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RL Isal
Ph.D. Scholar, Department of Agronomy, Dr. PDKV, Akola, Maharashtra, India

SS Wanjari
Associate Professor, Department of Agronomy, Dr. PDKV, Akola, Maharashtra, India

VM Bhale
Head, Department of Agronomy, Dr. PDKV, Akola, Maharashtra, India

SB Wadatkar
Professor & Head, Department of IDE, Dr. PDKV, Akola, Maharashtra, India

AN Paslawar
Professor & H.S, College of Agriculture, Dr. PDKV, Akola, Maharashtra, India

ND Parlawar
Head, Department of Agronomy, Dr. PDKV, Akola, Maharashtra, India

Corresponding Author:
RL Isal
Ph.D. Scholar, Department of Agronomy, Dr. PDKV, Akola, Maharashtra, India

Effect of polythene mulch and irrigation levels on yield of *Bt* cotton

RL Isal, SS Wanjari, VM Bhale, SB Wadatkar, AN Paslawar and ND Parlawar

Abstract
A trial was conducted to study the effects of Polythene Mulch and Irrigation levels on growth and yield of Bt cotton. at Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra (India) during *kharif* 2013-14 and 2014-15 on clayey soil. The experiment was laid out with eight treatment combinations in Factorial Randomized Block Design replicated thrice. Treatment comprises were without polythene mulch and with polythene mulch and four irrigation levels as 0.4 ETc, 0.6 ETc, 0.8 ETc and 1.0 ETc constituted the factor I and factor II respectively. The Polythene mulch treatment recorded significantly higher yield attributes, seed cotton yield (g) plant$^{-1,}$ Seed cotton yield (Kg ha $^{-1}$,) Stalk yield (Kg ha $^{-1}$,) over without polythene mulch both being at par with each other, recorded significantly higher number of bolls plant^{-1} than 0.4 ETc (33.42). But Interaction effect between mulch and irrigation was found to be non-significant.

Keywords: Crop evapo transpiration, irrigation scheduling, Bt cotton, benefit: cost ratio

Introduction
Cotton the word is derived from Arabic word 'Quntun'. Cotton (*Gossypium* spp.) popularly known as 'White gold' or king of fibre. It is one of the most ancient and very important commercial crop plays a vital role in the history and civilization of mankind. Cotton is mainly grown for its fibre used in the manufacture of cloth for mankind. It is a valuable product traded globally as well as an important employment creator. World widely, more than 100 millon farming units are directly involved in Cotton production, more than 100 millon farming units are directly involved in cotton production, in many more in its complementary activities. The cotton crop has global importance with a significant role in Indian agriculture, industrial development, employment generation and improving the national economy. It plays a vital role in the Indian economy, Since, man has made all out endeavours to increase its productivity to meet the burgeoning human need. Water is the major limiting factor for crop production. Optimizing water use is an economic and environmental concern for agricultural producers. Since land is a shrinking resource, the pathway for achieving this goal to be higher productivity per unit of land and water. As water is becoming limiting resource, there is no scope to increase irrigation potential by using additional water. Hence, only way to increase fibre production is by increasing water use efficiency. The objective of irrigation in the present era is not only to provide supplementary water for crop production but also to increase crop per drop of water. Faulty Improper irrigation practices causes not only wastage of expensive and precise water resource but also decreases crop yield, quality, and economic return.India will be a highly water stressed country by 2020 onward (Anonymous, 2006) [1]. To meet the requirement of water scarcity, there are two options, either increase the gross irrigation potential or increase the water use efficiency. In Vidarbha, region cotton is grown as mainly *rainfed* crop, R*ainfed* cotton production has direct bearing on the agrarian economy of the region. The low productivity is mainly due to maximum area of cotton under rainfed and it is characterized by erratic distribution of rainfall. As micro-irrigation system is found to be one of the advanced methods of irrigation. It is amply proved that drip irrigation saves the irrigation water to the extent of 30 to 50% and which enhances the crop yield by 15 to 20%. In addition, it saves the cost of inter cultivation which results in improving the fertilizer use efficiency, hasten the maturity of crop and improves the quality of the final produce.
Polythene mulch is crucial to Indian agriculture in view of the changing technological scenario for boosting crop yields and productivity. Plasticultural applications is one of the fastest growing in the agricultural world. The mulch raised the soil temperatures, resulting in rapid germination and early plant growth. Therefore, it is very essential to have a thorough knowledge about proper irrigation scheduling to achieve maximum and efficient use of water

with the optimum moisture supply during crop growth stages and bring more area under irrigation through available water resources for getting higher yield of cotton crop.

