

Effect of Polythene Mulching on Moisture Conservation, Weed control, Yield and Economics of Tomato

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ABSTRACT

Thirty three demonstrations were conducted to study the 'Effect of polythene mulching on moisture conservation, weed control, yield and economics of tomato' in cluster villages of Chinnagottigallu mandal, Chittoor district, Andhra Pradesh under National Innovations on Climate Resilient Agriculture (NICRA) project from 2015-16 to 2019-20. The soil was red sandy in texture with neutral pH, normal in EC, low in organic carbon, available nitrogen, high in available phosphorus and potassium. The tomato hybrid used was US 448. Number of irrigations and weed density was low under polythene mulch than without mulch. Polythene mulching with drip irrigation significantly increased the number of fruits per plant (32.9), individual fruit weight (72.83gm) and fruit yield (65676kg/ha) as compared to the farmers practice. Gross returns (Rs.387736/- per ha), net returns (Rs.222169/-per ha) and BC ratio (2.45) were more in the case of demonstration when compared to farmers practice.

Key words: Tomato, Polythene mulch, Weed, Drip irrigation, NICRA, Gross returns, BC Ratio

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INTRODUCTION

Tomato (*Lycopersicon esculentum*) is the most consumed vegetable in the world after potato. About 68% of the global tomato production is consumed as fresh while the remaining 32% are processed. Tomato plays a vital role in Indians regular diet due to its nutrients, delicious taste and various modes of consumption and its uses. Water is being a limited resource, its efficient and effective utilization through viable irrigation management is essential for tomato crop to attain sustainable yields. Weeds are one of the constraints that competes for space, light, water and nutrients with tomato crop and causes yield reduction. Polythene mulching has been emerged as potential management approach to maintain favorable soil moisture and control or suppress the weeds at critical stages of crop growth in tomato and thereby to attain good yields.

MATERIAL AND METHODS

The present study was undertaken by Rashtriya Seva Samithi (RASS) – Krishi Vigyan Kendra (KVK) to study the 'Effect of polythene mulching on moisture conservation, weed control, yield and economics of tomato' in Chittecherla and Deendarlapalli villages of

Chinnagottigallu mandal, Chittoor district, Andhra Pradesh under National Innovations on Climate Resilient Agriculture (NICRA) project from 2015-16 to 2019-20. Thirty three demonstrations were conducted in the cluster villages with an objective of soil moisture conservation and weed control thereby to improve productivity in tomato. The soils are red sandy in texture with a pH of 7.38 (Neutral) and EC of 0.40 (Normal). Soils were low in Organic Carbon (0.37), low in available nitrogen (203kg/ha), high in available phosphorus (74.3kg/ha) and high in potassium (276kg/ha). The tomato hybrid used was US 448.

In the demonstration black colour high density polyethylene film of 25 micron thickness was spread over a raised bed on which holes of 4-5cm diameter were punched and tomato seedlings were planted in the recommended spacing of 90X30cm on either side of the drip line. The irrigation given in the demonstration as well as in the farmers practice was through drip system. The recommended dose of fertilizers, phosphorus (60kg/ha) and potassium (60kg/ha) were applied at the time of planting and the nitrogen (150kg/ha) was applied in three equal splits viz 30, 45 and 60 days after planting. Need based plant protection measures were taken up in the demonstration as per the recommendations of Dr.YSRHU. The observations were recorded on the traits viz. number of irrigations required during crop period, weed density, number of fruits per plant, fruit weight, yield, cost of cultivation, gross returns, net returns and BC Ratio.

RESULTS AND DISCUSSION

It was observed from the results (Table 1) that the number of irrigations required by tomato in the demonstration are less (17.6) when compared to farmers practice (26.2). It might be due to application of polythene mulch reduced the loss of moisture through direct evaporation from the upper soil layers and hence water use efficiency is higher in polythene mulch than without polythene mulch. Deepa *et al*, [3] reported that highest water use efficiency was recorded under polythene mulch than without mulch.

