Enhancing Nutritional Value of Legume Cereal Intercrops in Northern Kazakhstan Through Rhizobium Inoculation

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Abstract:

Our study evaluated the effects of combining legume–cereal grass mixtures and inoculating them with Rhizobium-based preparations on yield, nutrient content, and amino acid composition. By leveraging the biological traits of legumes, inoculation with nodule bacteria and associative nitrogen fixers was used to enhance nitrogen fixation in mixed crops. The research aimed to compare monocultures and mixed crops in terms of yield and nutritional value, examining the impact of biological preparations (Rhizotorphin, Mizorine, Flavobactrin, and Azolene) on photosynthetic activity and productivity. Results showed that inoculated mixtures significantly improved green mass yield, protein content, and feed quality. Two-component mixtures with Rhizotorphin increased yield by 8.79%, while three-component mixtures achieved a 16.49% increase. Among all combinations, the oat–pea mixture showed the greatest amino acid enhancements, with lysine increasing by 6.26% and tyrosine by 3.24%. The findings from a two-year experiment (2022–2023) in northern Kazakhstan's hill–plain zone indicate that legume-cereal mixtures treated with nodule bacteria outperform monocultures in productivity and nutritional value. This highlights the potential of bacterial inoculants for optimizing forage crop systems in the region, with recommendations to prioritize legume-based mixtures for high-quality feed production.