



International Journal of Research in Agronomy

E-ISSN: 2618-0618

P-ISSN: 2618-060X

© Agronomy

www.agronomyjournals.com

2024; 7(1): 414-419

Received: 06-10-2023

Accepted: 10-11-2023

Ashok S Jadhav

Cotton Research Scheme,
Vasantrao Naik Marathwada
Krishi Vidyapeeth, Parbhani,
Maharashtra, India

Prashant B Jadhav

Cotton Research Scheme,
Vasantrao Naik Marathwada
Krishi Vidyapeeth, Parbhani,
Maharashtra, India

Assessment of integrated management technologies in *Bt*-cotton under drip irrigation

Ashok S Jadhav and Prashant B Jadhav

DOI: <https://doi.org/10.33545/2618060X.2024.v7.i1f.249>

Abstract

An experiment entitled “Assessment of Integrated Management Technologies in *Bt*-Cotton under Drip Irrigation” was conducted at Water Management Research Scheme, Vasantrao Naik Marathwada Krishi Vidyapeeth Parbhani (M.S.) during the year 2021-22 and 2022-23 in randomized block design with three replications. The experiment comprised of eight treatments T₁- Control Wider Planting (150 X 30 cm), T₂- Control Dense Planting (90 X 30 cm), T₃-Removal of Monopodia at 60 DAS (DP), T₄- De-topping at 75 DAS (DP), T₅- Removal of Monopodia at 60 DAS + De-topping at 75 DAS (DP), T₆- Spraying of Mapiquate Chloride @ 25 g a.i. at 60 DAS (DP), T₇- Use of Polymulch (DP) and T₈- Polymulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS (DP). The results obtained from this experiment shows that growing of cotton under polythene mulch along with removal of monopodia at 60 DAS and de-topping at 75 DAS (T₈) recorded significantly highest no. of bolls per plant (46.04, 37.23 and 41.65), yield plant⁻¹ (139.53, 154.13 and 146.83 g plant⁻¹) and boll weight (4.58, 6.51 and 5.54 g), seed cotton yield (3314, 3911 and 3613 kg ha⁻¹) and GMR (Rs. 314830, Rs. 391087 and Rs 352958 ha⁻¹ during 2021-22, 2022-23 and in pooled analysis as compared to all other treatments respectively. while removal of monopodia at 60 DAS and de-topping at 75 DAS (T₅) recorded significantly highest NMR (Rs.185301, Rs.237401 and Rs. 211351 ha⁻¹) and Benefit: Cost ratio (3.28, 3.24 and 3.26) during 2021-22, 2022-23 and in pooled respectively as compared to rest of the treatments.

Keywords: Cotton, drip irrigation, removal of monopodia, de-topping, plastic mulch, growth, yield, yield attributes

Introduction

Cotton (*Gossypium hirsutum* L.) is the most important fibre crop of India and backbone of textile industry. In India it is grown on an area of 123.07 lakh hectares with a production of 311.18 lakh bales and productivity of 428 kg/ha. In Maharashtra it is grown in an area of 44.10 lakh hectares with a production 82.49 lakh bales and productivity of 318 kg/ha (Anonymous, 2022) [1]. In Marathwada, it is grown in an area of 12.85 lakh hectares with a production of 20.04 lakh bales and productivity of 265 kg/ha. Cotton is grown as a rainfed crop and has direct effect on the economy of the farmer. Cotton contributes to 30% of the Indian agriculture gross domestic production.

Cotton seed contain 15.20 percent oil which can used for edible purpose after refining and left over cake is nutritious feed for livestock and concentrated organic manures which contains 6.4% N, 2.9% P and 2.2% K.

Monopodial branches are not boll bearing and they only compete for nutrients, water and other resources. De-topping of cotton terminal bud and removal of monopodial branches considered as important adjustment for plant geometry of cotton plants. De-topping practice reduces lodging and helps to translocates the nutrients towards the development of bolls, ultimately helps to increase *Bt*-Cotton yield. Considering this, a field experiment “Assessment of integrated management technologies in *Bt*-cotton under drip irrigation was conducted.

Materials and Methods

A field experiment was conducted during *Kharif* season of 2021-22 and 2022-23 in randomized block design, replicated thrice on the experimental farm of Water Management Scheme,

Corresponding Author:

Ashok S Jadhav

Cotton Research Scheme,
Vasantrao Naik Marathwada
Krishi Vidyapeeth, Parbhani,
Maharashtra, India

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The topography of experimental field was fairly uniform, leveled with a good drainage and the soil was clayey in texture, low in available nitrogen and phosphorous and very high in available potash and slightly alkaline in reaction. Agro-climatically Parbhani is situated at latitude, longitude and altitude of 19° 16' N, 76°47' E and 409 m above MSL respectively.

