

GA₃ 200 ppm priming showed significant effect on root length and root dry matter accumulation of cucumber promoting root development through active stimulation of enzyme synthesis (hydrolytic enzyme) and enhanced cell elongation in the radicle region leading to highest root length. The results were observed for root length as earlier found by Badu et al. (2022). GA₃ priming showed improved assimilate partitioning toward root tissues and increased root sink strength for carbohydrate and other structural compounds leading to dry matter accumulation. Singh (1984), reported that GA₃ significantly increased dry root weight in seedling. KNO₃ 1% showed best result in shoot dry matter accumulation because KNO₃ supports in supply of readily available nitrogen promoting protein synthesis and more efficient reserve mobilization and assimilation during early growth. Similar finding was reported by Farooq et al. (2007), where improvement in seedling dry weight was observed from seed primed with KNO₃ 1% solution.

Distinct advantages can be revealed from comprehensive comparison among treatments. Hot water priming results in higher and uniform germination, making it beneficial for nursery establishment. For rapid and synchronized emergence of seedling, KNO₃ 1% could be beneficial, while GA₃ 200 ppm showed higher root dry matter biomass leads to potential improvement in transplant establishment. These trade-offs highlight the importance of selecting proper seed priming methods based on production objectives.

Beside of positive outcomes, the experiment was limited to single location and inside polyhouse condition. Absence of field validation restrict broader generalization. More studies are required under large and open field condition for better conformity.

5 Conclusion

Priming cucumber seed with hot water (45 °C for 5 minutes) proved to be effective for highest germination percentage. However, it was not significantly different from GA₃ 100 ppm, and GA₃ 200 ppm. Similarly, hot water was found to decrease days to 50% germination, increase seed vigour index-I, seed vigour index-II and have better effect on root length and fresh root weight. Mean germination time was decreased and the highest speed of germination was found in KNO₃ 1%. Dry shoot weight was significantly affected by KNO₃ 1% while GA₃ 200 ppm showed significant effect on dry root weight. Control treatment consistently produced the lowest result in most of the parameters. Hence, in practical applications, the choice of priming method should be based on target trait, as well as cost and availability considerations to enhance most of the germination and seedling growth parameters of cucumber.

Authors' contributions

Saroj Yadav is the principal researcher who conceptualized the idea, collected and analysed the data, and prepared the manuscript. Bibas Chaulagai and Promise Shrestha helped Saroj Yadav in data collection, analysis, editing and proofreading of manuscript. Ganesh Lamsal helped in conceptualizing the idea, data analysis and proofreading of the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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