



**University of Zabol**  
**Graduate School**  
**Faculty of Soil and Water**  
**Department of Soil Science**

The Thesis Submitted for the Degree of Master of Science  
(In the field of Soil Science)

**Title**

The Use of Layered Triple Hydroxide to Slow Release of Plant Nutrients in Soil

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## **Abstract**

Triple layer hydroxides obtained from the synthesis of chemicals are promising matrices for the production of frankincense fertilizers and in the production of modern crops and horticultural products as frankincense fertilizers, biosynthesizers or regulators. Biomasses are used to improve plant quality and yield and reduce negative environmental impacts. These fertilizers absorb metal contaminants from the soil. It also causes the elements in the soil to be absorbed slowly and sufficiently by the plant. These fertilizers contain macro and micro nutrients and minerals. In order to investigate the effect of triple layer hydroxide fertilizer on the quantitative and qualitative characteristics of nightshade plant in a completely randomized design with three replications in the educational greenhouse of Baqiyatallah (AS) (Chah Nimeh) of Zabol University in 1397-98 done. To implement this plan, triple layer hydroxide (LTH) and commercial fertilizer and enriched fertilizer (EEH) were applied in 7 levels (0, 0.25, 0.50, 1, 2.5, 5, 10) as soil application. The nightshade plant was cultured and 45 days after the end of the plant growth period, the shoot was removed from the crown and after determining the fresh weight of the shoot, it was transferred to the laboratory. Isolation of roots was slowly separated from the soil by a 2 mm sieve and washed with water and then after determining the fresh weight of the roots, it was transferred to the laboratory for further steps. The results of analysis of variance showed that triple layer hydroxide, commercial fertilizer and enriched fertilizer (EEH) had a significant effect on all measured plant parameters and also played an important role on growth indices (longest and shortest root length, root volume, weight). Wet and dry roots, stem height and diameter, fresh and dry weight of shoots and leaf chlorophyll content (a, b, carotenoids) of catalase, ascorbate peroxidase, polyphenol oxidase, peroxidase as well as nocturnal plant elements. In fact, according to the results, it was found that the greatest effect on the quantitative and qualitative traits of nightshade plant in the application of enriched fertilizer (EEH) treatment as soil application at the level of 5 mg / kg soil was obtained. Triple layer hydroxide fertilizer affected some quantitative and qualitative traits of nightshade plant including root volume, root area, shortest stem length, longest stem length, catalase enzyme, polyphenol enzyme and chlorophyll b and increased plant yield.

**Keywords:** Layered triple hydroxide, New fertilizer, Slow release, Soil element