For this, to meet the ever increasing demand of irrigation water the known technique is use of polymulch, with micro-irrigation that is to be proven for its efficiency and input saving The new emerging technologies are to be understood properly and its effective management needs to be evolved for their proper address.Keeping in view the above perspectives, the presentresearch work was taken up to find out the effect of polythene mulch and irrigation levels on yield of *Bt* cotton under western Vidarbha region *i.e.,* at akola location.

Materials and Methods

An experiment was conducted at Department of Agronomy, Dr.Panjabrao Deshmukh Krishi Vidhyapeeth Akola (M.S) during *kharif* 2013-14 and 2014-15. on drip irrigation under varying irrigation level based on ETc. On clayey soil Experiment was laid out in Factorial Randomized Block Design replicated thrice. Treatment comprises of without polythene mulch and with polythene mulch and irrigation levels were constituted the factor I and the factor II respectively. The farmers practice used as check treatment.The water requirement of cotton crop was worked out on the basis of class 'A' open pan evaporation. The irrigation was scheduled to alternate days for cotton crop.Before sowing of cotton crop common irrigation was applied to the field for better survival. The plastic films (silver up and black down) of 30 µm thickness were used to cover the four treatments of every replications and remaining treatment were uncovered. The experimental plot was ploughed once and harrowed twice to ensure proper tilth for easy sowing and better emergence before laying the experiment. Farm yard manure 5 t ha^{-1} was applied in the field and thoroughly mixed in the soil at the time of field preparation. The crop was fertilized with nitrogen, phosphorus, and potassium as per the recommended dose (100:50:50 kg N, P_2O_5 and K_2O ha^{-1} was applied respectively.) Nitrogen was applied trough urea, phosphorus is applied trough Single Super Phosphate and potassium trough Murate of Potash.The basal fertilizer (½ N, full K and full P) was applied as basal before spreading the polythene film. The remaining dose of fertilizer was applied after 30days of emergence through fertigation. Certified seeds of *Bt* cotton variety Paras Brahama were obtained from the open market of Akola. The dibbling method was used for the sowing of cotton. The irrigation was scheduled to alternate days for cotton crop. The treatment wise water requirement of cotton crop was worked out on the basis of class 'A' open pan evaporation. The value of pan coefficient was taken as 0.8. The duration of operation of drip system was worked out for different levels of irrigation, i.e. for different treatments (0.4 ETc, 0.6 ETc, 0.8 ETc, 1.0 ETc with polythene mulch and without polythene mulch). The observations regarding growth and yield of seed cotton, water used during consecutive period were collected and subjected to statistical analysis according to the procedures given by Panse and Sukhatme (1978) [8].

Results and Discussion

The data collected on different yield contributing characters *viz.,* seed cotton yield and stalk yield are summarized in table 1.

Number of bolls plant $^{-1}$

The data on number of bolls $plant^{-1}$ was influenced by different treatments are presented in Table 1, reveals that mean number of picked bolls $plant^{-1}$ was more during 2013-14 as compared to 2014-15.

Effect of mulch

Significantly higher number of bolls $plant^{-1}$ were recorded with polymulch treatment over without polymulch, the similar trend was observed during 2014-15 season.

The marked difference in the number of bolls $plant^{-1}$might be due to the mulch used in the trial which have conserved and utilized more moisture. The results obtained are in conformity with the findings of Nalayini (2007) [6] who also reported polythene mulching improved the number of bolls $plant^{-1}$ significantly than non-mulching.Similar result also reported by (Halemani *et al*. 2009) [5].

Effect of irrigation levels

Significantly higher number of bolls per plant were recorded under I_3 treatment (Irrigation at 0.8ETc), it was found at par with I_4 (1.0 ETc) than other irrigation treatment during 2013-14 season, the similar trend was observed during 2014-15 season.

