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New formulations of specialized mineral-organic fertilizers according to the guidelines for a closed loop economy

Abstract

The paper presents new formulations of specialized mineral-organic fertilizers based on secondary raw materials. Fertilizing potential of waste plant biomass after extraction with supercritical carbon dioxide, secondary raw materials with high phosphorus content (bones, bones and ashes from sewage sludge combustion) and waste animal biomass (waste category 2) was utilized. Secondary plant biomass was enriched in Cu^{2+}, Mn^{2+} and Zn^{2+} ions, phosphorus-bearing waste was subjected to microbial solubilization, and waste category 2 was managed by acid hydrolysis. The resulting formulations were subjected to formulation correction and analysis, followed by evaluation of their biological effectiveness in germination tests, vase tests, or field tests. For each proposed technology, the feasibility of commercialization was checked, a production node diagram and mass balance were prepared, and basic cost-effectiveness calculations were performed. The formulations proposed in this work have a low environmental footprint, so they are an environmentally friendly solution, in line with the circular economy guidelines and the European Green Deal.