

Abstract

Liquid Complex Fertilizers with Bio-Additives [†]

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Every year, approximately 2.5 billion tons of waste are generated in the European Union. Due to these reasons and the limited amount of raw materials, the integration of the circular economy is encouraged [1]. The fertilizer industry is one of the industries that is characterized by the recycling of by-products into new products. One of the by-products in the fertilizer industry is the liquid phase, which is obtained as a secondary product after the crystallization and filtration of the solid primary product. Liquid fertilizers have many advantages: they are highly compatible with trace elements, fungicides, physiologically active substances or other important additives [2]. It is very important to choose the right fertilizer, because plants need to be given the required amount of nutrients. If at least one element is missing, the plant may rot or even die [3]. During this work, the possibility of using the post-crystallization solution for the production of liquid complex fertilizers was examined. To achieve this goal, the concentrations of plant nutrients and chlorine in the post-crystallization solution and its chemical—physical properties were determined. Considering the need to increase the concentration of nitrogen in the post-crystallization solution, studies were conducted, during which the influence of different nitrogen compounds on the crystallization temperature of the post-crystallization solution were observed. Studies have also been carried out in which solutions (as organic nitrogen additives) that would be highly compatible with the post-crystallization solution were extracted from the lupine (*Lupinus polyphyllus*). After the chemical analysis, the liquid complex fertilizers were found to contain 1.4%–P₂O₅, 4%–Cl and approximately 13.5%–K₂O. Depending on the nitrogen additions, the concentration of nitrogen in the liquid fertilizers varied from 1.02% to 3.78% N. Four liquid complex fertilizers of different brands were obtained and used: 1-2-14; 3-2-14+ME; 4-2-14+ME+mineralized lupine leaves; and 4-2-14+ME+lupine leaf extract.

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