The results obtained are in conformity with the findings of Halemani *et al*., (2009) [5]. They observe significantly higher values of number of bolls $plant^{-1}$ due to moisture conservation practice than no mulch.

Interaction

Interaction due to polymulch and irrigation level were found non-significant during both the study.

Check treatment

Planting taken on ridges and furrows with polymulch had recorded significantly higher number of bolls per plant during 2013-14 season, same trend was noticed during 2014-15 season.

Boll weight (g)

Effect of mulch

Significantly higher boll weight was observed under polymulch treatment, than without polymulch treatment, similar trend was observed during 2014-15 season, and similar results were reported by Halemmani *et al*. 2009) [5] and Ahmad *et al*., (2015) [2].

Effect of irrigation levels

Significantly higher boll weight were recorded under I_3 treatment (Irrigation at 0.8 ETc), it was found at par with I_4 (1.0 ETc) than other irrigation treatment during 2013-14 season, the similar trend was also observed during 2014-15 season.

This might be due to favourable moisture availability in which the irrigation treatment reflected in accumulation of boll weight at the level of significance.

Interaction

Interaction due to polymulch and irrigation level were found non-significant during both the year of study.

Check treatment

Planting taken on ridges and furrows with polymulch had recorded significantly higher boll weight during 2013-14 season, same trend was noticed during 2014-15 season.

Seed cotton yield (g) plant^{-1}

Effect of mulch

Significantly higher seed cotton yield (g) plant^{-1} was observed under polymulch treatment, over without polymulch treatment, similar trend was observed during 2014-15 season.

The marked difference in the weight of seed cotton yield plant^{-1}might be due to the mulch which have conserved and utilized more moisture and applied nutrients. The results obtained were in conformity with the findings of Shinde *et al.* (2002) [10].

Effect of irrigation levels

Significantly higher seed cotton yield (g) plant^{-1} were recorded under I_3 treatment (Irrigation at 0.8 ETc), it was found at par with I_4 (1.0 ETc) than other irrigation treatment during 2013-14 season, the similar trend was observed during 2014-15 season.

Increased irrigation level increased the weight of seed cotton yield plant^{-1} due to efficient moisture utilization by plants. The results obtained are in conformity with the findings of Sagarika *et al.* (2002) [9] and Bhalerao *et al.* (2011) [3].

Interaction

Interaction effect due to polymulch and irrigation level were found significant during 2013-14 season. The interaction of I_3PM_2 had recorded significantly higher seed cotton yield (g) plant^{-1} than other interactions tried during experimentation.

Check treatment

Planting taken on ridges and furrows with polymulch had recorded significantly higher boll weight during 2013-14 season, same trend was noticed during 2014-15 season.

Seed cotton yield (kg ha^{-1})

Effect of mulch

Significantly higher seed cotton yield (kg ha^{-1}) was observed under polymulch treatment, than without polymulch treatment, similar trend was observed during 2014-15 and pooled season also.

The increase in seed cotton yield under the polymulch might be because of better vegetative growth, and more number of sympodial branches, number of bolls plant^{-1} seed cotton yield plant^{-1} there by seed cotton yield (kg ha^{-1}) as compared to without polythene mulch. These favourable influences on these parameters were reflected on seed cotton yield due to growing on polymulch. Similar results were also reported by Ghadage *et al.* (2005) [4] and Nalayini *et al.* (2007) [6].

Effect of irrigation levels

Significantly higher seed cotton yield (kg ha^{-1}) were recorded under I_3 treatment (Irrigation at 0.8 ETc), however it was found at par with I_4 (1.0 ETc) than other irrigation treatment during 2013-14 season, the similar trend was observed during 2014-15 season.

The results obtained are in conformity with the findings of Sagarika *et al.* (2002) [9], Halemani *et al.* (2009) [5], Tekale *et al.* (1999) [11], Bhalerao *et al.* (2011) [3] and Ghadge *et al.* (2005) [4] in cotton.

