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Selecting efficient treatments to phytoremediate nitrate contamination in well water, ex-situ, using *Ipomoea aquatica*

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Abstract

Ipomoea aquatica has been identified as a potential plant to phytoremediate nitrate contamination of water. This study was conducted to select efficient treatments using *Ipomoea aquatica* to reduce nitrates in groundwater ex-situ and to get adequate nitrate-safe leafy vegetables. Groundwater samples were collected from a nitrate-contaminated well in the Chunnakam aquifer and analyzed for nitrate content. The experiment was conducted in plastic containers having 3.7 liters of groundwater in three-factor factorial design with three replicates, in. The factors were numbers of plants (5/10), water refilling (without a refill/refill up to the initial mark weekly), and foliar fertilizer application (without/with foliar fertilizer-FF). An organic formulation containing banana pseudostem liquid and Panchagavya was used as a foliar fertilizer. Treatments were, T1- 5 plants alone (PA), T2- 5 plants + FF, T3-10 PA, T4- 10 plants + FF, T5- 5 PA + refill, T6- 5 PA + refill + FF, T7- 10 PA + refill, T8- 10 plants + refill + FF. The pre-germinated two weeks old seedlings of *Ipomoea aquatica* were placed in plastic net trays above the containers having water in such a way that the roots were immersed in water. Nitrate in water was analyzed initially and at weekly intervals. Fresh weight, dry weight and NO_3^- - N (Nitrate Nitrogen) of plants were measured after harvesting, at the end of three weeks after treatment. Initial nitrate in water was 138 mg/L. The treatments with 10 plants removed significantly higher nitrate reaching the safe level (below 50 mg/L). However, the available volume of water at the end was the lowest in T3 and T4, while T7 and T8 had the initial volume, indicating the efficiency of refilling. The lowest NO_3^- in treated water (23.46 mg/L) and the highest NO_3^- -N in plants (55.84 mg/kg) were recorded in T8. According to the acceptable daily intake (ADI) limit of NO_3^- - N as 3.7mg/kg body weight/per day, this phyto-remediated *Ipomoea aquatica* could be used as a vegetable without any harmful effect. It can be concluded that T7 (10 PA + refill) and T8 (10 plants + refill + FF) could be used by households to treat nitrate polluted well water while getting fresh leafy vegetables.

Keywords: Groundwater, *Ipomoea aquatica*, Nitrate, Phytoremediation

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