental Protection in Poland. It is founded and maintained by the Gdańsk Forest District - a part of Polish State Forests. The garden is also a member of the Council of Botanical Gardens in Poland.

«Marszewo» garden covers the area of ca. 50 ha located in the suburbs of the Gdynia city (N Poland). Within the area the central part (5 ha) are taken by botanical collections and buildings, while the rest are forests - mainly beech and oak-hornbeam forests.

There are 30 botanical collections, focused on plants typical for Pomerania region. They are mostly varied forest species, but also such collections as: orchard of old fruit trees, geographically alien species or collection of medical and edible plants. There are also phytocoenotical collections (e.g. oak-hornbeam col., heathland col. meadow col.). Major part of the open area in garden has a wild character – as extensively mown (once a year) meadows.

One of botanical collections presented in Forest Botanical Garden «Marszewo» is called «Wild edible and medical plants, used formerly and nowadays