Effect of Different Mulching and Irrigation Scheduling on Water Requirement of Bokchoy

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Abstract -- A field experiment was conducted to study the Bokchoy productivity under drip irrigation with different mulching at Mhasrul farm of K. K. Wagh College of Agril. Engg. And Tech, Nashik during February 2018 to March 2018. The experiment was laid out in randomized block design with six treatments. Crop water requirement was calculated by using daily pan evaporation data. Crop water requirement was observed highest in March. The total water requirement with 100% irrigation treatment throughout the crop period was 28.77 lit/plant (208 mm) and with 80% irrigation treatment it was 23.01 lit/plant (166 mm). Irrigation was scheduled at two days interval.

Indexed Terms:- Crop water requirement, randomized block design, crop period.

I. INTRODUCTION

Bokchoy, also known as Pak choi or Spoon cabbage. Bokchoy is one of the most popular Chinese leafy green. Scientific name of bokchoy is Brassica rapa belongs to Crucifer family

Bokchoy is low in calories, but still packs a nutritional punch, containing high amounts of vitamin-C and source of vitamin-K. It is effective on bone health and prevention of osteoporosis. It improves immune response and decrease inflammation. Bokchoy is used to make recipes like Chinese greens, fried rice etc.

Mulch is any type of material that is spread or laid over the surface of the soil as a covering. It is used to retain the moisture in the soil, suppers weed, keep the soil cool and make the garden bed look more attractive. Organic mulches also improves the soil fertility, as they decompose. The mulch is usually, but not exclusively, organic in nature. It may be permanent (e.g. plastic sheeting) or temporary (e.g. bark chips). Materials used for mulches are crop residues levees clippings, bark manure, paper, plastic films, petroleum products, gravels etc. Plastic films are more widely used as mulch. They help in maintaining higher water content in soil resulted from reduced evaporation, induced infiltration, reduced transpiration from weeds or combination of all these factors

Irrigation must be scheduled according to water availability and crop need. If adequate water supplies are available, irrigation are usually provided to obtain optimum or maximum yield, however over irrigation should be avoided as this can decreases yield by reducing soil aeration and increasing leaching fertilizer while increasing water and energy cost.The amount of water lost by evapotranspiration can be estimated by climatological data or from a pan evaporation reading in scheduling of irrigation by this approach, the irrigation interval is fixed as two or three days and irrigation can be applied based on crop evapotranspiration values.

II. MATERIALS AND METHODS

2.1 Site selection

The experiment was carried out on the Mhasrul farm of K. K. Wagh College of Agricultural Engineering and Technology, Panchvati, Nashik during summer season of 2018. Nashik is situated at north region of Maharashtra. It is situated at an altitude of 700 m above mean sea level (MSL). The type of soil on the Mhasrul farm is black cotton.

2.2 Materials:

The materials used were mulching paper (16micron), laterals (16mm), emitters (4lph), flow control valves (16mm), joiners (16mm), seedlings, organic mulch i.e. wheat straw, end caps.

Main line conveyed irrigation water from the head unit to the sub main. A PVC pipe of 63 mm diameter and 1 kg/cm² pressure were used. Inline drippers of 4 lph discharge rate at 1.0 Kg/cm2 pressure were connected

with spacing of 35 cm between two drippers. Pressure gauge was used to measure the pressure developed in the network of irrigation pipelines.

In water distribution unit tees, elbows, end caps and flow control valves were used. Water from the main line delivering to sub main was controlled with the help of flow control valve. Threaded end cap was used at end of sub main. End plug was used to close the end of the lateral.

2.3 Methods:

Crop water requirement:

It is the amount of water required by the plant from the time of its sowing to the time of its harvesting for its full growth. It can be calculated by using following formula:

CWR= Crop area × PE × Kp × Kc × % wetted area / Eu

Where,

Crop area= row to row spacing (m) × plant to plant spacing between plants (m), m2

PE = Cumulative pan evaporation of the region, mm/day

Kp = Pan coefficient

Kc = Crop coefficient, value depends on growth stage of crop

% wetted area = It is area which depend on crop canopy cover

Eu = Emission uniformity, for drip irrigation it is taken as 0.9.