The climate of the Parbhani is sub-tropical and average annual precipitation is 960.7 mm. The monsoon commenced in the second week of June and sowing of cotton experiment was under taken on 20/07/2021 & 19/06/2022. Sowing of cotton done by dibbling method. "Moksha" variety of cotton used for sowing. The seed rate used for sowing of cotton is 3.0 kg/ha for 150 X 30 cm spacing and 5.50 kg/ha for 90 X 30 cm spacing.

The land was prepared by tilling once by tractor driven cultivar, one harrowing were done by disc harrow to obtain the desirable fine seed bed. RDF 100:50:50 NPK kg/ha in which N in 3 splits i.e. 20% at sowing and 40% each at 30, 60 DAS P& K 100% was applied at the time of sowing. The experiment comprised of eight treatments T₁- Control Wider Planting (150 X 30 cm), T₂- Control Dense Planting (90 X 30 cm), T₃-Removal of Monopodia at 60 DAS (DP), T₄- De-topping at 75 DAS (DP), T₅- Removal of Monopodia at 60 DAS +De-topping at 75 DAS (DP), T₆- Spraying of Mapiquate Chloride @ 25 g a.i. at 60 DAS (DP), T₇- Use of polymulch (DP) and T₈- Polymulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS (DP). The crop was harvested manually by labor early in the morning. Picking of cotton was done on 17/11/2021, 29/12/2021 and 24/01/2021 during first year and during second year picking was done on 20/10/2022, 9/11/2022 and 23/12/2022.

Results and Discussion

Growth Characters

Data on plant height during 2021-22, 2022-23 and in pooled as influenced by various treatments are presented in Table 01 and graphically depicted. Significantly highest plant height (110.67, 120.32 and 115.49 cm during 2021-22, 2022-23 and in pooled analysis respectively) was recorded in T₂- Control DP (90 X 30 cm) and it was at par with the treatments T₁- Control Wider Planting (150 X 30 cm), T₃- Removal of Monopodia at 60 DAS (DP) and T₇- Use of poly mulch (DP). While treatment T₄- De-topping at 75 DAS (DP) and T₈- Poly mulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS (DP) recorded lowest plant height during 2021-22, 2022-23 and in pooled and was at par with each other. Similar results were observed by Choudhary *et al.* (2021) [2].

Yield Attributes

Data on yield attributing characters such as number of bolls plant⁻¹, boll weight (g) and yield plant (g) are presented in Table 02 and graphically depicted.

Among yield attributes, number of bolls per plant (46.04, 37.23 and 41.65), boll weight (4.58, 6.51 and 5.54 g) and yield plant⁻¹ (139.53, 154.13 and 146.83 g plant⁻¹) were highest in T₈ (Polymulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS) and found significantly highest as compared to all other treatments respectively during 2021-22, 2022-23 and in pooled results. Such type of findings were also reported by Choudhary *et al.* (2021) [2], Vekaria *et al.*, (2020) [3], Suma *et al.*, (2019) [6] and Chauhan *et al.*, (2014) [10].

Seed Cotton Yield:

Data on seed cotton yield during 2021-22 and 2022-23 as influenced by various treatments are presented in Table 03 and graphically depicted.

Seed cotton yield was influenced significantly due to various treatments and highest seed cotton yield was recorded in T₈ (Polythene mulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS) (3314, 3911 and 3613 kg ha⁻¹ during 2021-22, 2022-23 and in pooled respectively) and it was significantly superior over rest of the treatments. Similar results were observed by Choudhary *et al.* (2021) [2], Vekaria *et al.*, (2020) [3], Suma *et al.*, (2019) [6], Isal *et al.*, (2019) [7] and Chauhan *et al.*, (2014) [10].

Economics

Data on GMR, NMR and B:C ratio as influenced by various treatments are presented in Table 04 and 05 and graphically depicted. Treatment T₈ (Use of Polymulch + Removal of monopodia at 60 DAS and De-topping at 75 DAS) recorded significantly highest GMR (Rs. 314830, Rs. 391087 and Rs 352958 ha⁻¹ during 2021-22, 2022-23 and in pooled respectively) as compared to all other treatments.

