

Different Irrigation Levels Testing on Cucumber in Tissue Tunnel

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Abstract

Cucumber require high amount of water about 95%. Irrigation earlier than necessary, effects on water productivity, energy and also has a negative impact on soil condition and plant growth. Tissue tunnel is more viable practice for temperature maintaining and control pest attack. An experiment of in time applications of irrigation to the cucumber crop under a tissue tunnel was conducted at Water Management Research Center (WMRC), University of Agriculture Faisalabad (UAF). Randomize Complete Block Design (RCBD) was selected with three repetitions to check the effect of three irrigation levels, 20% MAD as T₁, 40% MAD as T₂ and field capacity as T₃. Growth parameters like plant height, number of fruits, number of leaves and fruit weight per plants were calculated. Two different discharge levels of drip system were selected 4 liters per hour (lph) and 2 liters per hour (lph). The Results revealed that irrigation efficiency was 95% of 4 lph drip discharge and only 88% of 2 lph drip discharge. Average plant height calculated in T₂ was 6 ft with 4lph drip discharge and 5.3 ft. in T₅ (field Capacity). Weight of fruit per plant was 1300 g in T₂ with 4 lph and 900 g in T₅ with 2 lph drip discharge. Water saving was 20% in T₁ and T₂ and 40% in T₃ and T₄ with maximum and in T₄ and T₃ with minimum yield, respectively. Experiment approach justified that amount of irrigation water directly affect yield and growth parameters of Cucumber plant.

INTRODUCTION

Cucumber is one of the most important greenhouse crops particularly because it can be grown throughout the year. However, such intensive production system, the crop is often severely infested with several insect and mite pests and diseases including the fungal, bacterial and viral diseases. Integrated pest management (IPM) in greenhouse is one of the most important approaches for successful pest control. So, the cucumber crop growing in tissue tunnel have significant resistance against fungal, bacterial and viral diseases. Cucumber mature quickly and produce high yield but are extremely sensitive to frost. As the demand of locally grown cucumber has increased. Therefore, many growers are seeking to extend the cucumber growing season. The most cost-effective way to extend the growing season is by using unheated, plastic covered and high tunnels.

Due to this, cucumber is most significant high tunnel crop. As many growers know, choosing the right variety can result a large difference in yield and market value.

Water plays a very important role in plants life because it takes part in different chemical and physical processes like transpiration and evapotranspiration in plant body. Many vegetables crops required significant amount of irrigation as a major consumer. Cucumber crop is also a major consumer of water because a healthy cucumber contained 85% of water. It needs more irrigation due to Eco physiological particularities; it is member of such vegetables family with higher utilization of water and reduced possibilities of absorption. Management allowable depletion level is very important phenomenon for the production of fruits and vegetable crops in controlled conditions. Cucumber generally grow more rapidly than tomatoes and produce earlier. They also require high temperature which mean they are generally grown as a spring or early summer crop. Daytime temperatures should be 80-85°F and night-time 65-75°F. Soil temperature should be at least 65°F. Lower temperature will delay plant growth and fruit development (Florica, B.M.2014).

Cucumber crop is very sensitive to nutrients. It requires 150 Kg/acre of phosphorus and similar quantity of potassium are required. Weekly feeding with a balanced fertilizer (20-20-20) will be required for maximum production (Iqbal *et al.*, 2015). Never stress to seedlings for water or nutrients. Plants are best started in individual containers. As seeds are often very expensive, sow one seed per container (0.25 to 0.50-inch deep) in a sterile potting mix with the spiked end of the seed up (root will emerge facing down). Cover pots with clear polyethylene, and place in the shade. Plants will emerge in two to three days at 80-85°F. Remove plastic coverings when plants emerge and place them in full sun. After plants have formed at least two true leaves, transplant them to their permanent location in the growing bed. Cucumber will acquire 6-8 square feet of space per plant. Plants are generally spaced two feet apart in rows three to four feet apart.

Cucumber is universally grown in open fields and greenhouses for its palatable immature green fruit that is relished as raw, in cucumber salads, pickles and sometimes cooked in some parts of the world. Cucumber loves warm conditions and is grown in Kharif season, although is not a big crop (Reid, J. 2006). Yields are better in sandy-loam soils with adequate organic matter and plenty of sun. It is a shallow-rooted crop and can be easily grown in backyards, home-gardens, in open fields and in greenhouses. It is marketed throughout the year. Cucumber is a short duration crop and it starts coming in the local markets after 40-50 days of sowing. In certain seasons, the retail price goes up from Rs20 to Rs30 per kg.

