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Effect of tillage practices on growth and yield of *Bt* cotton (*Gossypium* spp)

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Abstract

A field experiment was conducted during the *Kharif* season of 2022-23 to evaluate the Performance of *Bt* Cotton (*Gossypium* spp) and Pigeon pea (*Cajanus cajan*) under different resource conservation practices at experimental Central Farm Balsa, Department of Agronomy, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S.). The soil of the experimental site was clayey in texture, soil pH of 8.2, low available N (193.28 kg ha⁻¹), medium in P₂O₅ (19.34 kg ha⁻¹) and high in K₂O (596.53 kg ha⁻¹). The experiment was laid out in split plot design with twelve treatment combinations consisting of six tillage practices T₁: Conservation tillage (one harrowing by tractor mounted blade harrow before sowing) (CnT), T₂: Conventional tillage (one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade harrow) (CvT), T₃: Conventional tillage + Sub soiling (one sub-soiling + one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade harrow) (CvTSS), T₄: Shallow tillage by tractor (one shallow tillage by tyne cultivator + one harrowing by blade harrow) (STT), T₅: Tillage by cultivator and rotavator (CRT), T₆: Shallow tillage by bullock (one shallow tillage by indigenous plough + one harrowing by bullock drawn blade harrow) (STB) and two treatment of crops C₁: *Bt* Cotton C₂: Pigeon pea. Results revealed that among the treatments, combination of tillage practices comprising of one sub-soiling + one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade harrow (T₃) with sole *Bt*. Cotton (Ajeet-155) recorded significantly greater seed cotton yield (kg ha⁻¹), GMR, NMR and B:C ratio as compare to Pigeon pea (BDN-711) found productive and profitable at Parbhani location.

Keywords: Tillage practices, *Bt*. cotton, pigeon pea, ploughing, sub-soiling, conventional tillage, rainfed, vertisol

Introduction

Cotton, popularly known as “King of fibre” and “White gold” is the most important fibre and commercial crop of global significance, which is cultivated in tropical and subtropical regions of more than seventy countries all over the world. Cotton is valued for its oil as well as its fibre, and the cotton seed cake (by-product of cotton oil mills) is an important livestock feed. Cotton seeds contain 15 to 20 percent oil, which can be used in the soap industry after refining. India ranks first in the World in terms of area under cotton cultivation. The total world area under cotton cultivation is 33.16 million hectare with the production of 25.89 million tons. India covers an area of 12.06 million hectare (36% of world area) with the production of 5.36 million tons (21% of world production) (Anonymous, 2021a) ^[2, 3]. In fact, the average yield of cotton is very low and it is around 445 kg ha⁻¹ as against the average yield of 781 kg ha⁻¹ in the world (Anonymous, 2021c) ^[2, 3]. In India, only 35.8 percent of area under cotton crop is irrigated.

Conservation tillage system is a method in which at least 30 percent of the soil surface remains covered by crop residues. Minimum and zero tillage systems are important methods of conservation tillage. Conservation tillage improves soil and water resources, saves energy and time, and reduces the cost of agricultural production.

Materials and Methods

A field experiment was conducted during *kharif* season of 2022-23 at the experimental Central Farm Balsa, Department of Agronomy, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S.) under rainfed conditions. The soil of the experimental site was clay with soil pH of 8.2, low available N (193.28 kg ha⁻¹), medium in P₂O₅ (19.34 kg ha⁻¹)

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and high in K_2O (596.53 kg ha⁻¹). The experiment was laid out in split plot design and data was analysed in RBD, which consisted of twelve treatment combinations comprising of six treatments of tillage practices as a main plots and two treatment of crop as a sub plots and were replicated four times. The size of gross and net plots were 10 m x 10 m and 8.4 m x 7.2 m respectively. There were six treatments tillage practices viz., T₁: Conservation tillage (one harrowing by tractor mounted blade harrow before sowing) (CnT), T₂: Conventional tillage (one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade harrow) (CvT), T₃: Conventional tillage + Sub soiling (one subsoiling + one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade harrow) (CvTSS), T₄: Shallow tillage by tractor (one shallow tillage by tyne cultivator + one harrowing by blade harrow) (STT), T₅: Tillage by cultivator and rotavator (CRT), T₆: Shallow tillage by bullock (one shallow tillage by indigenous plough + one harrowing by bullock drawn blade harrow) (STB) as main plots and two crops as sub plots were as follows farmer's practice (C₁), *Bt*

cotton (Ajeet-155), and (C₂) pigeon pea (BDN-711). *Bt* cotton seeds were dibbled @ 1 seed hill⁻¹ on 15th July during 2022.

