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Long-Term Effects of Soil Salinity on Coriander Seed Viability and Yield in Jharkhand and Bihar

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ABSTRACT

Soil salinity is a critical environmental issue that significantly affects agricultural productivity, particularly in arid and semi-arid regions. This study focuses on the long-term effects of soil salinity on the seed viability and yield of Coriandrum sativum (coriander), an essential crop in Indian agriculture, widely cultivated in the states of Jharkhand and Bihar. The research aims to provide a comparative analysis of how soil salinity impacts the growth, yield, and seed viability of coriander in these two regions, known for their varying agro-climatic conditions. Understanding these effects is crucial for improving crop management practices and mitigating the adverse effects of soil salinity on coriander production.

The study uses a combination of field experiments and controlled greenhouse trials. In both Jharkhand and Bihar, coriander plants were grown under varying levels of soil salinity, measured in deciSiemens per meter (dS/m). The experiments were conducted over a period of two years to assess both the immediate and long-term effects of salinity. Key variables analyzed include germination rate, plant height, leaf chlorophyll content, seed viability, and overall yield. Soil samples were collected periodically to monitor changes in salinity levels and soil health indicators such as pH and organic matter content.

Initial findings indicate a marked difference in the tolerance of coriander plants to soil salinity between Jharkhand and Bihar. In Jharkhand, coriander plants displayed greater resilience, with less significant declines in seed viability and yield under moderate salinity levels (up to 4 dS/m). The relatively stable rainfall patterns and better water management practices in Jharkhand might contribute to the plants' ability to withstand saline conditions. In contrast, coriander plants in Bihar experienced a sharper decline in both yield and seed viability, particularly under salinity levels above 3 dS/m. The higher evaporation rates and poor soil drainage in certain areas of Bihar may exacerbate the effects of salinity on coriander growth.

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The study also reveals that prolonged exposure to high salinity levels (>5 dS/m) results in substantial physiological stress in coriander plants in both regions, as evidenced by reduced leaf chlorophyll content, stunted growth, and lower seed germination rates. The data suggest that while coriander plants in Jharkhand exhibit a higher tolerance to moderate salinity, long-term exposure to high salinity poses significant risks to both regions' coriander production.

This research concludes that while Jharkhand has better adaptive capacity for coriander cultivation in saline soils, both states require improved salinity management techniques to sustain coriander production. Recommendations include adopting salt-tolerant coriander varieties, enhancing soil drainage, and implementing soil amendments such as organic matter to mitigate the effects of salinity. Further research into breeding salt-resistant coriander strains could offer long-term solutions to the challenges posed by soil salinity.

The findings from this comparative study will provide valuable insights for farmers, agricultural scientists, and policymakers in Jharkhand and Bihar. By understanding the regional impacts of soil salinity on coriander, tailored strategies can be developed to improve crop resilience and productivity, ultimately contributing to food security in these regions.

Keywords: Soil Salinity, Coriander (Coriandrum Sativum), Seed Viability, Crop Yield, Jharkhand, Bihar, Agricultural Productivity, Salinity Tolerance, Soil Management, Chlorophyll Content, Germination Rate, Salinity Stress.