

Effect of Splitting the Dose of Phosphate Fertilizers on Phosphorus Availability and Growth and Yield of Cauliflower (*Brassica oleracea* var. Botrytis)

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Abstract: A field experiment was carried out at the Agricultural Research Station College of Agriculture, University of Basra in southern Iraq. It included the response of cauliflower plants to the addition of 60 kg P_2O_5 in the form of Concentrated Superphosphate (CSP) or Diammonium Phosphate (DAP) fertilizers with four treatments of splitting the level of fertilizer: addition all Fertilizer dose at Transplanting (T1); 50% of the fertilizer level at transplanting and remaining 50% divided into three doses, 10 days apart (T2); 50% of the fertilizer level at transplanting and remaining 50% divided into two doses, 15 days apart (T3); 50% of the fertilizer level at transplanting and remaining 50% is added 30 days after planting (T4). Drip irrigation was used to irrigate the plants grown on bands 0.5m wide and each plot 2m long, containing 5 plants. Each treatment was repeated in three replicates with randomized complete block design. Results showed that the type of phosphate fertilizer did not affect soil pH, but affected the soil salinity; salinity increased in the presence of CSP over DAP. Likewise, Type of phosphate fertilizer had a significant effect on available phosphorus in soil, as DAP fertilizer outperformed CSP at a rate of 97.94 and 83.63 mg kg^{-1} , respectively. This result significantly affected the superiority of DAP on CSP in plant growth parameters (P in leaves, number of leaves plant⁻¹ and leaf area) and in terms of plant yield and quality (head weight, head diameter, total yield, total dissolved solids, carotene in fruits). For the splitting fertilizer level, T3 treatment surpassed the rest of treatments in available phosphorus in soil, growth parameters and yield parameters and quality of cauliflower plants; total plant yield reached 54.37 and 54.20 tons ha^{-1} with DAP and CSP fertilizers, respectively, with an increase percents of 22.53 and 37.59% compared to the conventional Treatment (T1).

Keywords: Concentrated Superphosphate, Diammonium Phosphate, Available P, Splitting Fertilizer Dose, Cauliflower, Carotene

INTRODUCTION

Iraq is located within dry and semi-arid regions, consisting more than 20% of total area Alwan [1]. Therefore, these regions suffer from a high content of calcium carbonate and a high pH value, which leads to a decrease in the available concentrations of nutrients, including phosphorus. Phosphorus is one of the essential elements for plant growth and productivity controlling soil fertility, plant yield and quality. Phosphorus is involved in formation of nuclear acids, RNA and DNA.

Salimpour et al. [4] stated that the efficiency of phosphate fertilizers does not exceed 20-35% due to its exposure to stabilization and adsorption processes. Tisdale et al. [5] explained that benefit of added phosphate fertilizers may reach 10-30% and the reactions velocity with soil components varies depending on soil nature and environmental conditions. Therefore, a deficiency available phosphorus occurs in most agricultural soils in arid and semi-arid areas, such as southern Iraq, which is of a calcareous nature characterized by an abundance of