Results and Discussion

Effect of tillage practices on growth of *Bt* cotton (*Gossypium spp*)

Growth was significantly increased by different tillage practices. Plant height was increased with the age of the crop up to harvest irrespective of the treatments. Highest plant height was recorded in T₃-(CvTSS) Conventional tillage + Sub soiling (one sub-soiling + one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade harrow) 156.98 cm a harvest. This result similar findings were Dangolani and Narob (2013) [4] and Leghari *et al.* (2017) [9]. Maximum number of monopodial (2.29) and sympodial branches plant⁻¹ (15.28) are recorded at 120 DAS in the treatment of T₃-(CvTSS) Conventional tillage + Sub soiling (one sub-soiling + one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade

Table 3.1: Effect of tillage practices on plant height (cm), No. of monopodial, sympodial branches and Total dry matter accumulation

Sr. No.	Treatment	At harvest	120 DAS	At harvest	
		Plant height (cm)	No. of monopodial branches	No. of sympodial branches	Total dry matter accumulation
T ₁	CnT	133.11	2.01	12.18	185.25
T ₂	CvT	150.65	2.25	14.80	212.39
T ₃	CvTSS	156.98	2.29	15.28	221.69
T ₄	STT	147.49	2.20	14.25	208.29
T ₅	CRT	142.47	2.15	13.50	199.29
T ₆	STB	138.50	2.11	13.38	196.79
S.Em±		4.53	0.05	0.55	7.34
C.D. at 5%		13.66	-	1.74	22.14

Effect of tillage on yield attributes and yields of *Bt* cotton (*Gossypium spp*)

Number of picked bolls plant⁻¹

The tillage practices significantly increase the no. of picked bolls plant⁻¹. The highest no. of picked bolls plant⁻¹, average boll weight (g) and seed cotton yield plant⁻¹ was recorded in T₃-(CvTSS) Conventional tillage + Sub soiling (one sub-soiling + one ploughing + one harrowing by tyne cultivator

+ one harrowing by tractor mounted blade harrow) 35.82, 3.87 g and 138.57 g respectively. However, at par with T₂-Conventional tillage (one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade harrow). This result similar finding is Khan *et al.* (2014) [8] and Karishma *et al.* (2019) [7] also reported the similar results.

Table 3.2: Effect of tillage practices on No. of picked bolls plants⁻¹, Average boll weight (g) And Seed cotton yield plant⁻¹ (g)

Sr. No.	Treatment	No. of picked bolls plant ⁻¹	Average Boll weight (g)	Seed cotton yield plant ⁻¹ (g)
T ₁	CnT	26.99	3.51	94.73
T ₂	CvT	34.78	3.84	133.42
T ₃	CvTSS	35.82	3.87	138.57
T ₄	STT	31.71	3.82	121.04
T ₅	CRT	29.49	3.69	108.83
T ₆	STB	29.41	3.67	107.96
S.Em.		1.39	0.15	5.90
C.D. at 5%		4.18	NS	18.58

Yield attributes

The tillage practices significantly increase the Seed yield, Stalk yield, biological yield (kg ha⁻¹) and Harvest index (%) was recorded in T₃-(CvTSS) Conventional tillage + Sub soiling (one sub-soiling + one ploughing + one harrowing by tyne cultivator + one harrowing by tractor mounted blade harrow) 2350 kg ha⁻¹, 3783 kg ha⁻¹, 6133 kg ha⁻¹ and 38.32% respectively. Since the source was not restricting in traditional tillage, the enhanced plant development helped to better partition assimilates into reproductive portions, *i.e.*,

number of sympodial branches, number of selected bolls plant⁻¹ and boll weight, resulting in higher seed cotton output per plant. Similar findings were reported by Ishaq *et al.* (2001) [5], Jalota *et al.* (2008) [6]. The increase in the plant height, no. of monopodial and sympodial branches no. of functional leaves and leaf area increases the dry matter accumulation, which is contributed to stalk yield. Similar findings were also reported by Ishaq *et al.* (2001) [5], Raut *et al.* (2016) [12], Karishma *et al.* (2019) [7] and Pawar (2021) [10].

