

EFFECT OF RAW MATERIAL COMPOSITION ON THE PHYSICAL PROPERTIES OF SOLID ORGANIC FERTILIZERS

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Intensive agricultural practices have led to a gradual depletion of soil organic matter, highlighting the need to increase the input of organic materials to maintain soil health and productivity. At the same time, the accumulation of organic solid waste in landfills as a result of high consumption levels has become a serious environmental concern in many European Union countries, contributing to increased emissions of carbon dioxide and methane. In line with the objectives of the EU Green Deal, there is a growing emphasis on the development and implementation of technologies that promote nutrient recovery and material recycling from the food and agricultural sectors. In this context, organic fertilizers derived from secondary raw materials represent a promising solution, offering both environmental and agronomic benefits.

Organic waste, such as residues from buckwheat groats processing (buckwheat husks, their ash, and other biomass fractions), which are currently underutilized, can be used as raw materials for the production of organic fertilizers. When properly combined, these materials can be used to produce solid organic fertilizer formulations containing essential nutrients required for plant growth. However, the effectiveness and practical applicability of such fertilizers depend not only on their chemical composition but also on their physical properties, which are strongly influenced by the composition of the raw materials used.

The physical properties of solid organic fertilizers were studied using the following methods. Fractional composition, i.e., particle size distribution, was determined using woven sieves (RETSCH GmbH, Haan, Germany) in accordance with DIN ISO 3310-1, with mesh sizes of 0.2, 0.5, 1.0, 2.0, 3.15, 4.0, and 5.0 mm.

The static strength of granules was measured using an IPG-2 device (АО “УНИХИМ с ОЗ”, Yekaterinburg, Russia).

The hygroscopicity of granular organic fertilizers was evaluated using the gravimetric method by monitoring changes in mass over time under different conditions: at 98–99% relative humidity and 21.1–25.9 °C, and at 60–61% relative humidity and 20.6–25.0 °C.

The bulk density of loose granules was determined by the gravimetric method based on mass difference, according to CEN EN 1236:1995. The compacted bulk density was determined in accordance with DIN EN 1237.

Moisture content was determined using an electronic moisture analyzer (Kern MLS 50-3HA160N, Kern & Sohn GmbH, Balingen, Germany).

Fertilizer pH was measured using a pH meter (HANNA pH211, HANNA Instruments, Woonsocket, RI, USA).