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Adoption level of high density planting system in cotton crop at Jangaon district of Telangana state

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Abstract

The study undertaken in the Jangaon district of Telangana state during 2023-24 aimed to quantify the farmers knowledge before and after the implementation of ICAR-CICR's special project on cotton entitled "Targeting technologies to agro-ecological zones – large scale demonstrations of best practices to enhance the cotton productivity" under NFSM. A total of 80 respondents were specifically chosen from six mandals within the Jangaon district and all the respondents followed HDPS in cotton. The study used a descriptive research methodology and pre-structured interviews to collect data through in-person interviews.

Keywords: High density planting system (HDPS), adoption, cotton growers, Mepiquat chloride

Introduction

Cotton crop is widely known for its performance and adaptability. Cotton lint and cotton seeds are the parts of the plant that are most frequently utilized. Cotton's strength and absorbency made it an ideal choice for manufacturing tarpaulins, tents, hotel bedding, army uniforms and even the outfits that astronauts wear inside the shuttles they travel in. The short fibers that remain on the seed, known as linters are mostly utilized to make products like bandages, swabs, cotton buds, bank notes, x-rays, etc., Crushed cotton seeds are used to manufacture cholesterol-free oil and the seeds themselves make up around half the weight of the plucked cotton. It is estimated that a tonne of cotton seed produces 200 kgs of oil, 500 kgs of cotton seed meal, and 300 kgs of hull. Worldwide, the production of cotton seeds has the ability to meet the protein needs of hundreds of millions of people and other animals (Kalidasan, 2020)^[2].

Cotton is a crop of great importance to India's sustainable economy and the life of the country's cotton farmers. Around the world, 32.94 million hectares of cotton was sown during the 2021 - 22 growing season, yielding 120.2 million bales at a productivity of 778 kg/hectare. India produced 362.18 lakh bales of cotton in 2021–2022 on 120.69 lakh hectares, yielding 510 kg of cotton per hectare (*Cotton Corporation of India*, 2022)^[4].

The sustainable economy of India and the livelihood of the country's cotton farmers depend heavily on the crop. In the nation, it is grown on around 117 lakh hectares, and on about 312 lakh hectares worldwide. India thus makes up around 37.5% of the world's cotton area and contributes 26% (or 6.20 million MT) of the world's 23.92 million MT cotton yield. As the primary raw material for the textile industry, cotton continues to have a dominant and most favored fiber status among Indian textile mills (Hasanuzzama and Chandan, 2016)^[1]. India produced 510 kgs of cotton per hectare on 120.69 lakh hectares in 2021–2022, producing 362.18 lakh bales of cotton (*Cotton Corporation of India*, 2022)^[4]. Gujarat leads in output with 90 lakh bales while Maharashtra leads in acreage at 42.86 lakh acres.

Research Methodology

This study focused on enhanced cultivation techniques using a high density planting system cotton in the Jangaon district of Telangana state. The study used a descriptive research design, which explains the traits or phenomena under investigation. A total of 80 respondents were purposefully chosen from six mandals within the Jangaon district order in to gauge the degree of

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adoption of higher density planting systems for cotton growing. Using a pre-structured interview schedule, the data was gathered through in-person interviews. Appropriate statistical analysis (frequency, percentage, etc.) was then performed to arrive at a reasonable conclusion.

Cotton production in Telangana

With the second-largest cotton acreage in India, Telangana is the country's third-largest producer of cotton. According to <https://www.agri.telangana.gov.in>, the area covered by cotton in Telangana state on September 29, 2021–22, was 46,42,695 acres, compared to 60,17,992 acres in 2020–21. With 6,54,667 acres, Nalgonda was the largest district followed by Warangal (5,56,228 acres), Adilabad (3,87,311 acres), Sangareddy (3,61,213 acres), Nagarkurnool (3,52,619 acres) and Asifabad (2,97,280 acres).

High density planting in cotton

Cotton productivity increased in 2002 with the introduction of hybrids and the development of Bt technology. On the other hand, farmers were searching for alternatives due to the time and expense associated with manual harvesting. A step in the right direction was promised by enhanced farming techniques made possible by the High-Density Planting System (HDPS). Farmers searched for plants that would produce more at higher planting densities, with fewer bolls per plant and that would mature and burst uniformly. Around the world, initiatives have been made in this regard. India, however, is both the world's biggest producer and consumer of cotton. A few varieties appropriate for this situation have been released from many universities through interventions and the futuristic requirements for achieving at least 700 kgs of lint per hectare. It is now evident that, despite having a higher area under cotton, the productivity of cotton is very low compared to many of the countries, which warrants attention primarily on developing newer genotypes that would

yield better on higher management conditions. Strategies that could maximize the per unit area yield in cotton is under implementation in India.

