proceedings

Abstract

Buckwheat Husks, Ash and Biomass for Sustainable Plant Fertilization and Soil Improvement †

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† Presented at the International Conference EcoBalt 2023 "Chemicals & Environment", Tallinn, Estonia, 9–11 October 2023.

Keywords: buckwheat; organic fertilizers; granulation

Nowadays, it is difficult to imagine agriculture without the use of fertilizers, because plants cannot absorb the required amount of nutrients from the soil. The only way to provide plants with all the nutrients they need is to fertilize them. Depending on the properties of the soil, the type of plant, climatic conditions, etc., different amounts of nutrients are required for effective plant growth [1]. However, the intensive and unbalanced use of concentrated mineral fertilizers reduces the reserves of fertilizer raw materials, exhausts the soil and harms the ecosystem. Meanwhile, in some industries (food, energy, etc.), increasing amounts of production by-products are generated, which could be processed into high-quality organic fertilizers. The decomposing matter from organic fertilizers breaks down naturally and would provide nutrient and minerals to the soil [2,3]. One such material is waste from the buckwheat groats industry: uncleaned buckwheat biomass (UBM), buckwheat husks (BH) and buckwheat husk ash (BHA). These wastes contain many different nutrients that plants need, so it becomes possible to use them as fertilizers. It is difficult to directly use biofuel ash, buckwheat hulls or biomass for soil fertilization because, due to the improper shape, non-uniformity and high dustiness of their particles, the maximum fertilization efficiency is not achieved, and it is necessary to granulate them. A drum granulator was used to produce a mixture of raw materials containing various wastes: BH, BHA and UBM. Depending on the composition of the starting materials, it was possible to obtain up to 60% of a productive fraction. The moisture content of such granules varied between 2 and 10% and they had a relatively low bulk density (between 430–480 kg/m^3). The pH values of the 10% solution of the produced granules ranged from 9.7 to 12.0, which indicates that the fertilizer can act as a lime agent; it is recommended to fertilize acidic soils. It should also be mentioned that the obtained pellets are quite weak and plastic. Granular fertilizers are non-hygroscopic and retain their shape when stored at 21–23 °C and 70–75% humidity. In summary, it can be said that buckwheat groat waste can be used in the production of environmentally friendly fertilizers in order to reduce environmental pollution, slow down soil degradation and increase the amount of soil organic matter.

Author Contributions: Conceptualization, R.Š. and O.P.; methodology, R.Š. and O.P.; software, O.P.; formal analysis, O.P.; investigation, O.P.; resources, O.P.; data curation, R.Š.; writing—original draft preparation, O.P.; writing—review and editing, R.Š.; supervision, R.Š. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Citation: Pocienė, O.; Šlinkšienė, R. Buckwheat Husks, Ash and Biomass for Sustainable Plant Fertilization and Soil Improvement. *Proceedings* **2023**, *92*, 53. https://doi.org/10.3390/proceedings2023092053

Academic Editors: Monika Mortimer, Anne Kahru, Ivo Leito, Riin Rebane and Villem Aruoja

Published: 27 November 2023

Informed Consent Statement: Not applicable.

Data Availability Statement: Data sharing is not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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