

Integrative application of foliar yeast extract and gibberellic acid improves morpho-physiological responses and nutrient uptake of *Solidago virgaurea* plant in alkaline soil

Alkaline soils have fertility issues due to poor physical qualities, which have a negative impact on crop growth and output. *Solidago* is used in flower arrangements, bouquet filler, and traditional medicine. The possible biological fertilizers' eco-friendly and cost-effective nature favours farmers because of the vital role in soil productivity and environmental sustainability. A field experiment was performed during two successive seasons to explore the effect of applying yeast extract (YE) at (0, 0.5, 1.0, and 1.5 g/L) and/or gibberellic acid (GA₃) at (control, 100, 200, and 300 ppm) on the morpho-physiological parameters, macronutrients, and biochemical constituents of *Solidago virgaurea*. The results emphasize that YE (1.5 g/L) and/or GA₃ (300 ppm) treatments show the highest significant increase in plant growth (i.e., plant height, no. of branches, fresh and dry weight of shoots); photosynthetic efficiency (i.e., chlorophyll (a), chlorophyll (b) and total carotenoids); macronutrient content (i.e., N, P, and K); and biochemical constituents (i.e., total soluble sugars, total phenolic, total flavonoids, and total glycosides). The study results recommend using YE and GA₃ in combination at concentrations of 1.5 g/L and 300 ppm, respectively, to improve *Solidago* production sustainability under alkaline soil conditions.