Mehmood *et al.* (2011) discussed that the country produced 15,949 tons of cucumber from 1,251 hectares and 1,461 tons from 839 hectares in 2003-04. Most of the production is accounted for Baluchistan and Sindh. Both the area and production shows a downward trend from 2000-01, presumably due to pest attack and diseases and due to lack of resistant varieties. Cucumber is not only cooling and palatable to take but it is also quite nutritive. One medium size cucumber provides as much as Calories = 39, Saturated fat (g) = 09, Cholesterol (mg) = 0, Carbohydrate (g) = 8.3, Dietary fiber (g) = 2.4, Protein (g) = 2.1, Sodium (mg) = 6.0, Potassium (mg) = 433, Calcium (mg) = 42, Iron (mg) = 0.8, Zinc (mg) = 0.6, Vitamin C (mg) = 16, Vitamin A (mg) = 647, Vitamin B (mg) = 0.13, Thiamine (mg) = 0.07 and Niacin (mg) = 0.7. Not only the growers can reap benefits from

it but it could also be a source of earning and foreign exchange for the country by its increased export.

MATERIALS AND METHODS

Research experiment has been conducted to test the different MAD levels on the growth and the yield of cucumber crop in a sandy loam soil in tissue tunnel at Water Management Research Center, University of Agriculture, Faisalabad. Research was designed with two different MAD levels at 20% and 40% and compare their results with field capacity of the soil in which water is present at its full capacity. For irrigation purposes, two treatments in which 2lph and 4lph emitters were selected to check the efficiency of the drip irrigation system at the field level. Treatments are 20% MAD level with 2 lph as T₁, 20% MAD level with 4 lph as T₂, 40% MAD level with 2 lph as T₃, 40% MAD level with 4 lph as T₄ and field capacity of the soil as T₅. Growth parameters like crop height, number of fruits, number of leaves and weight of fruits were calculated. For irrigation purpose number of watering, irrigation rate, time and duration of irrigation, irrigation scheduling are the major parameters of irrigation system. Water consumption for plants was measured on daily basis from pan evaporation and calculate the amount of water saved. In which water consumption in peak months on average 55-65 m³/ha was depend on the crop varieties. Soluble fertilizers were chosen and applied through the drip irrigation system.

RESULTS AND DISCUSSION

In this experiment, after installation of drip system firstly we check the efficiency of the drip irrigation system. Check the irrigation efficiency at the time of installation, at the mid of season and at the end of the crop. Result shows that 4 lph discharge show high efficiency throughout the season about 95% and followed by 2 lph about 85%. Results shown in the graph below.

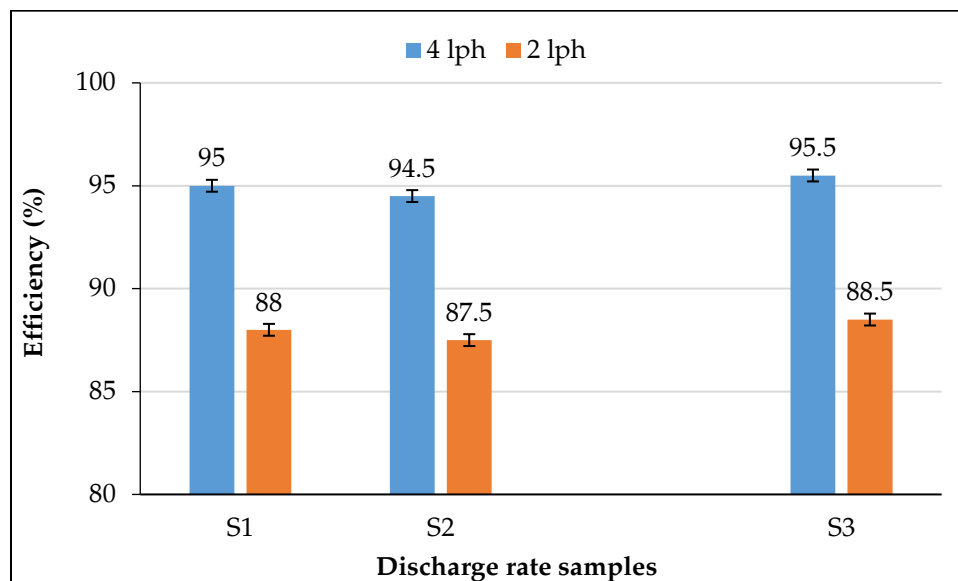


Figure 1: Comparison of emission uniformity of drip irrigation system in the field.

