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Effect of Seed Priming on Germination and Seedling Growth of Cucumber (*Cucumis sativus* cv. Bhaktapur Local) in Syangja, Nepal

Saroj Yadav ✉, Bibas Chaulagai, Promise Shrestha, Ganesh Lamsal

Agriculture and Forestry University, Faculty of Agriculture, Rampur, Chitwan, 44209, Nepal

✉ Corresponding author: saroj8030y@gmail.comInternational Journal of Horticulture, 2026, Vol.16, No.2 doi: [10.5376/ijh.2026.16.0007](https://doi.org/10.5376/ijh.2026.16.0007)

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Abstract Cucumber (*Cucumis sativus* L.) is high-value vegetable in Nepal, known for its high nutritive value, high water and fiber content. However, cucumber faces low and inconsistent germination rates and poor seedling growth. Seed priming is a viable option to address these issues. Hence, an experiment was conducted from March to July, 2024 in Syangja, Nepal to analyse the effect of seed priming on germination and seedling growth of cucumber under high-tech polyhouse condition. The experiment was laid out in Completely Randomized Design (CRD) with ten treatments i.e. T₁: Control, T₂: Hot water (45 °C for 5 minutes), T₃: GA₃ 100 ppm, T₄: GA₃ 200 ppm, T₅: KNO₃ 1%, T₆: KNO₃ 3%, T₇: Cow urine 5%, T₈: Cow urine 10%, T₉: Vermiwash 10%, and T₁₀: Vermiwash 20%, each replicated three times. The results revealed that significantly the highest germination percentage (88%), seed vigour index-I (2,643.83), seed vigour index-II (22,555.33), fresh root weight (0.51 g) and earliest days to 50% germination (6 days) were recorded from the seed primed with hot water (45 °C for 5 minutes). Significantly the earliest mean germination time (6.06 days), highest speed of germination (0.49) and highest dry shoot weight (240 mg) were recorded in KNO₃ 1%, while dry root weight was maximum in GA₃ 200 ppm (46.00 mg). Hot water significantly enhanced germination percentage and overall seed vigour; KNO₃ 1% reduced MGT and improved germination speed; GA₃ 200 ppm promoted root dry matter accumulation. In practical applications, the choice of priming method should be based on target trait, as well as cost and availability considerations.

Keywords Cucumber (*Cucumis sativus* L.); Germination; Hot water; Potassium nitrate; Seed priming**1 Introduction**

Cucumber (*Cucumis sativus* L.) is one of the economically important cucurbits grown during summer season in hills and terai region of Nepal. Cucumber is low in calories and contains soluble fiber, high level of vitamins like C, K, other traces of minerals and antioxidants (Murad and Nyc, 2016). The nutritive value of 100 g of edible cucumber contains 12 calories of energy, 0.6 g of protein, 0.1 g of fat, 2.2-3.6 g of carbohydrates, 0.5 g of dietary fiber, 14 mg of Ca, 15 mg of Mg, 124 mg of K, 24 mg of P (Shakuntala et al., 2020).

Seed priming is a pre-sowing strategy for influencing seedling development by modulating pre-germination metabolic activity prior to the emergence of radicle and generally enhance rapid, uniform emergence and plant development to achieve higher yield (Black and Bewley, 2000). It is a technique to elevate the germination percentage and reduce the time of seedling emergence along with improvement in uniformity of germination and emergence in field condition (Dhal et al., 2022). Hydro-priming enhance the seed germination, growth and uniform seedling growth in the field in various crops (Adebisi et al., 2012), and increases the speed of germination, decreases mean germination time (MGT), increases seed vigour index (SVI) (Shakuntala et al., 2020). GA₃ play essential role in plant growth and development (Bai et al., 2016), chlorophyll biosynthesis, carbohydrate metabolism (Varier et al., 2010), and increases germination by 30.56% (Behera, 2016). KNO₃ improves seed parameters of cucumber and other vegetables (Ghassemi-Golezani and Esmaeilpour, 2008). Cow urine 10% shows positive influence in capsicum due to presence of physiologically active substances (Ambika and Balakrishnan, 2015). Vermiwash priming increases the first and final count germination compared to control (Sowmya et al., 2022). Fathima and Sekar (2014) revealed that vermiwash treatment was most effective in promoting seedling growth, including maximum hypocotyl and radicle length.