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**Phytoremediation capacity of selected Filicophytes (*Adiantum latifolium* L.,
Christella hispidula and *Pteris vittata* L.) in improving quality of ground water
through removing hardness**

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Dug wells are the major source of drinking water for inhabitants of Nikawewa and Moragollagama in the Kurunegala District and water in most of the wells is of undesirable quality for drinking due to hardness. The frequent complaint of the villagers had been that water hardness in their wells had increased following removal of the plant cover on the walls of the wells and plastering them with concrete/cement. This study was carried out to characterize hardness of ground water used for drinking and cooking purposes and to investigate the possibilities of using Filicophytes as phytoremediation agents in removing ground water hardness. In this research, three Filicophytes (*Adiantum latifolium* L., *Christella hispidula* and *Pteris vittata* L.) were tested for three months to assess their capabilities of removing ions that cause hardness in water. Water samples were collected from twenty one wells located in Nikawewa and Moragollagama. Water samples were tested for total hardness, calcium hardness and content of other ions (CO_3^{2-} , Cl^- , NO_3^- , PO_4^{3-} and SO_4^{2-}), pH, turbidity and conductivity. Total hardness and calcium hardness were measured using EDTA titrations. The NO_3^- , PO_4^{3-} and SO_4^{2-} concentrations were determined colorimetrically using UV- visible spectrophotometry. An acid titration was used to determine the CO_3^{2-} levels and chloride content was measured using Mohr method. Total hardness of water in sample wells ranged from 197- 975 mg/l. Total hardness, magnesium hardness, phosphate, chloride, pH and turbidity values of the tested groundwater samples exceeded WHO (World Health Organization) prescribed maximum permissible limits for drinking water. Under these conditions there is potential to use phytoremediation to remove hardness causing ions in order to improve the quality of well water. Filicophytes established in the fern bed system which was prepared using Moragollagama and Nikawewa soil showed higher efficacy of water hardness removal than the hydroponic system. After 66 days *Pteris vittata* L., *Adiantum latifolium* L. and *Christella hispidula* has reduced hardness by 35.31%, 34.66% and 33.89% respectively. Hardness removal rates of *Pteris vittata* L., *Christella hispidula* and *Adiantum latifolium* L., were 0.69 mg/l/day per 20 g of fresh weight of plant material, 0.66 mg/l/day per 30 g of fresh weight of plant material and 0.68 mg/l/day per 15 g of fresh weight of plant material respectively exhibiting their remediation capacity to improve the quality of well water by reducing hardness.

Keywords: Filicophytes, groundwater, phytoremediation, removal rate, water hardness