UREA GRANULATION USING ALGAE ADDITIVE

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One of main sources of nitrogen, which is very important for plant, is soil. The lowest nitrogen amount is in the sand, and higher in the black soil and peat. Humus is the main nitrogen store and holder, it can hold up to 5 % nitrogen. There is only a small part of the soil nitrogen is absorbed by the plant, before the soil organisms have to mineralize the organic nitrogen [1]. Nitrogen fertilizers are very important for plants, especially when fertilizing plants in spring. They provide plants with nutrients, affect plant growth, are important for protein formation, and regulate soil pH. However, there are even three forms of nitrogen (ammonia, nitrate and amide) and they assimilation on plants is distinct. Urea is a high concentrate nitrogen fertilizers (nitrogen concentration is 46%) where the nitrogen is in the form of an amide group. Nitrogen in this group dissolves much more slowly, are slower compared to other forms of nitrogen, not so strongly washed out of the soil. The amide form of the soil eventually migrates to the ammonia form. Urea is suitable for fertilization both through the leaves and through the roots and is often used [2].

However, urea is very hygroscopic and this makes it difficult to store it. Furthermore nitrogen from simple urea granules is lost in leaching, denitrification, nitrous emission processes. Many scientists are exploring ways to reduce the increase its efficiency of use and reduce nitrogen pollution. One of this research is manufacturing granular urea fertilizer encapsulated with biodegradable film to obtain controlled release coated urea [3].

In this research, to slow down urea solubility another bioactive component – Chlorella Vulgaris algae, is used. Chlorella Vulgaris algae are widely used bioactive substances containing many chemical elements (K, P, Ca, S, Fe, Cu, Na, Mg, Mn, Si). However, the amount of chemical elements in the algae depends on the algae cultivation medium. Scanning electronic microscope (SEM) Phenom World ProX (G5) image shows the concentration of the elements (Fig. 1 a) and that the particles are spherical regular form and the surface of the particles is slightly uneven (Fig. 1 b).

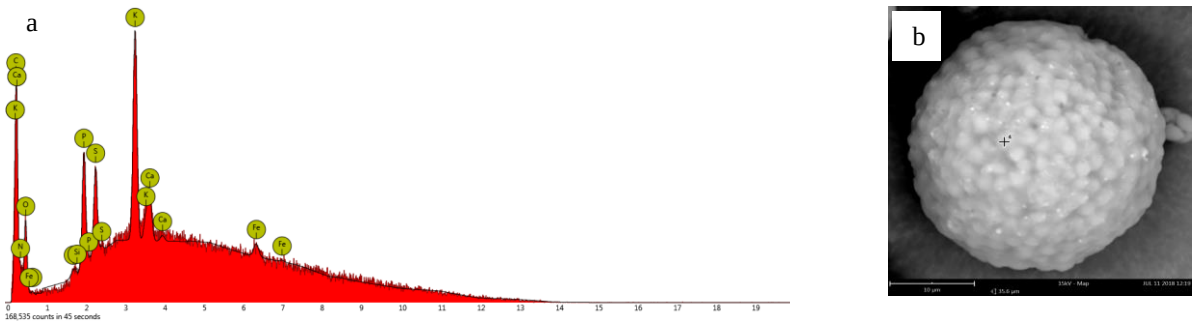

Fig. 1. SEM of Chlorella Vulgaris algae: a – concentration, b – surface

In this research together urea and bioactive component granulation method was used. Granulation is the process by which pellets from small particles are formed. In this case, also distilled water as granulating material (binder) was used. Granulation process was carried out on a laboratory drum granulator-dryer [4]. Pelletizing of fertilizers using liquid phase for irrigation of the material consists of four stages: powdered irrigation of raw materials, granulation of wetted material, drying of pellets, granule analysis.

For granulation, urea samples with 5–20 % algae addition were prepared and moisture content in the mixture from 5–20 % ranged. Granulator rotation speed was 24 rpm, inclination angle 3 degrees, air flow temperature for pellet drying 55–65 °C. The got granules were dried, fractionated and the static strength of granules and hygroscopicity of the marketable fraction were determined.

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