High density planting system in cotton concept

Idea of high density planting method in cotton is a brand-new, cutting-edge technique for growing cotton. Instead of using outdated and customary farming methods, this improved cultivation technique involves planting cotton before July 10 of the *kharif* season, spacing plants at 90 x 15 cms thus, planting 29,629 plants per acre in the new cultivation method and applying fertilizer per hectare that contains 120 kg of N, 60 kg of P, and 60 kgs of K. Application of Mepiquat chloride, a growth regulator, at two regular intervals i.e., once during flowering, 45 days after sowing, at a dosage of 1.5 ml per litre of water and again, 60 after sowing, at the period of boll formation, @ 2.0 per litre of water. Mepiquat chloride gives the plant a slowdown in growth and size, causing all of the bolls to burst at the same time. Cotton picking is simple. The yield per acre has increased to 10–12 Q/acre but it has also decreased in acres of cotton grown and the effectiveness of pink boll worms and peasant surveillance has decreased in the following *kharif* crop. If cotton is harvested before the last week of November, the *rabi* crop can be grown alternately with other crops like sesamum and groundnut (Prasad *et al*, 2023) [3].

Objectives of research

- To determine the knowledge of the farmers about the high density planting system in cotton crop.
- To evaluate the response of special project on HDPS cotton among the cotton farmers of Jangaon district.
- To assess the progress in adoption of the high-density planting system in cotton crop.

Results and Discussion

Table 1: Knowledge of the farmers about the high density planting system in cotton crop before the implementation of CICR Project

S. No.	Statements	Knowledge			
		Yes		No	
		F	%	F	%
1	Soil suitable for HDPS cotton cultivation	34	42.5	46	57.5
2	Recommended spacing (90 x 15 cms)	18	22.5	62	77.5
3	Cultivars used for HDPS	35	43.75	45	56.25
4	Gap filling	32	40	48	60
5	Crop duration	28	35	52	65
6	Pre- emergence herbicides	26	32.5	54	67.5
7	Post - emergence herbicides	16	20	64	80
8	Recommended dose of NPK fertilizers	19	23.75	61	76.25
9	Recommended dose of FYM	13	16.25	67	83.75
10	Pest identification in HDPS cotton (Jassid, thrips and whitefly, american, spotted and pink boll worm)	33	41.25	47	58.75
11	Disease identification in HDPS in cotton (Anthracnose, fusarium wilt)	27	33.75	53	66.25
12	Recommended dosage of PGR	24	30	56	70
13	Harvesting (one or two times)	15	18.75	65	81.25
14	Using PGR mepiquat chloride in regular intervals used	18	22.5	62	77.5
15	Yield (12-15 q a ⁻¹)	38	47.5	42	52.5

F = Frequency, % = Percentage

Knowledge of the farmers about the high density planting system in cotton crop before the implementation of CICR Project

The current state of utilization of the suggested practice packages in the high density planting system among cotton farmers is shown by the available information. The findings from the assessment of the farmers awareness of advised

practices among high density cotton growers before the implementation of CICR Project is shown in Table 1. Observations from the above table reveal that most of the farmers knew about (43.75%) cultivars used in HDPS cotton, followed by (42.5%) soil suitable for HDPS cotton cultivation and most of the farmers (41.25%) knew about the pest identification in HDPS cotton and disease identification

(33.75%). Most of the farmers lack knowledge in recommended dose of FYM (83.75%) followed by harvesting (one or two times) (81.25%) and also most of them are lacking of knowledge

about the Post - emergence herbicides (80%) and crop duration (77.5%).

Table 2: Knowledge of the farmers about the high density planting system in cotton crop after the implementation of CICR Project

S. No.	Statements	Knowledge			
		Yes		No	
		F	%	F	%
1	Soil suitable for HDPS cotton cultivation	76	95	4	5
2	Recommended spacing (90 x 15 cm)	79	98.75	1	1.25
3	Cultivars used for HDPS	78	97.5	2	2.5
4	Gap filling	75	93.75	5	6.25
5	Crop duration	72	90	8	10
6	Pre- emergence herbicides	70	87.5	10	12.5
7	Post - emergence herbicides	72	90	8	10
8	Recommended dose of NPK fertilizers	75	93.75	5	6.25
9	Recommended dose of FYM	76	95	4	5
10	Pest identification in HDPS cotton (Jassid, thrips and whitefly, American, spotted and pink boll worm)	68	85	12	15
11	Disease identification in HDPS in cotton (Anthracnose, fusarium wilt)	70	87.5	10	12.5
12	Recommended dosage of PGR	79	98.75	1	1.25
13	Harvesting (one or two times)	77	96.25	3	3.75
14	Using PGR mepiquat chloride in regular intervals used	75	93.75	5	6.25
15	Yield (12-15 q a ⁻¹)	78	97.5	2	2.5

F = Frequency, % = Percentage

Knowledge of the farmers about the high density planting system in cotton crop after the implementation of CICR Project

The findings from the assessment of the farmer's awareness of advised practices among cotton growers after the implementation of CICR Project are shown in Table 2. Observations from the above table 2, indicate that almost 95% of the farmers gained complete knowledge about the High Density Planting System by after implementation of CICR Project in Jangraon district. During the implementation of this project,

conducted various Training programmes, Field Days and Kisan Mela. Most of the farmers attended these programmes and gained full of knowledge about HDPS cotton. Most of the farmers learnt about (98.75%) recommended spacing (90 x 15 cms) in HDPS cotton and recommended dosage of PGR (98.75%) followed by cultivars used for HDPS (97.5%) and yield in HDPS cotton (99.5%). Some of the farmers are having lacking less of knowledge about (15) pest identification followed by disease identification in HDPS in cotton (12.5%) and pre-emergence herbicides (10%).