Interaction

Interaction due to polymulch and irrigation level were found significant during 2013-14 season. The interaction of I_3PM_2 (Irrigation at 0.8ETc with polymulch), had recorded significantly higher seed cotton yield (kg ha^{-1}) than other treatments combinations tried under experimentation.

Check treatment

Planting taken on ridges and furrows with polymulch had recorded significantly higher seed cotton yield (kg ha^{-1}) during 2013-14 season, same trend was noticed during 2014-15 season.

Stalk Yield (kg ha^{-1})

Effect of mulch

Significantly higher Stalk Yield (kg ha^{-1}) was observed under polymulch treatment, than without polymulch treatment, similar trend was also observed during 2014-15 and pooled mean.

The increase in stalk yield under the polymulch might be because of better vegetative growth, and more number of sympodial branches plant^{-1} thereby stalk yield (kg ha^{-1}) as compared to without polythene mulch. These favourable influences on these parameters were reflected on stalk yield due to growing on polymulch. Similar results were reported by Ghadage *et al.* (2005) [4] and Nalayini *et al.* (2007) [6].

Effect of irrigation levels

Significantly higher Stalk Yield (kg ha^{-1}) were recorded under I_3 treatment (Irrigation at 0.8 ETc), it was found at par with I_4 (1.0 ETc) than other irrigation treatment during 2013-14 season, the similar trend was observed during 2014-15 season. These favorable influences on these parameters were reflected on stalk yield due to growing on polymulch. Similar results were also reported by Ghadage *et al.* (2005) [4] and Nalayini *et al.* (2007) [6].

Interaction

Interaction due to polymulch and irrigation level were non-significant during both season.

Check treatment

Planting taken on ridges and furrows with polymulch had recorded significantly higher Stalk Yield (kg ha^{-1}) during 2013-14 season, same trend was noticed during 2014-15 season.

Table 1: Number of bolls plant $^{-1}$ Boll weight (g) Seed cotton yield (g) plant $^{-1}$ Seed cotton yield (kgha^{-1}) Stalk yield (kgha^{-1})as influenced by different reatments

Treatments		Number of bolls plant $^{-1}$		Boll weight (g)		Seed cotton yield (g) plant $^{-1}$		Seed cotton yield (kgha^{-1})			Stalk yield (kgha^{-1})		
		2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	Pooled	2014-15	2013-14	Pooled
Levels of Mulch													
PM1	Without Polymulch	32.28	30.05	4.31	4.25	139.30	127.90	2321	2131	2226	3043.	2725	2884
PM2	With Polymulch	42.81	41.52	4.44	4.37	190.13	181.65	3168	3027	3098	4051	3755	3903.
	SE (m) ±	0.33	0.43	0.01	0.01	1.44	1.94	23.94	32.36	21.79	31.15	41.27	28.00
	CD P= 0.05	1.01	1.31	0.03	0.03	4.36	5.89	72.59	98.14	66.08	94.46	125.16	84.91

Levels of Irrigation													
I1	Irrigation at 0.4 ETC	34.48	32.31	4.32	4.27	149.33	138.26	2488	2304	2396	3299	3047	3173.
I2	Irrigation at 0.6 ETC	36.51	33.55	4.35	4.29	159.05	144.26	2650	2404	2527	3475	3097	3286
I3	Irrigation at 0.8 ETC	39.97	39.05	4.41	4.36	176.92	170.67	2948	2844	2896	3716	3472	3594
I4	Irrigation at 1.0 ETC	39.21	38.23	4.42	4.34	173.54	165.91	2892	2765	2828	3699	3344	3522
	SE (m) =	0.31	0.39	0.01	0.01	1.31	1.77	21.85	29.54	19.89	28.43	37.68	25.56
	CD P= 0.05	0.93	1.19	0.03	0.03	3.98	5.38	66.27	89.59	60.32	86.23	114.26	77.51
Interaction PM X Irrigation													
	SE (m) ±	0.75	0.96	0.01	0.02	3.21	4.34	53.52	72.36	48.72	69.64	92.29	62.60
	CD P= 0.05	NS	NS	NS	NS	9.74	NS	162.32	NS	NS	NS	NS	NS
	GM=	37.54	35.78	4.38	4.31	164.71	154.77	2745	2579	2662	3547	3240	3394
Checks													
Ch1	Ridges and Furrows	24.50	22.17	4.24	4.19	103.86	93.01	1730	1550	1640	2407	2122	2265
Ch2	Ridges and Furrows with Poly Mulch	31.87	29.33	4.32	4.26	137.76	125.03	2296	2083	2189	3070	2815	2942
	SE (m) ±	1.01	1.16	0.01	0.03	4.33	5.23	72.10	87.10	62.30	95.21	112.04	81.21
	CD P= 0.05	3.01	3.43	0.03	0.09	12.85	15.52	214.20	258.73	185.08	282.83	332.85	241.24