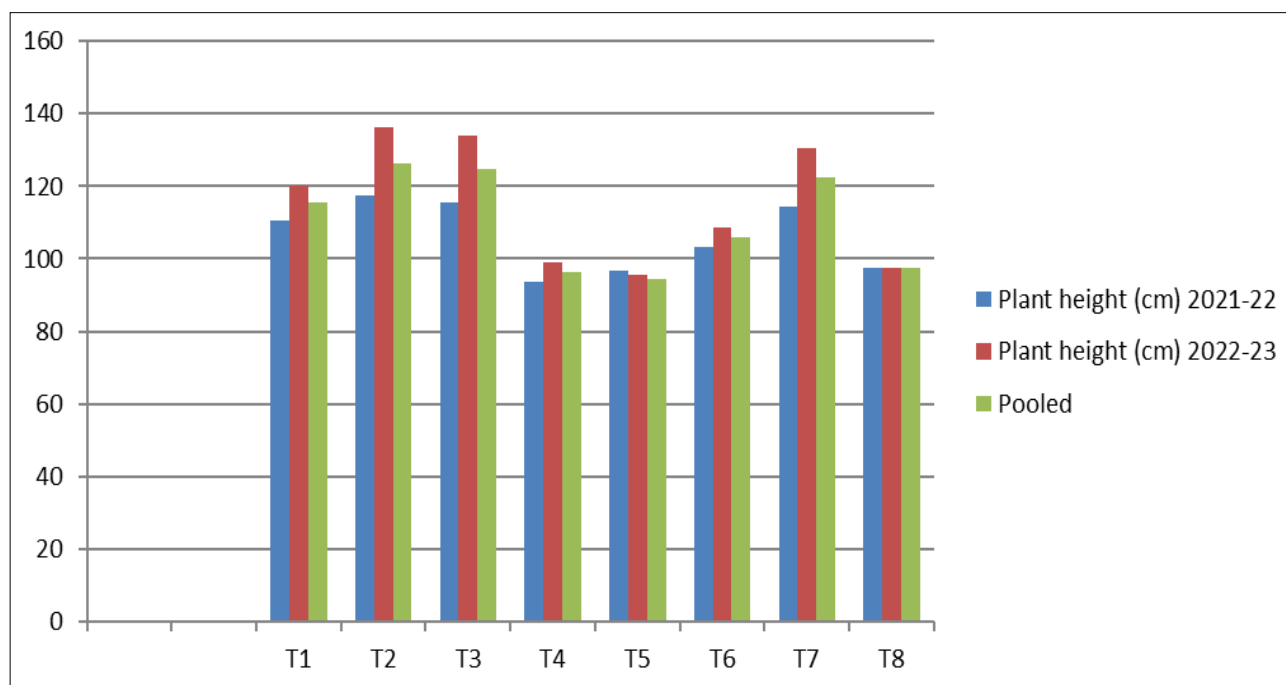
In case of Net Monetary Returns treatment T₅ (Removal of monopodia at 60 DAS and de-topping at 75 DAS) recorded significantly highest NMR (Rs.185301, Rs.237401 and Rs. 211351 ha⁻¹ during 2021-22, 2022-23 and in pooled respectively) as compared to rest of the treatments. Maximum Benefit: Cost ratio (3.28, 3.24 and 3.26 during 2021-22, 2022-23 and in pooled respectively) was recorded in treatment T₅ (Removal of monopodia at 60 DAS + Detopping at 75 DAS) than all other treatments. Similar results were observed by Choudhary *et al.* (2021) [2] and Jayswal *et al.*, (2022) [9].

Table 1: Plant height (cm) as influenced by different treatments during 2021-22 and 2022-23.

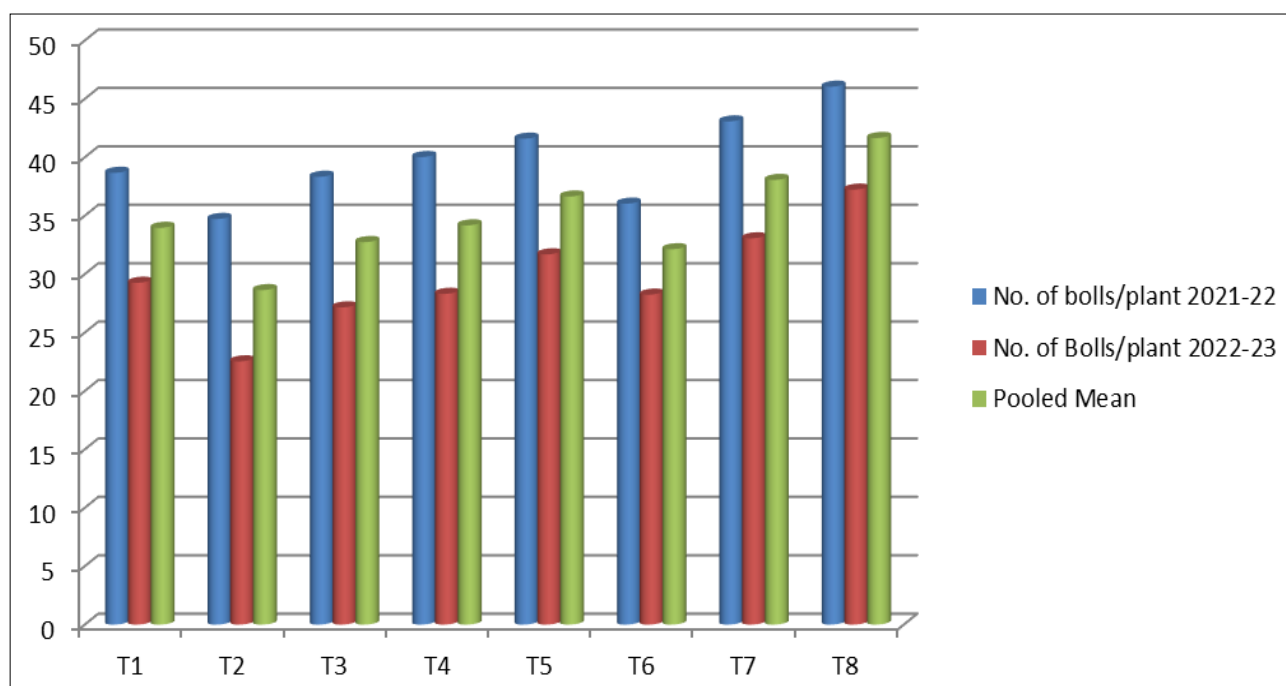
Treatments	Plant height (cm)		
	2021-22	2022-23	Pooled Mean
T ₁ - Control Wider Planting (150 X 30 cm)	110.67	120.32	115.49
T ₂ - Control HDP (90 X 30 cm)	117.33	136.11	126.44
T ₃ - Removal of Monopodia at 60 DAS (HDP)	115.68	133.97	124.83
T ₄ - De-topping at 75 DAS (HDP)	93.67	98.89	96.28
T ₅ - Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	96.58	95.55	94.60
T ₆ - Spraying of Mapiquat Chloride @ 25 g a.i./ha at 60 DAS (HDP)	103.33	108.55	105.94
T ₇ - Use of poly mulch (HDP)	114.33	130.66	122.50
T ₈ - Poly mulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	97.67	97.35	97.50
SE(m)	3.10	5.74	3.42
C.D.	9.52	17.58	9.46
Mean	106.17	115.18	110.57
C.V.	9.07	8.6	8.85