Table 1: Effect of polythene mulch on number of irrigations, weed density and fruit yield of tomato

Particulars	Number of irrigations		Weed density (no of weeds / 5 m ²)		Fruit weight (gm)		No of fruits per plant		Fruit yield (Kg/ha)	
	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo
2015-16	29	20	56.3	34.5	60.41	71.47	30.0	37.8	54380	78750
2016-17	25	15	62.6	41.2	62.54	73.47	34.1	36.0	63580	75870
2017-18	27	19	58.7	45.4	64.58	73.38	31.2	33.4	56580	66651
2018-19	26	18	59.2	40.4	66.55	75.32	24.3	30.5	48580	56651
2019-20	24	16	60.8	28.2	61.50	70.49	22.7	26.8	43500	50460
Average	26.2	17.6	59.5	37.9	63.12	72.83	28.5	32.9	53324	65676

FP: Farmers Practice - Drip Irrigation without polythene mulch, **Demo: Demonstration** - Drip irrigation with polythene mulch

Weed density was low under polythene mulch condition (37.9 per 5m²) than without mulch, farmers practice (59.5 per 5m²). It might be due to polythene mulch acts as physical barrier and prevents light to enter soil and checks the germination of weed seeds and hence low weed density. Arun Kumar *et al*, [5] reported that the black polythene mulch has recorded significantly lowest weed density at 20 DAT (3.73 m⁻²) and 40 DAT (5.60 m⁻²), whereas unweeded or control has recorded highest weed density of 39.93 m⁻² and 42.10 m⁻² at 20 and 40 days after transplanting, respectively.

The results indicated that polythene mulching with drip irrigation significantly increased the number of fruits per plant (32.9) and individual fruit weight (72.83gm) as compared to the farmers practice. More number of fruits and more fruit weight in the demonstration might be due to better soil moisture condition, efficient nutrient utilization and less number of weeds at critical crop growth stages due to use of polythene mulch. These results are in agreement with the findings of Kundu *et al*, [2].

Polythene mulch recorded about 23.1% higher fruit yield (65676kg/ha) when compared to farmers practice (53324 kg/ha). It was mainly due to conservation moisture, better control of weeds and improved microclimate under polythene mulched condition. These findings

are in consistent with the observations of Singh and Kamal, [4], they found that mulching recorded 21.7 to 29.8% increase in fruit yield as compared to bare soil.

Table 2: Effect of polythene mulch on various parameters (n=33)

S. No.	Components	Mean		Mean difference	'Z' - Cal value
		Demonstration	Farmers Practice		
1	Number of irrigations	17.60	26.20	-8.6	-34.95**
2	Weed density (Number of weeds/5m ²)	37.90	59.50	-21.60	-79.89**
3	Fruit weight (gm)	72.83	63.12	9.76	39.91**
4	Number of fruits/plant	32.90	28.50	4.4	18.67**
5	Fruit yield (kg/ha)	65676.4	53324.0	12352.4	57495.42**

**significant at 0.01 level of probability **0.01 't' - critical value - 2.57

Statistical analysis was carried out using 'z' test to know the effect of polythene mulch on various parameters like number of irrigations, weed density, fruit weight, number of fruits per plant and fruit yield between demonstration and farmers practice. From the data (Table 2), it can be concluded that there was significant difference between demonstration and farmers practice with respect to all the above parameters. Number of irrigations and weed density were significantly low in the demonstration than farmers practice whereas, fruit weight, number of fruits per plant and fruit yield were significantly higher in the demonstration than farmers practice.

Table 3: Effect of polythene mulch on economic parameters of tomato

Particulars	Cost of cultivation (Rs./ha)		Gross returns (Rs./ha)		Net returns (Rs./ha)		BC Ratio	
	FP	Demo	FP	Demo	FP	Demo	FP	Demo
2015-16	68250	104250	217500	315000	149250	210750	2.02	2.19
2016-17	155400	172900	370666	442322	215266	269422	2.39	2.56
2017-18	161344	183844	565800	666510	381956	445166	2.37	2.42
2018-19	83844	91344	153027	178451	69183	87107	1.82	1.95
2019-20	215000	238000	290000	336400	75000	98400	1.35	1.41
Average	136767	158067	319398	387736	178131	222169	2.34	2.45

FP: Farmers Practice - Drip Irrigation without polythene mulch, **Demo: Demonstration** - Drip irrigation with polythene mulch

The cost of cultivation (Rs.158067/- per ha), gross returns (Rs.387736/- per ha), net returns (Rs.222169/-per ha) and BC ratio (2.45) were more in the case of demonstration when compared to farmers practice. Though the cost of cultivation in the demonstration was more due to use of polythene mulch, but it was compensated by achieving higher economic returns and it was due to effective control of weeds and soil moisture conservation thereby higher fruit yield. Kavitha *et al*, [1] also reported similar findings.

CONCLUSION

From the study it can be concluded that the use of polythene mulch along with drip irrigation was significantly increased the yield and economic parameters in tomato. It was showing its superior performance in conserving soil moisture, effective nutrient uptake and suppressed weed growth thereby, increased fruit yield and net returns. Therefore, the cultivation of tomato using polythene mulch is economically viable practice and could be adopted by farmers wherever it is feasible.

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