

DEVELOPMENT OF PACKAGE OF PRACTICES FOR OPEN FIELD CULTIVATION OF CAPSICUM (*CAPSICUM ANNUM* L.)

G.D. Sahu, P.C. Chaurasiya* and S.P. Tiwari

Precision Farming Development Centre, Department of Horticulture
Indira Gandhi Krishi Vishwavidyalaya, Raipur-492012(C.G.)

Received-01.11.2014, Revised-05.04.2015

Abstract: The genus *Capsicum* (*Capsicum annuum* L.) belongs to the family Solanaceae it is grown in several parts of the world and is believed to be the native of Tropical South America. The domesticated peppers could be broadly classified into sweet and hot types based on their level of pungency. The bell pepper (*Capsicum annuum* (L.), $2n = 24$) is commonly known as sweet pepper, capsicum or green pepper. The present investigation was carried out at the Horticultural Research Farm, Precision Farming Development Centre, Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur Chhattisgarh with effect of different types of plastic mulches with four levels of fertigation and three levels of mulching. The results under this study the 80% RDF through fertigation gave maximum fruit yield followed by 100% RDF through fertigation with maximum plant height and number of leaves. The *Capsicum* cv. Indra hybrid is most important vegetable and can be grown profitably under plastic mulch. Silver polyethylene mulch was significantly superior over Black Polyethylene mulch paddy straw mulch and without mulch. The study also revealed that the net income and benefit cost ratio was observed higher in 80% water through drip irrigation as compared to traditional method of irrigation.

Keywords: Capsicum, Fertigation, Plastic mulches, RDF

INTRODUCTION

The bell pepper (*Capsicum annuum* (L.) $2n = 24$) is commonly known as sweet pepper, capsicum or green pepper. They differ from common hot peppers in size and shape of the fruits, capsacin content and usage. Bell pepper is one of the highly remunerative vegetables cultivated in several parts of the world especially in temperate regions of Central and South America and European countries, tropical and subtropical regions of Asian continent. In the world, area and production of bell pepper is merged with that of hot pepper (chilli). Hence, the statistics related to pepper/chilli as whole is given. Annual world production of bell pepper in the year 2012 amounted to 79.35 million metric tonnes from an area of 3.74 million hectares. China is the major producer of capsicum and contributes 36 per cent of the worlds cultivated area with a production of 19.54 million tonnes. India contributes average annual production of 0.9 million tonnes from an area of 0.885 million hectare with a productivity of 1.017 tonnes per ha (Anon., 2012). They are mainly cultivated during *rabi* and *kharif* seasons in Karnataka, Maharashtra, Tamil Nadu, Himachal Pradesh and hilly areas of Uttar Pradesh. One of the most important factors responsible for poor productivity of *Capsicum* is the improper water management. In view of water being a scarce commodity, it is necessary to adopt a suitable method of water application for increasing irrigation efficiency and crop productivity. The drip irrigation effects a saving of water and is a solution to problems of water scarcity. Because drip irrigation system is a very efficient method of supplying water to plant precisely very close to the root zone of plants. In drip method of irrigation, water is carryout

*Corresponding Author

through an extensive pipe network an allow to drip slowly through the emitters at a low pressure directly near to the root zone by considering evaporative demand of the crop [Bankar *et al.* Very meager work has been carried out on water management aspects of *Capsicum* under drip irrigation system. Hence the present study was undertaken.

MATERIAL AND METHOD

A field experiment was conducted during the year 2012-13 at Horticultural Research Farm, Precision Farming Development Centre, Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur Chhattisgarh. The experiment soil was sandy loam. The treatments are as follows:

Main Plot- Irrigation (4 level)

F₁- 100% of RD (200:140:180 kg NPK/ha)

F₂- 100% of RD (200:140:180 kg NPK/ha) through fertigation

F₃- 80% of RD (160:112:144 kg NPK/ha) through fertigation

F₄- 100% of RD (120:84:108 kg NPK/ha) through fertigation

Sub plot- Mulching (3 level)

M₁- Without mulch

M₂- Black polyethylene mulch

M₃- Silver polyethylene mulch

The experiment was laid out in a Split Plot design with three replications. *Capsicum* plants were transplanted at a spacing of 1.0 x 0.45 m. The drip system was designed with measured paths and lengths of main, sub-main and lateral lines with water sources and experimental site. To maintain the required operating pressure in the system the drip main line was connected with the pumping source along with a gate valve for regulating water daily as

per the treatment requirement. Reference crop evapo-transpiration was estimated using the Modified Penman Method [Doorenbos and Pruitt using weather data collected from automatic Weather Station, 1 km away from the field site. The actual

evapo-transpiration was estimated by multiplying reference evapo-transpiration with crop co-efficient for different months based on crop growth stages. Analysis of the data was done as suggested by Panes and Sukhatme (1978).