Table 2: No. of bolls plant⁻¹, Boll weight (g) and Yield plant⁻¹ (g) as influenced by different treatments during 2021-22 and 2022-23.

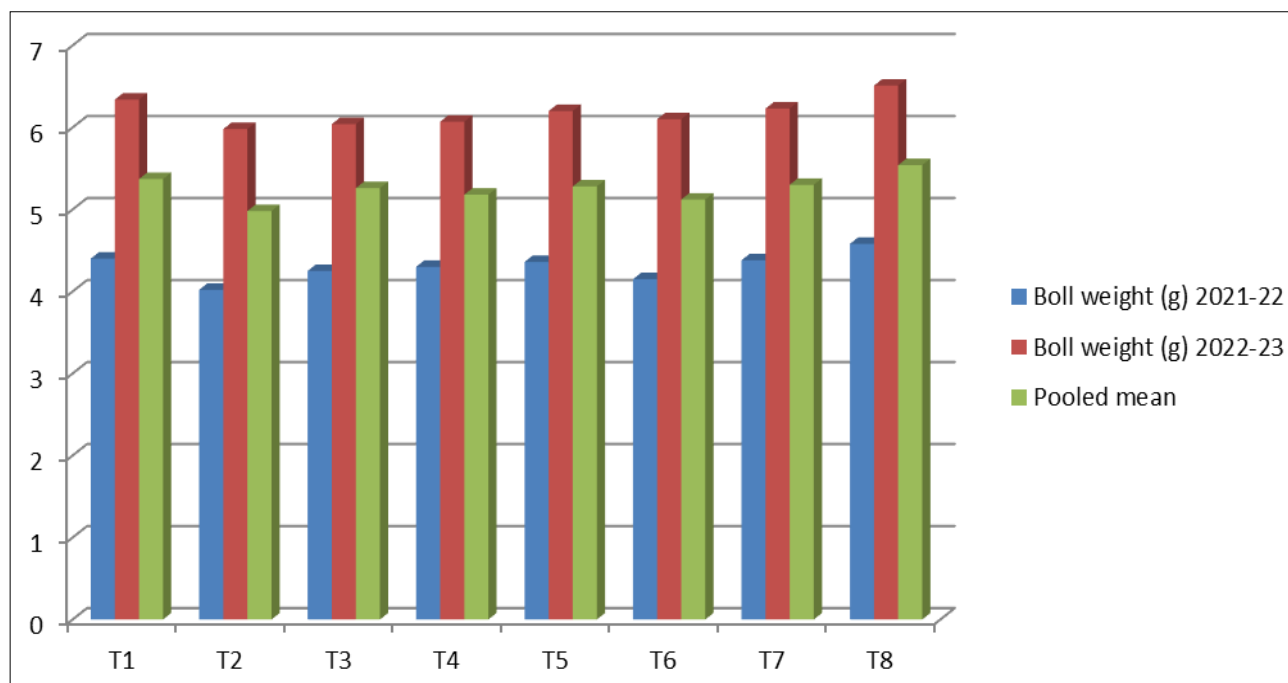
Treatments	No. of Bolls			Boll weight (g)			Yield plant ⁻¹ (g)		
	2021-22	2022-23	Pooled Mean	2021-22	2022-23	Pooled Mean	2021-22	2022-23	Pooled Mean
T ₁ - Control Wider Planting (150 X 30 cm)	38.67	29.26	33.96	4.40	6.34	5.37	128.33	141.85	135.09
T ₂ - Control HDP (90 X 30 cm)	34.72	22.53	28.63	4.02	5.98	4.98	122.67	131.73	127.20
T ₃ - Removal of Monopodia at 60 DAS (HDP)	38.33	27.15	32.74	4.25	6.04	5.26	128.33	135.07	131.70
T ₄ - De-topping at 75 DAS (HDP)	40.02	28.31	34.17	4.30	6.07	5.18	131.67	136.86	134.26
T ₅ - Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	41.59	31.69	36.64	4.36	6.20	5.28	132.03	143.87	137.95
T ₆ - Spraying of Mapiquat Chloride @ 25 g a.i./ha at 60 DAS (HDP)	36.03	28.24	32.13	4.15	6.10	5.12	125.85	138.64	133.91
T ₇ - Use of poly mulch (HDP)	43.07	33.06	38.06	4.38	6.23	5.30	134.02	147.10	140.56
T ₈ - Poly mulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	46.04	37.23	41.65	4.58	6.51	5.54	139.53	154.13	146.83
SE(m)	0.78	0.85	1.00	0.07	0.04	0.06	1.67	2.23	2.10
C.D.	2.40	2.57	3.02	0.21	0.13	0.18	5.10	6.93	6.18
Mean	39.81	29.68	34.74	4.30	6.18	5.25	130.31	141.16	135.93
C.V.	8.11	10.2	9.02	8.60	8.00	8.42	9.31	8.01	8.50



