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UDK 631.81:[635.262:631.879]

PRODUCTIVITY OF WINTER GARLIC USING MIXTURES OF DIGESTATE AND WOOD ASH

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Garlic (*Allium sativum* L.) is one of the most popular vegetable crops. It is used fresh, in the meat and vegetable canning industry. The popularity of garlic is due to its bactericidal and antioxidant properties.

To obtain high and stable yields, garlic requires an optimal supply of various factors for growth and development – in particular, nutrients. In production, various types of fertilizers for garlic are recommended, both in the main application and in top dressing [1-3].

In biogas and wood cogeneration plants, a large number of biological by-products, including digestate and wood ash, are generated during the production process; therefore, it is important to identify the possible sectors of economy where they can be effectively applied. By-products of biological production can be reused, for example, for soil improvement, as they contain the nutrients required for plant growth and development. In agriculture, the above substances are currently used separately as soil fertility improvers. Digestate is rich in nutrients, can provide the majority of nutrients the plant needs during the growing season, as well as improves the soil structure. Approximately 35-81% of the total nitrogen content in the digestate is ammonia (NH₄) or nitrogen in a plant-available form.

Wood ash contains a small amount of phosphorus and potassium, and is strongly alkaline (pH 8-12) due to oxides. Wood ash contains mainly calcium carbonate which, when solidified, turns into CaCO₃, so the ash can be used to regulate soil pH. In agriculture practice, digestate and wood ash are most often used separately to improve soil

fertility; however, the use of both of these products separately can create certain environmental problems. In order to at least partially prevent the environmental pollution, the idea arose to mix digestate and ash in certain proportions and use them in crop fertilization.

The purpose of the study was to determine the effect of fertilization norms of digestate and ash mixtures on the productivity of the winter garlic variety Lyubasha. Fertilizer rates of unfertilized plantings of winter garlic and three types of digestate were used as control options. During the growing season, the dynamics of the development of winter garlic was determined, the yield was recorded, and the quality of garlic bulbs was determined: the content of dry matter, crude protein, sulfur, phosphorus, potassium, and reducing sugars in dry garlic bulbs.

It was found that fertilizers affected the yield of winter garlic in different ways – depending on the type of a fertilizer, the yield varied from 7.5 to 9.1 t ha⁻¹. The content of dry matter in the bulbs of winter garlic was in the range of 35.4–39.1.0%. Dry matter is an important indicator of the quality of a product –the higher it is, the less the garlic is subject to mechanical damage and the better is stored in winter. The norms of the fertilizer mixture did not have a significant effect on the change in the content of crude protein in garlic, and its content in the total dry matter of the studied options ranged from 6.1 to 7.8%.

The main qualitative characteristic of garlic is its taste and the sharpness of cloves, and it is determined by sulfur-containing non-volatile amino acids. In addition to taste properties, they also determine the medicinal properties of garlic. The sulfur content in the total dry matter was 0.28–0.70% depending on the fertilizer rate and type. In general, the use of wood ash and biogas digestate mixtures to fertilize crops and improve soil fertility can be an efficient way to process both products, and can also be an environmentally friendly alternative to mineral fertilizers on acidic soils.

ACKNOWLEDGEMENTS. The research was supported by a grant from the Ministry of Agriculture and the Rural Support Service of the Republic of Latvia for the project "Development of a new technology for the production of plant fertilizers from the residues of biogas plant digestion and woodchip cogeneration (woodchip ash)", contract No. 19-00-A01612-000008.

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