

The Interactive Effect Organic Fertilization And Amount Of Water Applied On Plant Nutrient Availability In Soil And Productivity Of Potatoes. (*Solanum Tuberosum* . L)

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Abstract

This study was conducted to study the effect of different levels of Organic Fertilizers application (0, 5 and 10%, M₀, M₁ and M₂) from furrow weight and different quantity of irrigation water 450 mm (S₂) and 350 mm (S₃) compared to the optimum quantity of water 550 mm(S₁) which represents the water requirement of potato and its hnteraction on nutrient availability,potato growth and yield, An expirement was conducted in silty clay loam soil. at Horticulture Field – College of Agriculture –University of Baghdad.

Organic Fertilizer levels added on 18th of January 2012 befor sowing, Potato tubers (Burren class Elite) were sown on 24th of Jonuary 2012. Using Randomized completed block design with three replicates. Leaf Concentrations of (N, P, K, Fe, Zn and Mn) nutrients were determined at plant leaves at two stages of plant growth (intioniation of tubers and their maturity). plant height Number of tillers per plant, leaves area, chlorophylls a, b and total and proline were determined too. Vegetative parts of plants were harvested at maturity, dried and the dry weight was determined. Tubers concentration of nutrients, percentage of protein, starch and dry matter were determined at tuber after harvest. Total yield of tubers, and tuber weight wear calculated as well. soil reaction, electrical conductivity, organic matter and the available content of N, P, K, Fe, Zn and Mn were determined for soil samples at the end at the experiment. The results showed that :

- 1- Total yield of tubers was increased significantly by adding organic fertilizer (M₁ and M₂) 168.48 and 172.14% respectively compared to control

treatment (M_0) While. Water stresses decreased total yield at percent (7.02, 28.56) for Water stresses S_2 and S_3 respectively compared to control treatment S_1 .

- 2- Organic fertilizer Levels significantly increased electrical conductivity of soil at tuber initiation stage and after tubers maturity(22.5, 77.5) and (15.4, 57.7)% also organic matter percent was increased at the same stages (257.0, 430.0) and (319.5, 385.0)% of organic fertilizer treatments (M_1 and M_2) compared to control treatment (M_0). Organic fertilizer decreased significantly soil reaction at percent of (4.9, 2.5)% at tubers initiation stage.
- 3- Application of Organic fertilizer levels significantly increased the concentrations of N ,P ,K, Fe, Zn and Mn in the soil at both stages of plant growth at(710.8, 785.3) and (968.6, 1022.8)% for nitrogen and (508.7, 605.6) and (453.7,512.7)% for phosphorus and (249.9, 311.9) and (143.5,180.6)% for potassium and (238.4,262.4) and(163.3,184.2)% for iron and (318.0, 413.5) and(264.4, 421.9)% for zinc and (83.3, 176.9) and (75.7, 88.5)% for manganese of organic fertilizer treatment (M_1 and M_2) respectively compared to control treatment (M_0), while water stress significantly reduced all above concentrations except potassium which increased its concentration.
- 4- Concentrations of N , P, K ,Fe, Zn and Mn in plant leaves and tubers for both stages of plant growth increased significantly with increasing levels of organic fertilizer application, while water stress significantly decreased the concentration of these nutrient in leaves and tubers except P which had no significant effect.
- 5- Application of organic fertilizers significantly increased Plant height stolons numbers, total dry weight of vegetative growth, Leaf area, chlorophyll a,b and total chlorophyll.with significant decreased of proline concentrations with increasing of organic fertilizer levels. while high water stress reduced all above properties except chlorophyll b and concentration of proline in leaves.
- 6- Tuber weight, number of tuber per plant , plant yield of tubers , percent of protein , starch and dry matter were increased significantly with increasing of organic fertilizer levels. while high water stress significantly reduced all these properties .

- 7- Application Of Organic fertilizer levels and reduce water quantity added increased water use efficiency (WUE), the best treatment the interaction M_1S_2 which was 9.74 kg m^{-3} .
- 8- Interaction treatment between organic fertilizer and water stress treatments(M_2S_1 , M_1S_1 , M_2S_2 and M_1S_2) was achieved higher increasing of tubers wieght compared to control treatment . The percent of increasement were 139.08, 123.84, 122.81 and 125.79 % respectively.
- 9- The interaction treatment between organic fertilizer and irrigation requirement of water M_2S_1 achieved the best result by increasing the total yield of tubers 46.43 Mg ha^{-1} , and the second order was at M_1S_2 treatment which gave 43.85 Mg ha^{-1} .