Research Note

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Efficacy of Drip Irrigation under Plant Geometry on Yield of Cauliflower

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An experiment on different combinations of plant density with drip irrigation was tested in cauliflower at Dehradun. It was found that the comination of subsurface drip placement with plant geometry of 60 x 30 cm gave the highest yield as well as benefit cost ratio.

Introduction

India has made significant achievements in the production of food grains, yet malnutrition is still very real impediment to the development of the country. Fruits and vegetables, being rich sources of nutrients, vitamins and minerals, have an indisputable role to overcome this problem. Cauliflower is one of the most important winter vegetables of India with a variety of uses. It is one of several vegetables in the species *Brassica oleracea*, in the family Brassicaceae of which only the head (the *white curd*) is eaten. It is low in fat, low in carbohydrates but high in dietary fiber, folate, water and vitamin C, possessing a high nutritional density.

In India, only 40% of the area is irrigated which produces more than 60% of country food and rest 60% of area is under rainfed which produces less than 40% of country food (Singh and Goyal, 2018). This is due to low irrigation efficiency of the traditional irrigation methods which is around 35% (Singh et. al., 2013). In view of this, it was need felt to improve productivity of vegetable crops like cauliflower, tomato, sweet pepper, chilly, coriander, etc through energy efficient water saving irrigation systems. It has been proved by experimentation that application of water to vegetable crops during moisture deficit period through drip irrigation system can enhance productivity of different crops by 30-50%. Hence, an effort was made to see the efficacy of drip irrigation under different plant densities on yield of cauliflower.

Method

Cauliflower was propagated by seeds and seedling were raised on nursery bed. The seedlings were transplanted under drip irrigation with different combinations of plant densities as i.) Surface drip placement (60 x 30 cm) ii.) Surface drip placement (60 x 45 cm) iii.) Subsurface drip placement (60 x 30 cm) iv.) Subsurface drip placement (60 x 45 cm).

Irrigation scheduling was developed using pan evaporimeter and weather station data which was istalled 100 meters away from the experimental field. Reference Evapotrancepiration (which is nothing but it is a crop water requirement and if included the values of losses it is called irrigation) was calculated by using following formula,

ET_0(Reference Evapotrancepiration) = ET_p (Pan Evapotrancepiration * K_p (Pan coefficient)

and after gattng ET_0, Crop ET_c was calculated by following formula

ET_c (Crop Evapotrancepiration) = ET_0 * K_c(Crop Coefficient),

Fig 1. Cauliflower seedlings in nursery

Fig 2. Transplating of seedling into research field and field layout

Fig 3. Cauliflower crop at harvesting stage

Results

Results showed that as plant density was increased yield was also increased and it was found maximum in 60x30 cm spacing. It was observed that sub surface placement of drip laterals gave more yield as compared to surface placement of drip laterals. Cost of cultivation, gross return, net return and benefit cost ratio were computed by keeping in view the present market price. Net

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return of surface drip placement in combination of plant density (60 x 30 cm) was Rs. 3,85,640/- per ha with BC ratio of 2.66. Whereas in subsurface drip placement with 60 x 45 cm spacing, it resulted in net return of Rs. 3,42,360/- per ha. Among the all combinations, subsurface drip placement with 60 x 30 cm spacing recorded the highest net return of Rs. 4,83,710/- per ha (Table 1).

Table 1: Average yield and economic analysis of cauliflower crop under different plant geometry and drip lateral placement systems

Drip System with Plant Geometry	Average Yield (t/ha)	Price (Rs./kg)	Cost of Cultivation (Rs./ha)	Gross Return (Rs./ha)	Net Return (Rs./ha)	BC Ratio
Surface drip placement (60 x 30)	58.96	9.0	145000.0	530640	385640	2.66
Surface drip placement (60 x 45)	55.27	9.0	139000.0	497430	358430	2.58
Subsurface drip placement (60 x 30)	73.19	9.0	175000.0	658710	483710	2.76
Subsurface drip placement (60 x 45)	58.04	9.0	180000.0	522360	342360	1.90

Conclusion

In the present investigation, the highly competitive benefit cost ratio indicated that growing of cauliflower crop under drip irrigation system with a specified plant geometry has potential for wide adaptability and hence can play important role in food and nutritional security with livelihood improvement. Thus, this system can be used for sustainability in cauliflower cultivation with a good remunerative return.

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