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Received: 01-May-2024, Manuscript No: jety-24-136508

The Influence of Various Agrotechnical Approaches on the Growth of Miscanthus Hybrid in Soil Contaminated with Trace Metals

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Abstract

Miscanthus plant establishment in the feld may sufer as a result of natural pollution and climate change. This is especially important because biomass can be produced on uncultivated land without harming food crops. The chosen hybrid, the cultivation method, the climatic conditions, and the concentration of pollutants in the soil all have an impact on establishment success. During the frst growing season and after the frst winter, there are a number of ways to increase the chances that the plants will survive. Utilizing biochar and photodegradable plastic mulch, both of which have the potential to be a solution for polluted soils containing trace elements (TMEs), is one of them. For two Miscanthus hybrids planted by rhizome (TV1) and seedling plugs (GNT43) on soils contaminated with trace metal elements (Pb, Cd, and Zn), the purpose of this study was to investigate the application of plastic mulch and biochar separately and in combination at the planting stage. TV1 is not suitable for TME-contaminated feld cultivation, as the survival rate was below 60% in the majority of the treatments studied. The survival rate did not rise with the chosen treatments. This parameter was signifcantly reduced when biochar and plastic mulch were combined, regardless of the hybrid under investigation. Pb and Cd in GNT43 were signifcantly higher in all treatments, but applied agrotechnology had no efect on TME accumulation in TV1's aboveground plant parts. During establishment on TME-contaminated soil or after the frst growing season, neither biochar nor plastic mulch applied separately nor in combination increased survival or decreased the accumulation of toxic TMEs.

electrical conductivity (EC) was measured using an ESP 2ZM electrode (EUROSENSOR, Gliwice, Poland) in accordance with the Polish standard. e hydrometric method was utilized to evaluate the soil's texture in accordance with the Polish standard [8-10].

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e studied Miscanthus hybrids' highly hybrid-dependent survival rates were signi cantly in uenced by the speci c planting method. In comparison to the seed-based GNT43, which had a survival rate of over 90% in the most e ective treatment, which was the control for both hybrids, the TV1 planted with rhizomes had a lower survival rate (about 60%) and was characterized by weaker growth (height and number of stems). e agrotechniques used to speed up establishment were the opposite in this experiment. Regardless of hybrid, the treatment with biochar and plastic mulch resulted in the greatest number of plant losses. TV1 and GNT43 had identical element concentrations a er the rst growing season, but GNT43 had signi cantly higher concentrations of Pb and Cd than the control. Biochar and plastic mulch applied separately or in combination did not decrease the accumulation of toxic TMEs during establishment on contaminated soils or increase the survival rate, contrary to published research on uncontaminated soils. However, Miscanthus, particularly GNT43, grows extremely well with low o akes once established. Because there are no other options, these slightly contaminated areas should be expanded with Miscanthus hybrids. To determine how Miscanthus hybrids establish in the rst year a er planting on di cult soils contaminated with TMEs, additional research employing a variety of methods is required. It is necessary to commercially develop agronomic innovations for various nations' slightly contaminated soils.

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