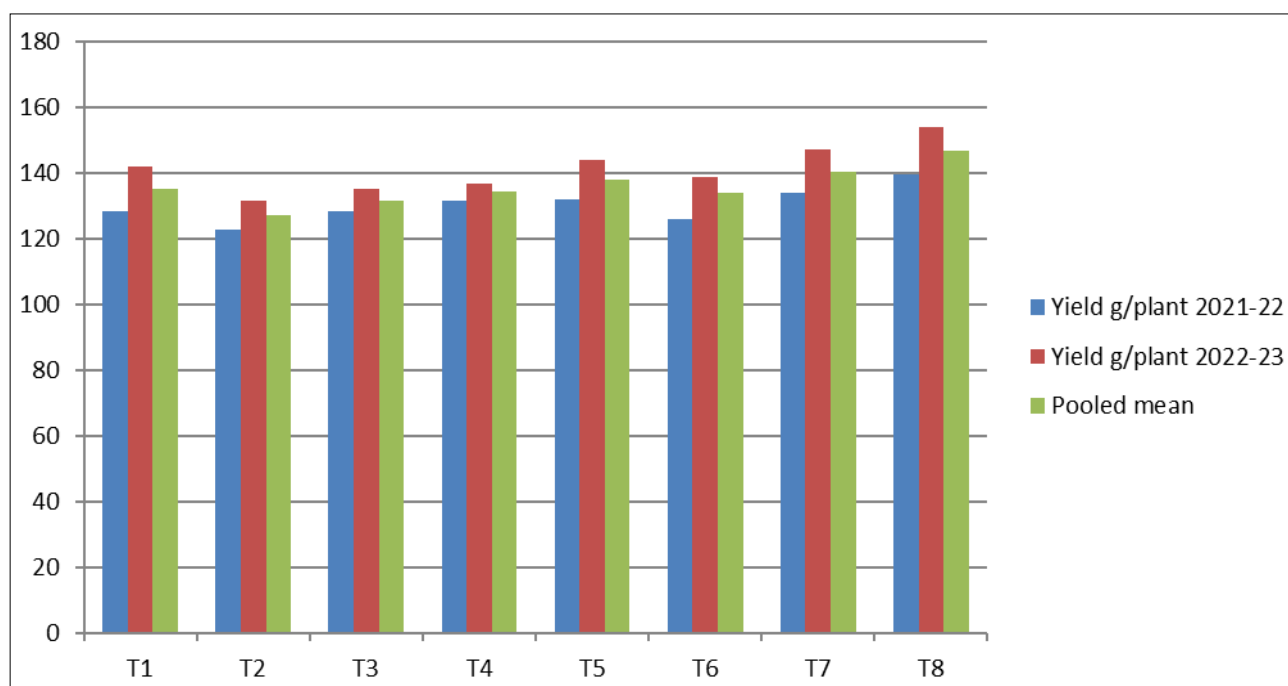
Graph 1: Plant height (cm) as influenced by different treatments during 2021-22 and 2022- 23.



Graph 2: No. of bolls plant⁻¹ as influenced by different treatments during 2021-22 and 2022- 23.