Fig. A field view of Capsicum cultivation under fertigation and mulch

Response on Plasticulture Applications

Silver polyethylene mulch was significantly superior over compare with Black polyethylene mulch, and without mulch. Silver polyethylene mulch reflects the sun rays in whole plant and gave high yield and Black polyethylene mulch surplus weed control and water conserve. It gave maximum plant height,

number of branches, number of fruits and yield (340.00 q/ha) with earlier flowering and fruiting. Among various interactions, fertigation with 80% RDF and Silver Polyethylene mulch was proved most promising in terms of earlier flowering and fruiting with highest fruit yield.

Table. Effect of different level of fertigation and different colour mulching on growth and yield of *Capsicum*

	Plant Height (cm)	No. of branches	Fruit set (%)	No. of secondary branches	Days to flower initiation	No of fruits /plant	Fruit length (cm)	Fruit dia meter (cm)	Rind thickness (mm)	Weight of individual fruit (g)	Shelf life (days)	Yield t/ha
Control	47.47	2.23	40	4.33	25.30	11.84	11.07	6.84	0.85	119.47	8	21.63
100% RDF	59.45	2.50	42	4.87	23.80	14.87	12.65	7.78	0.79	164.84	8	25.63
80% RDF	61.72	2.77	50	5.13	22.94	17.33	13.28	8.20	0.87	179.50	9	28.65
60% RDF	58.89	2.37	41	4.67	24.70	13.20	11.80	7.28	0.78	154.17	6	22.31
CD	1.64	0.22	1.35	1.25	1.01	1.09	0.81	0.53	0.24	17.00	0.39	0.32
With out mulch	55.07	2.20	40	4.10	25.35	12.43	11.48	7.07	0.80	139.95	5	22.10
Black Plastic mulch	57.67	2.43	48	4.80	24.05	14.35	12.41	7.64	0.85	150.28	9	24.59
Silver polyethylene mulch	57.91	2.78	52	5.35	23.15	16.15	12.70	7.86	0.89	173.25	10	26.97
CD	1.19	0.34	1.85	0.89	0.58	0.73	0.65	0.39	0.25	13.55	0.25	2.45
F1M1	42.82	2.00	40	4.00	26.60	9.70	10.45	6.45	0.85	112.30	9	115.08
F1M2	49.76	2.10	45	4.40	24.90	11.40	11.20	6.88	0.84	120.60	7	119.92
F1M3	49.83	2.60	40	4.60	24.40	14.40	11.56	7.18	0.78	125.50	10	127.57
F2M1	57.89	2.20	46	4.20	24.80	13.20	11.53	7.09	0.79	158.50	9	132.10
F2M2	59.70	2.50	45	4.60	23.60	14.80	13.32	8.20	0.82	155.50	8	143.97
F2M3	60.78	2.80	47	5.80	23.00	16.60	13.09	8.05	0.85	180.50	10	151.61
F3M1	61.66	2.40	44	4.20	24.30	14.60	12.96	7.96	0.82	155.50	7	150.61
F3M2	61.75	2.70	48	5.60	23.10	17.70	13.28	8.17	0.81	173.50	9	153.64
F3M3	61.75	3.20	51	5.60	21.40	19.70	13.58	8.46	0.80	209.50	9	163.75
F4M1	57.91	2.20	42	4.00	25.70	12.20	10.97	6.77	0.79	133.50	8	110.72
F4M2	59.47	2.40	45	4.60	24.60	13.50	11.85	7.31	0.85	151.50	8	112.53
F4M3	59.29	2.50	45	5.40	23.80	13.90	12.57	7.75	0.82	177.50	9	126.59
CD	3.09	0.59	1.25	2.25	3.26	1.62	1.36	0.82	0.25	27.83	0.39	5.19