Table No. 2.1: Treatment details

Treatment	Specification
T1	100% water with black polyethylene mulch with drip irrigation
T2	80% water with black polyethylene mulch with drip irrigation
T3	100% water with organic mulch with drip irrigation (wheat straw)
T4	80% water with organic mulch with drip irrigation (wheat straw)
T5	100% water without mulch with drip irrigation (control)
T6	80% water without mulch with drip irrigation (control)

Table No. 2.2: Experimental details

Sr. no.	Particulars	Specification
1	Name of the crop	Bokchoy
2	Scientific name	Brassica rapa
3	Planting time	Summer
4	Design	Randomized block design
5	Number of treatments	6
6	Plot size	9m × 6m
7	Crop spacing	0.60 × 0.45 m
8	Number of plants per row	39
9	Duration of crop	60 days
10	Mulches used	Plastic mulch and organic mulch

III. RESULTS AND DISCUSSION

The experiment was conducted at Mhasrul farm of K. K. Wagh College of Agril. Engg. and Tech. Nashik. The crop water requirements were calculated by measuring daily pan evaporation.

From figure 3.1, we can observe that, as the pan evaporation increases water requirement of the crop also increases. Maximum cumulative pan evaporation of 25.4 mm and minimum pan evaporation of 9.0 mm was observed during experiment. After calculating water requirement of crop maximum water applied to crop was 3.7338 lit/day/plant for 100% irrigation treatment and 1.0584 lit/day/plant for 80% irrigation treatment.

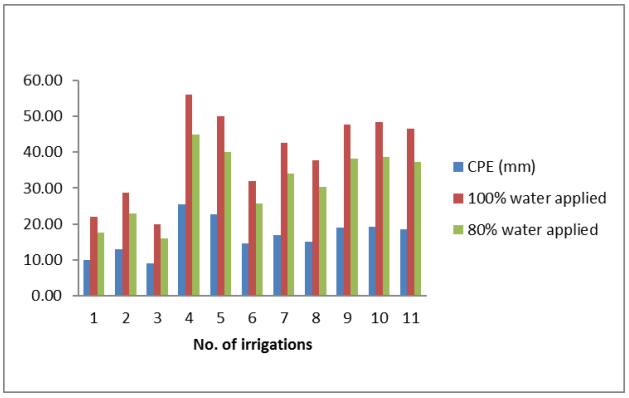

Fig No. 3.1Comparison between CPE and amount of water applied

IV. CONCLUSION

The field experiment entitled "Effect of different mulching and irrigation scheduling on Bokchoy'' was conducted at Mhasrul farm of K. K.Wagh college of Agril. Engg. and Tech., Nashik during 22nd Feb. 2018 to 23rd March 2018.

Crop water requirement was calculated by using daily pan evaporation data. Crop water requirement was observed highest in March 2018. The total water requirement with 100% irrigation treatment throughout the crop period was 28.77 lit/plant (208 mm) and with 80% irrigation treatment it was 23.01 lit/plant (166 mm).

The treatment drip irrigation with plastic mulch and 100% irrigation is the most significant for Bokchoy while Drip irrigation without mulch and 80% irrigation is the least significant.

REFERENCES

[1] Ankush, V. Singh, D. P. Singh, V. Kumar (2017). Effect of different irrigation and fertigation scheduling on economics of tomato crop. Trends in bioscience, 10 (25): 5345-5348.
[2] Basavraj, Surendrakumar, and D. Durairaj C.(2016). Study of agronomical and soil parameter in paddy field for development of paddy weeder.
[3] C.O. Cookey, C.M. Agu, E.C. Uwaga, R.E. Keyagha, and V.E. Ogwudire (2016). Effects of plastic mulch colour and cucumber cultivars (Cucumis sativus) on Root-Gall Nematode(Meloidogyne spp) infection in a Nigerian ultisol.
[4] D. Decoteau, J. Michael, Kasperbauer and P. G. Hunt(1990). Bell pepper plant development over mulches of diverse colours. Hortscience 25(4):460-462.
[5] M. G. Hutton, D. T. Handley (2005). Evaluation of silver reflective mulch, white inter-row mulch and plant spacing for increasing yields of Bell pepper.
[6] M. H. Khan, T. H. Chattha and N. Saleem (2005). Influence of different irrigation intervals on growth and yield of Bell pepper (Capsicum Annuum Grossum Group).
[7] M. McMillen (2013). The effect of mulch type and thickness on the soil surface evaporation rate.
[8] M. Nyajeka, E. Svotwa, and D. R. Katsaruware (2017). Effects of grass (Hyperenia spp.) muching rate on development and yield of Okra under drip irrigation.
[9] M.A. Salam and S. A. Mazrooei (2006). Crop water and irrigation water requirements of maize (Zea mays L.) in the entisols of Kuwait.