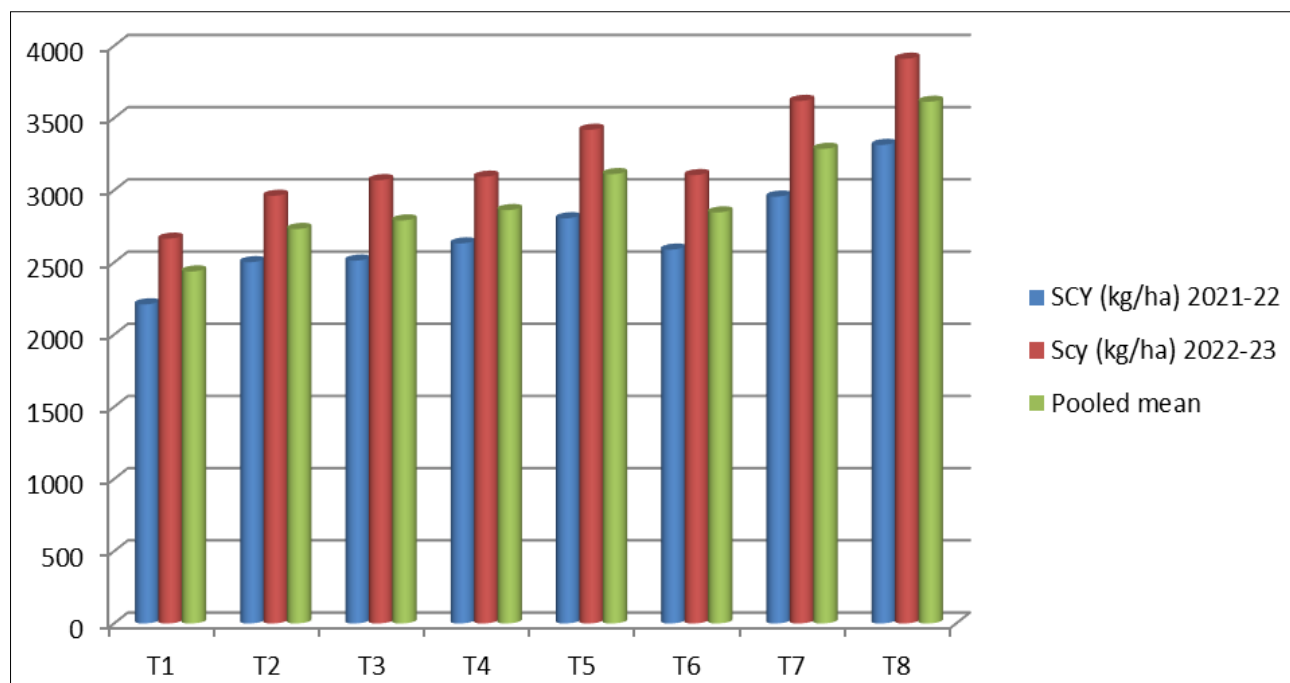
Graph 3: Boll weight (g) as influenced by different treatments during 2021-22 and 2022- 23.



Graph 4: Yield g/plant as influenced by different treatments during 2021-22 and 2022- 23.

Table 3: Seed cotton yield (kg ha^{-1}) as influenced by different treatments during 2021-22 and 2022-23.

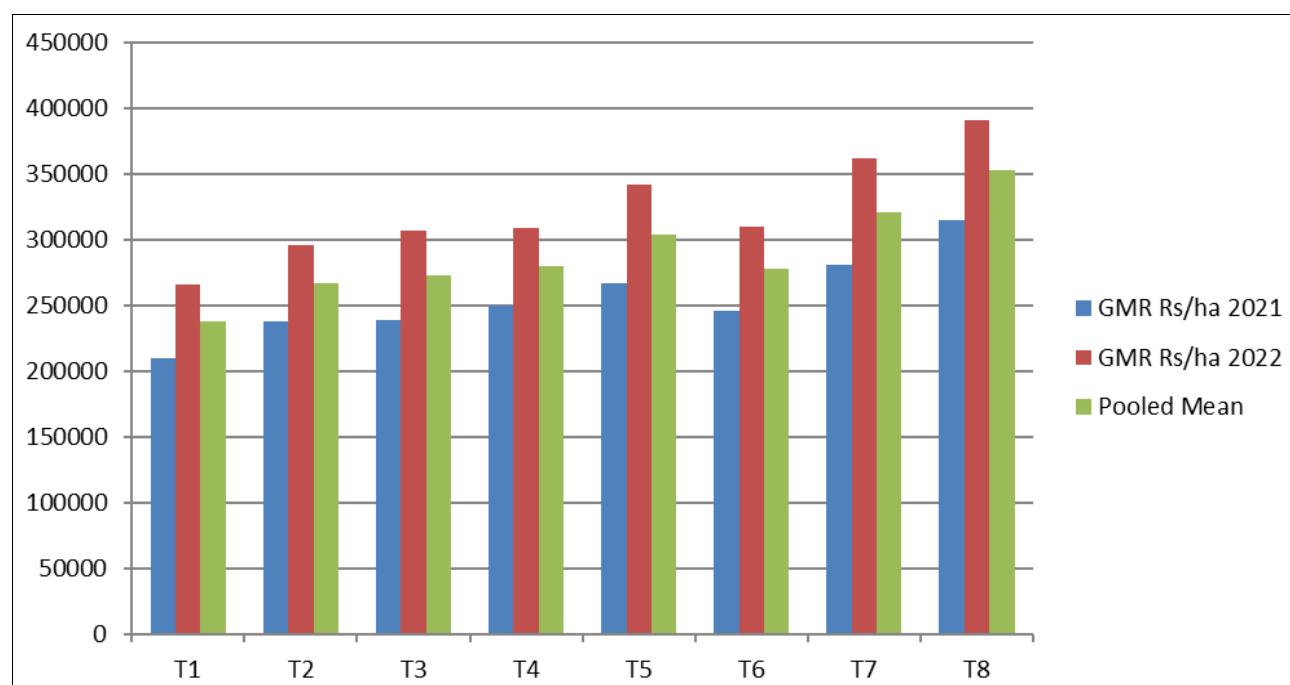
Treatment	SCY (kg ha^{-1})		
	2021-22	2022-23	Pooled Mean
T1- Control Wider Planting(150 X 30 cm)	2210	2665	2438
T2- Control HDP (90 X 30 cm)	2502	2962	2732
T3- Removal of Monopodia at 60 DAS (HDP)	2513	3070	2791
T4- De-topping at 75 DAS (HDP)	2632	3094	2863
T5- Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	2806	3419	3112
T6- Spraying of Mapiquat Chloride @ 25 g a.i./ha at 60 DAS (HDP)	2589	3105	2847
T7- Use of poly mulch (HDP)	2956	3619	3287
T8- Poly mulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	3314	3911	3613
SE(m)	81	93	53.46
C.D.	248	285	154.77
Mean	2690	3231	2960
C.V.	8.9	9.0	8.5



