

**A COMPLETE AND BALANCED FERTILIZER RECOMMENDATION
BASED ON A SYSTEMIC APPROACH FOR
CAULIFLOWER (*Brassica oleracea* L. var. *botrytis*)**

By

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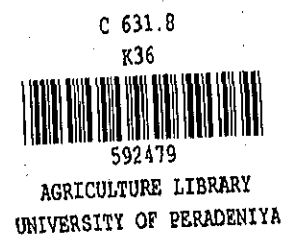
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ABSTRACT

Site-specific fertilizer management is a modern approach used with the intention of increasing the fertilizer use efficiency, maximizing profitability and minimizing negative environmental impacts. The commonly used general fertilizer recommendations for vegetable crops in Sri Lanka are based on crop response experiments, which do not consider the variability of soil fertility, and are often limited to the supply of N, P and K. The soil-test based fertilizer recommendation introduced by the Department of Agriculture (DOA) does not include secondary and micronutrients. In the above context, the objectives of the present study were to: a) evaluate the fertility parameters and nutrient status through a systematic approach combining soil analysis, fixation studies and greenhouse nutrient surveys and, (b) formulate and test a site-specific fertilizer recommendation for cauliflower (hybrid variety 'Fuji') in three experimental sites.

Demand for cauliflower as a vegetable has increased over the last decade. The average yield of cauliflower, however, has come to a plateau even after introducing new high yielding varieties to Sri Lanka. Low productivity due to low fertility of soils and the imbalanced fertilization are some of the identified reasons for the yield stagnation of vegetable crops.

The experimental sites were located in the dry zone at Pelwehera (Reddish Brown Earth; Alfisol), the intermediate zone at Dodangolla (Immature Brown Loams;

Inceptisol) and the wet zone at Gannoruwa (Immature Brown Loams; Inceptisol) of Sri Lanka. Soils were analysed using a three-step extraction method to evaluate the available nutrient status; ASI solution ($0.25\text{ M NaHCO}_3 + 0.01\text{ M EDTA} + 0.01\text{ M NH}_4\text{F}$) extraction for P, K, Cu, Fe, Mn and Zn, 1 M KCl extraction for $\text{NH}_4\text{-N}$, Ca, Mg and Na, and $0.08\text{ M CaH}_2(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$ extraction for B and S contents. Nutrient contents were compared with the established optimum and critical values to identify deficiencies. Fixation studies conducted for P, K, Cu, Zn, Fe, Mn, S and B were used to identify the fixation capacity of the soils for these nutrients and to calculate the amount of additional fertilizer to be supplemented when fixed or unavailable. An optimum fertilizer recommendation was formulated for each soil and was tested in the greenhouse using a modified missing element technique using Sorghum as the indicator plant, and in the field using cauliflower variety 'Fuji' as the crop.

The initial soil analysis indicated deficient levels of N, P, K in all three locations; deficient levels of Ca, S, B, Mn, Mo at Dodangolla site and deficient levels of Ca, B, Zn, Mo at Gannoruwa site. The optimum recommendation formulated for each soil consisted of the deficient nutrients at rates adjusted based on the fixation capacities for nutrients. The optimum treatment gave the highest dry matter yield while the low N, low P, or low K fertilizer treatments gave significantly ($p \leq 0.05$) lower yields in the greenhouse experiment in all three soils.

In the field, the average cauliflower curd yield varied between 129.8-263.7 g per plant ($5.19\text{-}10.55\text{ mt ha}^{-1}$) with the optimum treatment, which was significantly higher

($p \leq 0.05$) than the other corresponding fertilizer treatments. The results indicated that the K influenced the curd yield than any other single nutrient. The results of field experiments therefore indicate the importance of diagnosing of nutrient problems in soils prior to cultivation and site-specific fertilizer management for cauliflower. Benefit Cost Ratio analysis indicated a higher profit of Rs.903,018 at Pelwehera, Rs.602,091 at Dodangolla and Rs.935,576 at Gannoruwa with the optimum fertilizer treatment than any other treatment. The results of this study confirm that the systematic approach for site-specific fertilizer recommendation is an effective and reliable method to evaluate soil fertility status and nutrient limiting factors to recommend fertilizers and to refine the presently used recommendations for vegetable crops in Sri Lanka. A balanced fertilizer consisting of 200, 180, 400, 2 kg ha⁻¹ of N, P, K, Mo for Pelwehera, 200, 150, 400, 500, 160, 1, 5, 2 kg ha⁻¹ of N, P, K, Ca, S, B, Mn, Mo for Dodangolla and , 200, 170, 180, 600, 1, 1, 2 kg ha⁻¹ N, P, K, Ca, B, Zn, Mo for Gannoruwa respectively, can be recommended for Cauliflower (*Brassica oleracea* L.) based on a systemic approach.