Table 3.3: Effect of tillage practices on seed yield (kg ha⁻¹), stalk yield (kg ha⁻¹), biological yield (kg ha⁻¹) and harvest index (%)

Sr. No.	Treatment	Seed yield (kg ha ⁻¹)	Stalk yield (kg ha ⁻¹)	Biological yield (kg ha ⁻¹)	Harvest index (%)
T ₁	CnT	1597	4417	4417	36.15
T ₂	CvT	2260	3654	5914	38.21
T ₃	CvTSS	2350	3783	6133	38.32
T ₄	STT	2045	3516	5561	36.77
T ₅	CRT	1838	3240	5078	36.19
T ₆	STB	1825	3220	5045	36.17
S.Em±		104.68	148.13	211.68	-
C.D. at 5%		315.53	446.53	638.07	-

Conclusion

The following conclusions could be drawn from one year of investigation:

Combination of tillage practices comprising of one sub-soiling + one ploughing + one harrowing by tyne cultivator+ one harrowing by tractor mounted blade harrow (T₃-CvTSS) with sole Bt. Cotton (Ajeet-155) recorded best tillage practice with greater seed yield (kg ha⁻¹), GMR, NMR and B:C ratio as compare to Pigeon pea (BDN-711) found productive and profitable at Marathwada region.

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References

1. Afzalnia S, Behaen M, Karami A, Dezfuli A, Ghaisari A. Effect of conservation tillage on the soil properties and cotton yield. *Journal of Agricultural Machinery Science*. 2011;7(1):73-76.
2. Anonymous. Area, Production and Productivity of cotton of India and world. Ministry of Textiles; 2021. Available at: <http://texmin.nic.in/sites/default/files/A7.pdf>. Accessed on September 25, 2022.
3. Anonymous. Report of International Cotton Advisory Committee (ICAC). 2021. p. 2-4.
4. Dangolani SK, Narob MC. The effect of four types of tillage operations on soil moisture and morphology and performance of three varieties of cotton. *European Journal of Experimental Biology*. 2013;3(1):694-698.
5. Ishaq M, Ibrahim M, Lal R. Tillage effect on nutrient uptake by wheat and cotton as influenced by fertilizer rate. *Soil and Tillage Research*. 2001;62(1):41-53.
6. Jalota SK, Buttar GS, Sood A, Chahal GBS, Ray SS, Panigrahy S. Effects of sowing date, tillage and residue management on productivity of *Gossypium hirsutum* L. – *Triticum aestivum* L. system in northwest India. *Soil and Tillage Research*. 2008;99:76-83.
7. Karishma C, Taley SM, Atal GR, Paslawar AN, Katkar RN. Impact of tillage practices on crop growth and production in cotton under rainfed condition. *Journal of Pharmacognosy and Phytochemistry*. 2019;8(4):858-861.
8. Khan N, Usman K, Yazdan F, Saleem UD, Gull S, Khan S. Impact of tillage and intra-row spacing on cotton yield and quality in wheat-cotton system. *Archives of Agronomy and Soil Science*. 2014. DOI: 10.1080/03650340.2014.947284.
9. Leghari N, Shah AR, Farhad W, Hammad HM. Influence of tillage practices on yield components and economic analysis of maize. *Pakistan Journal of*

Agriculture Agricultural Engineering and Veterinary Sciences. 2017;33(1):66-73.

10. Pawar SB. Response of *Gossypium hirsutum* L. to tillage and weed management practices in vertisol [Doctoral Dissertation]. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani; 2021.
11. Pawar SB, Karle AS, Gokhale DN, Mane SG. Growth and yield of *Gossypium hirsutum* L. as influenced by tillage and weed management practices under rainfed condition. *The Pharma Innovation Journal*. 2022;11(7):1075-1079.
12. Raut SD, Mahadkar UV, Nitave SS, Rajemahadik VA, Shendage GB. Effect of tillage and methods of fertilizer application on yield and economics of horse gram. *Journal of Research ANGRAU*. 2016;44(3 & 4):1-5.