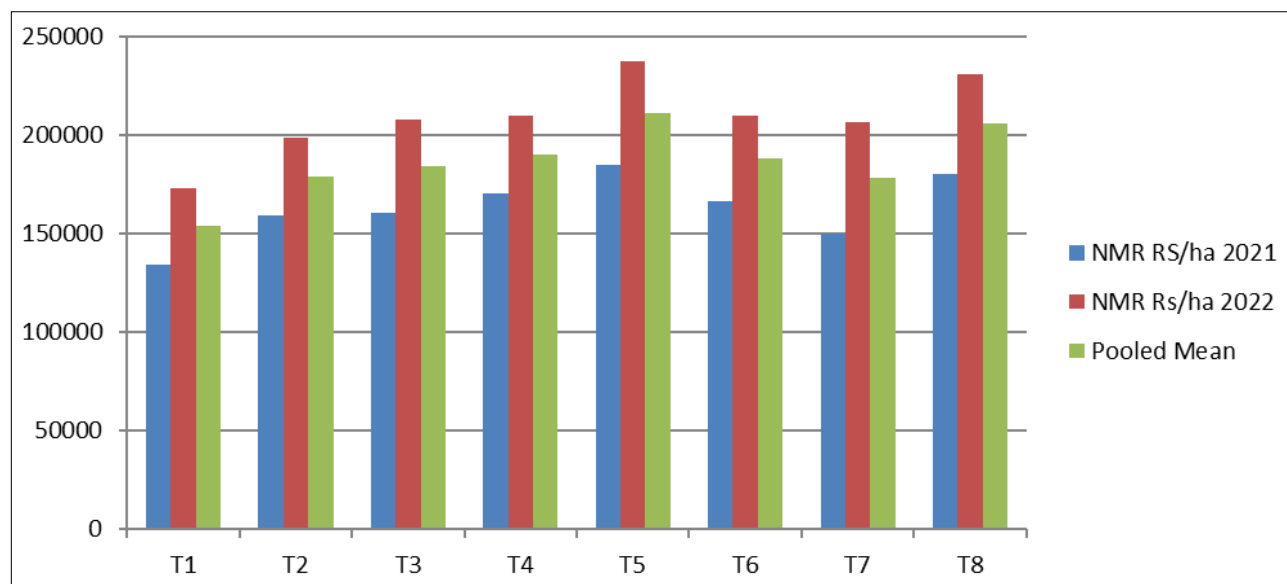
Graph 5: Seed cotton Yield (kg/ha) as influenced by different treatments during 2021-22-2022-23

Table 4: GMR (Rs ha⁻¹) and NMR (Rs ha⁻¹) as influenced by different treatments during 2021-22 and 2022-23.