Comparison of plant height and weight yield per plant shown in the graph. In which the highest yield was 1300 g in T₂ with 4 lph discharge and followed by T₁ with 1100 g yield with 2 lph discharge.

During vegetative growth of plant number of leaves are very important with leaves color and their size to manage the nutrient requirement to the crop. Number of leaves have no significant difference in different treatments. Number of fruits were high in the T₂ and minimum in T₃. It was concluded that Cucumber is highly affected by water stress. 20% MAD level is good for water saving and obtaining high yield of cucumber.

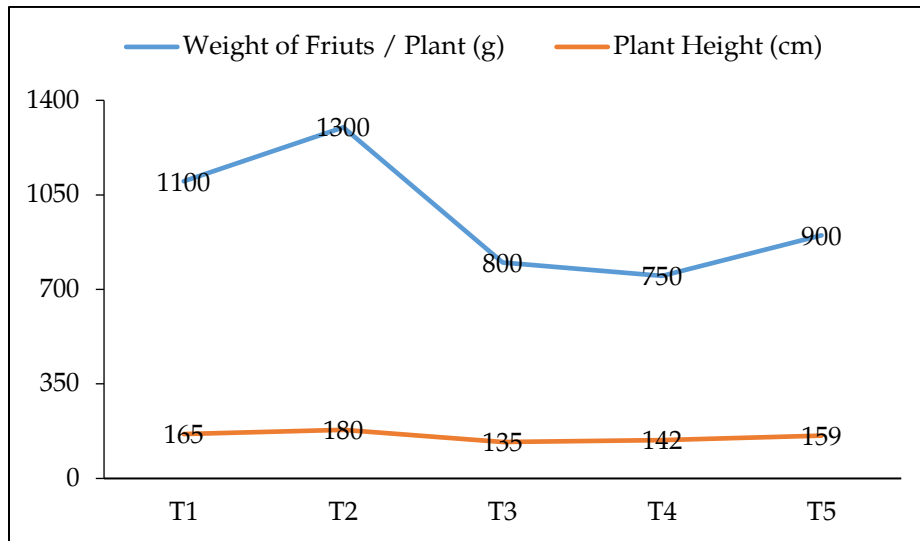


Figure 2: Comparison of weight and height of plant.

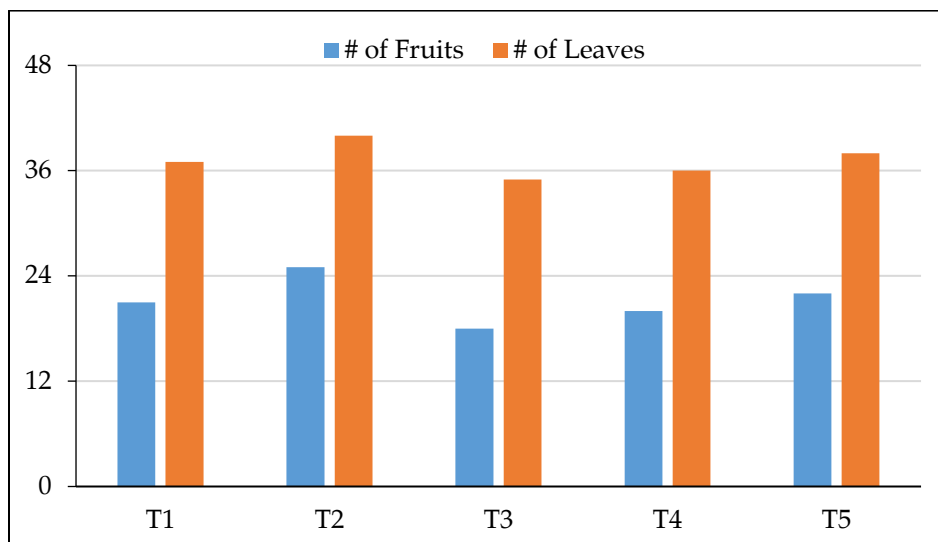


Figure 3: Comparison of number of fruits and leaves.

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