Table 3: Determination of the adoption level of high density planting system in cotton

S. No.	Adoption of HDPS in cotton	Fully Adoption	FA	Partial Adoption	PA	No Adaption	NA
		F	%	F	%	F	%
A)	Land preparation						
1.	Summer ploughing	20	25	34	42.5	26	32.5
2.	Cultivation of HDPS in recommended soil	42	52.5	21	26.25	17	21.25
B)	Suitable varieties	62	77.5	15	18.75	3	3.75
C)	Seed Treatment						
	Use of streptocyclin	33	41.25	24	30	23	28.75
	Use of agromycin	28	35	38	47.5	14	17.5
D)	Recommended time of sowing	38	47.5	32	40	10	12.5
E)	Seed rate and spacing						
	Seed rate	48	60	21	26.25	11	13.75
	HDPS Spacing (90 x 15 cm)	25	31.25	48	60	7	8.75
	Closer spacing (90 x 30cm)						
	Sowing with Pneumatic planter	-	-	-	-	-	-
F)	Macro and Micro nutrients Fertilizer application						
	Recommended dose of N fertilizers	24	30	51	63.75	5	6.25
	Recommended dose of P fertilizers	21	26.25	44	55	15	18.75
	Recommended dose of K fertilizers	18	22.5	41	51.25	21	26.25
	Recommended dose usage of Micro nutrients	12	15	35	43.75	33	41.25
G)	Weed management						
	Manual weeding	21	26.25	51	63.75	8	10
	Use of pre emergence herbicides	33	41.25	37	46.25	10	12.5
	Use of post emergence herbicides	15	18.75	10	12.5	55	68.75
H)	Irrigation management	22	27.5	42	52.5	16	20
I)	Plant protection measures and growth promoters						
	Exact Recommended dose on time	38	47.5	31	38.75	11	13.75
	Insecticides & Fungicides	29	36.25	41	51.25	10	12.5

J)	Plant growth regulators (PGR)						
	Only usage of mepiquat chloride PGR	65	81.25	14	17.5	1	1.25
	Application time of PGR exact 45 and 60 and 90 days interval	58	72.5	18	22.5	4	5
K)	Pickings						
	Appropriate No. of days for picking for HDPS cotton (150-165 DAS) & total No. of picking in single crop (only 1 time)	18	22.5	58	72.5	4	5
L)	Others						
	Bio fertilizers and FYM	12	15	35	43.75	33	41.25
	Pheromone traps and sticky traps	26	32.5	32	40	22	27.5

F = Frequency, % = Percentage,

(FA = Fully Adopted, PA= Partial Adopted, NA= No Adaption)

Adoption level of high density planting system

Adoption describes the current status of cotton growers use of the advised set of practices when utilizing the high density planting system. Table 3 depicts the findings from the examination of information regarding the high density cotton growers respondents adoption of suggested procedures. They use a high density planting strategy and developing trend to cultivate cotton on the available land. Concerning usage of PGR, 81.25% respondents fully embraced the usage of only mepiquat chloride as plant growth regulator, 77.5% respondents fully embraced the using of suitable varieties for HDPS cotton strategy. It is followed by seed rate which should be maintained for HDPS cotton @ 5-6 kg acre⁻¹, 60% farmers fully adopted the suitable seed rate for HDPS cotton.

Majority of the farmers i.e., 72.5% partially adopted the appropriate no. of days for picking for HDPS cotton i.e., 150-165 DAS and total no. of pickings in single crop (1 or 2 times) followed by 63.75% partially adopted for weeding technique (Manual weeding) and recommended dose of N fertilizers in cotton crop. From the above table, the farmers majorly lack in the adoption of soil treatment i.e., using of post – emergence herbicides (68.75%).

Conclusion

It was found that most cotton growers using high density planting systems adopted enhanced cultivation techniques for cotton at a medium level. Higher adoption levels were noted for techniques viz., of using of mepiquat chloride, suitable varieties, nutrient management and harvesting; lower adoption levels were noted for using of post emergence herbicides, soil treatment techniques, irrigation, FYM, micronutrient application. The study reveals that after implementation of project the awareness and knowledge was increased due to the organization of training programmes, Field Days and Kisan Mela. The farmers are more interested in this strategy and in future most of the farmers may follow this High Density Planting System.

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