Treatment	GMR (Rs ha ⁻¹)		Pooled Mean	NMR (Rs ha ⁻¹)		Pooled Mean
	2021-22	2022-23		2021-22	2022-23	
T ₁ - Control Wider Planting(150 X 30 cm)	209950	266481	238216	134641	173300	153971
T ₂ - Control HDP (90 X 30 cm)	237690	296239	266964	159461	198594	179027
T ₃ - Removal of Monopodia at 60 DAS (HDP)	238735	307004	272869	160396	207744	184070
T ₄ - De-topping at 75 DAS (HDP)	250040	309403	279722	170511	209784	190147
T ₅ - Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	266570	341894	304232	185301	237401	211351
T ₆ - Spraying of Mapiquat Chloride @ 25 g a.i./ha at 60 DAS (HDP)	245955	310506	278231	166396	210261	188329
T ₇ - Use of poly mulch (HDP)	280820	361883	321352	150051	206391	178221
T ₈ - Poly mulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	314830	391087	352958	180481	231215	205848
SE(m)	7553	9154	6225	8755	11334	4548
C.D.	23132	28015	18023	26815	34711	13169
Mean	255574	323062	289318	163405	209336	186371
C.V.	8.7	8.2	8.0	10.2	9.4	8.5



Graph 6: GMR (Rs ha⁻¹) as influenced by different treatments during 2021-22 and 2022-23.



Graph 7: NMR (Rs ha⁻¹) as influenced by different treatments during 2021-22 and 2022-23.

Table 5: B:C Ratio as influenced by different treatments during 2021-22 and 2022-23.

Treatment	B:C Ratio 2021-22	B:C Ratio 2022-23	Mean
T ₁ - Control Wider Planting (150 X 30 cm)	2.79	2.86	2.82
T ₂ - Control HDP (90 X 30 cm)	3.04	3.03	3.03
T ₃ - Removal of Monopodia at 60 DAS (HDP)	3.05	3.09	3.07
T ₄ - De-topping at 75 DAS (HDP)	3.14	3.11	3.13
T ₅ - Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	3.28	3.27	3.26
T ₆ - Spraying of Mepiquat Chloride @ 25 g a.i./ha at 60 DAS (HDP)	3.09	3.10	3.10
T ₇ - Use of poly mulch (HDP)	2.15	2.33	2.24
T ₈ - Poly mulch + Removal of Monopodia at 60 DAS + De-topping at 75 DAS (HDP)	2.34	2.44	2.39
SE(m)	-	-	-
C.D.	-	-	-
Mean	2.86	2.90	2.88
C.V.	-	-	-

Conclusions

- Growing of cotton under polythene mulch along with removal of monopodia at 60 DAS and de-topping at 75 DAS is found to be beneficial for getting higher seed cotton yield and GMR in Bt-Cotton grown under micro irrigation.
- Removal of monopodia at 60 DAS and de-topping at 75 DAS found to be beneficial for getting highest net monetary returns and B:C ratio in Bt-cotton grown under micro irrigation.

References

1. Anonymous. All India Cotton Research Project on Cotton; c2022.
2. Chaudhari JH, Chauhan SA, Chaudhary MM. Effect of topping and nitrogen levels on growth, yield attributes and yield of Bt cotton under drip irrigation conditions. The Pharma Innovation Journal. 2021;10(10):1898-1902.
3. Vekaria GB, Patel ML, Hirpara DS, Talpada MM, Patel TJ. Effect of growth regulators and de-topping on reproductive growth parameters of Bt cotton (*Gossypium hirsutum* L.) under rainfed condition. Journal of Pharmacognosy and Phytochemistry. 2020;9(3):377-381.
4. Shwetha NS, Halepyati AS, Pujari BT. Effect of detopping, removal of monopodia and plant spacings on nutrient uptake, quality parameters and economics of Bt cotton (*Gossypium hirsutum* L.). Karnataka Journal of Agricultural Sciences. 2009;22(4):892-893.
5. Anusree G, Sakthivel N, Thiruvavassan S, Balamurugan J. Effect of Drip Fertigation on Growth, Yield Parameters and Fertilizer use Efficiency of Irrigated Cotton (*Gossypium hirsutum* L.) under High Density Planting System. International Journal of Current Microbiology and Applied Sciences. 2020;9(7):2445-2453.
6. Suma P, Ajayakumar MY, Koppalkar BG, Krishnamurthy D, Ravi MV. Effect of Agronomic Management Practices and use of Growth Regulators on Yield and Economics of Bt Cotton (*Gossypium hirsutum* L.) under Irrigated Condition. International Journal of Current Microbiology and Applied Sciences. 2019;8(10):617-625.
7. Isal RL, Wanjari SS, Bhale VM, Wadatkar SB, Paslawar AN, Parlawar ND. Effect of polythene mulch and irrigation levels on yield of Bt cotton. Journal of Pharmacognosy and Phytochemistry. 2019;8(5):2030-2033.
8. Selvamurugan M, Chamy I, Navaneetha PV, Manikandan M. Effect of drip fertigation and plastic mulching on growth and yield of tomato. Journal of Applied Horticulture. 2018;20(1):75-78.
9. Jayswal PS, Joshi NS, Sondarva KN. Effect of plastic mulch on cotton yield and its economics. Gujarat Journal of Extension Education. 2022, 170-172
10. Chauhan SS, Celi P, Ponnampalam EN, Leury BJ, Liu F, Dunshea FR. Antioxidant dynamics in the live animal and implications for ruminant health and product (meat/milk) quality: role of vitamin E and selenium. Animal Production Science. 2014 Aug 19;54(10):1525-1536.