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# Identification of Suitable Substitutes for Calcium nitrate Usage in Coir Substrates Industry

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## Abstract

Coco-peat, a byproduct of the Cocos nucifera plant, is an important soilless plant growing medium with high sodium, potassium, and low calcium content. Buffering coco-peat with Calcium nitrate prior to medium preparation is critical for increasing fertility by changing ion concentrations through cation exchange capacity and ionic voltage. Calcium nitrate usage has been deemed unlawful due to the harmful impacts of the nitrate group on the natural environment. The objective of this study was to investigate a viable chemical alternative for coco-peat as an industrial buffering agent. It was laid out under two factor factorial design with Calcium nitrate, Calcium carbonate, Calcium oxalate, Calcium citrate and Calcium bicarbonate. Four replicates were prepared from each chemical. Since the industry norm for Calcium nitrate application is 10 kg per ton of coco-peat, a standard buffering solution was made using 10 g of Calcium nitrate in a 250 ml solution. 10 g, 20 g, and 30 g of mentioned chemicals were dissolved in 200 ml and 250 ml solutions separately to investigate the effect of different concentrations on electrical conductivity (EC). For each trial, 1 kg of coco-peat was used. Calcium ion concentrations in buffered coco-peat were determined using EDTA titrations and Flame Photometer analyses. General Manova Analysis was used for Analysis of Variance at ($P \leq 0.05$). Mean calcium ion concentration, EC and pH of Calcium nitrate treated samples were (1.03 ± 0.0168) %, (1480 ± 0.051) mS/cm and 6.485 ± 0.115 respectively. These values were used as control sample values to compare with other buffered samples' results. From analyzed results, 30 g of calcium citrate in 250 ml and 200 ml solutions have given parallel values with Calcium nitrate treated samples with its high solubility and buffering capacity beyond selected chemicals. A significant difference of EC values of coco-peat samples was identified from the EC of raw coco-peat samples (1480 ± 0.051) mS/cm. The cost per 500 g of each chemical was compared according to the Organic Trading's (Pvt) Ltd rates, and no significant cost difference between Calcium nitrate and Calcium citrate was identified. Overall results suggest that Calcium citrate performs similarly compared to Calcium nitrate and further studies on use of Calcium citrate for buffering coco-peat medium is required. Furthermore, more studies should be carried out on the use of Calcium citrate-enriched natural resources to improve the efficacy of buffering coco-peat in green technology while being environmentally benign.

***Keywords:*** *Buffering, Calcium citrate, Calcium nitrate, Coco-peat, Soilless plant growing media*

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