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Drip irrigation water requirement of capsicum under sub-humid sub-temperate region of Himachal Pradesh

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ABSTRACT

A field experiment was conducted on sandy loam soils 'Inceptisols' to evaluate the effect of different drip irrigation levels (100% crop evapotranspiration, 80% crop evapotranspiration and 60% crop evapotranspiration) along with black polyethylene mulch as compared to surface irrigation on growth and yield of capsicum. The treatments included different irrigation levels based on pan evaporation, pan and crop factors under polyethylene mulch and un mulched condition. Drip irrigation at 0.8'V' volume of water gave significantly higher yield (116.69 qha^{-1}) as compared to surface irrigation. Drip irrigation plus polyethylene mulch raised the yield further to 131.47 qha^{-1}. Water Use Efficiency at drip irrigation alone, drip irrigation plus polyethylene mulch and surface irrigation was 3.73, 3.88 and 2.35 respectively. Drip irrigation plus polyethylene mulch besides giving a saving of 55.6 per cent water resulted in 37 per cent higher yield as compared to surface irrigation only. The benefit cost ratio of capsicum cultivation under drip irrigation, drip irrigation plus polyethylene mulch and surface irrigation came out to be 2.66, 2.77 and 2.27, respectively.

Key words : Capsicum, Drip irrigation.

INTRODUCTION

Capsicum is major cash crop of mid hill zone of Himachal Pradesh but mostly it is rainfed or rarely through surface irrigation. In hill regions, the system of surface irrigation is not suitable under sloppy conditions, light textured soils of low water holding capacity with shallow soil depth whereas drip irrigation has proved its superiority over other irrigation methods in fruit and vegetable crops, owing to precise and direct application of water in the root zone. Optimum soil moisture regime plays a major role in the development of vegetative growth as well as fruit production and supplement of water through irrigation is necessary to maintain a proper soil moisture regimes particularly during summer season. Water is becoming a limiting factor in crop production with growing needs for intensive cropping. Thus, to use the scarce water resources, whether it is tural stream flow, spring water or harvested rain water, drip irrigation system being efficient and with high frequency, seems to be suitable alternative of surface irrigation under hill conditions. Chundawat (1990) reported water loss under surface irrigation upto 35-50 per cent, compared with 2-3 per cent under drip irrigation. An optimum irrigation schedule aims at achieving more yield with higher water use efficiency.

Mulch materials are well known to improve conservation of soil moisture during dry period in comparison to clean cultivation. The use of black polyethylene mulch has been reported to control the weed incidence reduce nutrient loss and improve the hydrothermal regime of soil (Ashworth and Harrison, 1983). Baskett (1960) reported reduction of watering in vegetables by using black polyethylene sheet for mulching. However, no attempt has so far, been made to study the effect of drip irrigation alone and in conjunction with plastic mulch as compared to surface irrigation on yield and irrigation water requirement of capsicum in mid hills of Himachal Pradesh. Therefore, the present studies were undertaken to study the effect of different levels of drip irrigation with and without plastic mulch on yield and irrigation water requirement of capsicum.

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MATERIALS AND METHODS

The experiment was conducted on loamy sand 'Inceptisols". The soil of the experimental area was having pH 7.28, Ec 0.314, OC 2.01, texture loamy sand while available N, P and K were 307.32, 358.40 and 198.40 kgha^{-1}, respectively. The following treatments, in triplicate, were tried in randomized block design.

T_1- Drip irrigation with 'V' volume of water (DV)
T_2- Drip irrigation with '0.8V' volume of water (0.8DV)
T_3- Drip irrigation with '0.6V' volume of water (0.6DV)
T_4- Surface irrigation (S)
T_5- T_1 + Plastic mulch (DV+M)
T_6- T_2 + Plastic mulch (0.8DV+M)
T_7- T_3 + Plastic mulch (0.6DV+M)
T_8- T_4 + Plastic mulch (S+M)

The 'V' volume of water requirement was computed using following equation:

$$V = E_p \times K_c \times K_p \times W_p \times N - R_e \times A$$

Where,

V= volume of water required (litres)
E = Pan evaporation (mm/day)
K^p= Crop factor
K^c= Pan factor
W^p = Wetting percentage
N^p= Number of days
R = Effective rainfall
A_e=Area of plot