Table 1(a): Interaction effect of polymulch and irrigation on Seed cotton yield (g) plant $^{-1}$ during 2013-14.

2013-14				
	I1	**I2**	**I3**	**I4**
PM1	126.56	135.95	143.09	151.60
PM2	172.11	182.15	210.75	195.49
SE (m) ±		3.21		
CD P= 0.05		9.74		

Table 1(b): Seed cotton yield (kg ha^{-1}) as influenced by Interaction of PM x Irrigation during 2013-14.

2013-14	**I1**	**I2**	**I3**	**I4**
PM1	2109	2265	2384	2526
PM2	2868	3035	3512	3258
SE (m) ±	53.52		CD P= 0.05	162.32

Conclusion

On the basis of two years experimentation, it could be concluded that application of polythene mulch (silver-black) with 0.8 ETc irrigation through drip significantly improve the number of bolls plant^{-1}, boll weight, seed cotton yield (kg ha^{-1}), found better for increasing the productivity of cotton.

Reference

1. Anonymous. World watch Institute report, 2006.
2. Ahmad S, Raza MAS, Saleem MF, Zahra SS, Khan IH, Ali M *et al*. Mulching strategies for weeds control and water conservation in cotton. ARPN J Agril Biol. Sci. 2015; 8(10):299-306.
3. Bhalerao PD, Gaikwadand GS, Imade SR. Productivity and nutrient uptake of *Bt*-cotton (*Gossypium hirsutum*) as influencedby precision in application of irrigation and fertilizer. Indian J Agron. 2011; 56(2):150-153.
4. Ghadge HL, Pawarand VS, Gaikwad CB. Influence of planting patterns, irrigation techniques and mulches on growth, yield, water use and economics of cotton (*Gossypium hirsutum*) under irrigated conditions of Western Maharashtra. Indian J Agron. 2005; 50(2):159-161.
5. Halemani HL, Hugar AY, Aladakatti YR, Nandagavi RA. Studies on the effect of polyethylene mulching on cotton genotypes under rainfed conditions: I. influence on growth, yield components and seed cotton yield. Karnataka J Agric. Sci. 2009; 22(2):280-283.
6. Nalayini P. Poly mulching a case study to increase cotton productivity. Model training course on cultivation of long staple cotton (ELS), 2007, 183-189.
7. Nalayini P, Anandham R, Sankaranarayanan K, Rajendran TP. Polyethylene mulching for enhancing crop productivity and water use efficiency in cotton (*Gossypium hirsutum*) and maize (*Zea mays*) cropping system. Indian J Agron. 2009; 54(4):409-419.
8. Panse Sukhatme, Panse VG, Sukhatme PV. Statistical methods for agricultural workers II Edn. ICAR, New Delhi, India, 1967, 328.
9. Sagarika BS, Malvia DD, Solan RM, Kachot NA, Dabhi BM. Effect of irrigation methods and nitrogen on yield and quality of winter cotton (*Gossypium hirsutum*). Indian J Agron. 2002; 47(4):544-549.
10. Shinde PP, Ramteke JR, More VG, Chavan SA. Evaluation of micro irrigation systems and mulch for summer chilli production. J Maharashtra Agric. Univ. 2002; 27(1):51-54.
11. Tekale DD, Patil RK, More MR, Nadre RG, Vaishnav VG. Yield response of cotton. Cv. NHH-4 to varying depths of irrigation through drip under differential planting geometry. J soils and Crops. 1999; 9(2):174-177.