Significant at 5% level

Cost Economics

	Particulars	Plasticulture Applications			Total amount (Rs.)	Conventional method			Total amount (Rs.)
		1	2	3		1	2	3	
A	Crop Name	Capsicum				Capsicum			
	Crop Variety	Indra hybrid				Indra hybrid			
	Area (ha)	1				1			
	Spacing (cm x cm)	60 x 45				60 x 45			
	No. of plants	37037				37037			
	Yield per plant (kg)	3				3			
	Total yield (Ton/ha)	65-80				65-80			
	Sale price (Rs/Kg)	10				10			
B	Variable Costs (Rs/sqm)								
	Land Preparation	4000	5000	6000	15000	1500	2000	2500	6000
	Fertilizer	73200	30000	35000	138200	15000	18000	20000	53000
	Irrigation Costs	3000	3500	4000	10500	8000	9000	10000	27000
	Seed Costs (Planting Material)	30000	32000	35000	97000	15000	18000	20000	53000
	Chemical Costs	8000	9000	10000	27000	4000	4500	5000	13500
	Soil Solarization				0	0	0	0	0
	Nursery Management	1000	1000	1000	3000	500	500	500	1500
	Low tunnel				0	0	0	0	0
	Mulching	36000	38000	40000	114000	0	0	0	0
	Labour	10000	12000	15000	37000	15000	17000	20000	52000
	Interest @ 10%	16520	13050	14600	44170	5900	6900	7800	20600
	System Maintenance cost	500	500	500	1500	0	0	0	0
	Other Variable Costs (Bamboo+GI wire etc.)	15000	17000	18000	50000	15000	17000	18000	50000
	Total Variable Costs (Rs.)	197220	161050	179100	537370	79900	92900	103800	276600
C	Fixed Costs @ Sqm								
	a. Shade net house				0	0	0	0	0
	b. Green house				0	0	0	0	0
	c. Drip Irrigation System	240000	0	0	240000	0	0	0	0
	d. Sprinkler System				0	0	0	0	0
	Total Fixed Costs (a+b+c+d) Rs.	240000	0	0	240000	0	0	0	0

B+C	Total Cost of Production (Variable + Fixed) Rs	437220	161050	179100	777370	79900	92900	103800	276600
	Gross Income (Rs.)	725000	725000	725000	2175000	175000	200000	200000	575000
	BC Ratio	1:1.01	1:3.76	1:3.33	1:2.20	1:1.19	1:1.10	1:1	1:1.11
	Pay Back period (years)	1							

Findings

It is evident from the data (Table 1 and Table 2) that all the characters i.e. plant height, number of primary branches, number of secondary branches, days to flower initiation, number of fruits per plant, fruit length, fruit diameter, weight of individual fruit and yield per plants were significantly influenced by different levels of fertigation and type of mulching used. Application of 80% RDF through fertigation with Silver colour plastic mulch showed maximum plant height, number of primary branches & secondary branches and comes to early flowering followed by 80% RDF with Black polyethylene mulch and without mulch. Similarly the yield attributing characters i.e. number of fruits per plant, fruit length, fruit diameter, weight of individual fruit and yield per plants were significantly influenced by different levels of fertigation and type of mulching used. Among all the treatments 80% RDF with Silver colour plastic mulch recorded maximum number of fruits per plants (22.40), fruit length (16.25 cm), fruit diameter (9.34 cm), weight of individual fruits (210 gm) and yield (340.00 q/ha) followed by 80% RDF with Black polyethylene mulch and without. Black polyethylene mulch was significantly superior over paddy straw mulch and without mulch. Among various interactions,

fertigation with 80% RDF and Silver colour plastic mulch was proved most promising in terms of earlier flowering and fruiting with highest fruit yield.

CONCLUSION

In case of different mulches and fertigation conditions Silver colour plastic mulches recorded the highest total marketable fruit yield with more number of excellent quality grade fruits. The capsicum cv. Indra gave a tremendous response to different mulches and fertigation conditions. For common farmers the growing of capsicum cv. Indra under Silver colour plastic mulches and Black plastic mulches will be more profitable.

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