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Comparative analysis of high-density planting system (HDPS) and traditional cotton cultivation practices in Sangareddy district, Telangana

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Abstract
This study investigates the adoption and effectiveness of High-Density Planting System (HDPS) in cotton cultivation, comparing it to traditional farming practices. The research was conducted during *Kharif* season 2023-24 season under DAATTC Sangupet & ICAR-CICR, Nagpur Special Cotton Project entitled "Targeting Technologies to Agro-Ecological Zones – Large Scale Demonstrations of Best Practices to Enhance Cotton Productivity" under NFSM, in the Sangareddy district of Central Telangana Zone. A descriptive research design was used to evaluate the effectiveness of HDPS, and the results provide insights into its adoption and advantages over traditional cotton farming practices.

Keywords: HDPS, closer spacing, cotton, Mepiquat chloride, Telangana, pink bollworm

Introduction
Cotton (*Gossypium hirsutum* L.) is a globally significant fiber and cash crop, grown in over seventy countries. In India, it is a critical component of agriculture and the textile industry, accounting for about 60% of the country fiber. India is the largest cotton producer in the world, cultivating 13.4 million hectares and producing 36.2 million bales, but its productivity stands at only 510 kg/ha, far below the global average of 778 kg/ha. Telangana, as the second-largest cotton-producing state in India, faces similar challenges in cotton productivity. In the 2021-22 season, the area under cotton in Telangana was 46.42 lakh acres, with the Sangareddy district contributing 3.61 lakh acres (Cotton Corporation of India, 2022) [3].

Lower productivity in India can be attributed to factors such as rainfed cultivation, weed competition, poor soil fertility, monocropping practices, pest incidences and insufficient use of fertilizers. In response, innovations such as High-Density Planting System (HDPS) are being introduced to enhance cotton productivity. HDPS optimizes plant populations by utilizing closer spacing, increasing yield potential. Countries like Brazil, China, and Australia have demonstrated success with HDPS, achieving seed cotton yields between 45 and 55 quintals per hectare. HDPS requires early-maturing, compact cotton varieties and effective canopy management, often supported by plant growth regulators like Mepiquat Chloride.

HDPS has been shown to improve water-use efficiency, promote weed competition, escape pink bollworm infestations, allow leading to lower labour costs and higher profitability for farmers. Moreover, HDPS cotton enables the possibility of a second crop such as Bengal gram, safflower, maize after the cotton harvest within the same season. This makes it a promising approach for improving cotton productivity, especially in rainfed regions like Telangana (Ranapanga *et al.*, 2023) [2].

Research Methodology
The study aimed to evaluate the performance of the High-Density Planting System (HDPS), Closer spacing (CS) system compared to traditional cotton cultivation in Sangareddy district. A descriptive research design was used to analyze the factors influencing cotton production. Data collection was carried out using a structured interview schedule, with 40 farmers purposively selected from three clusters: Andole, Chowtkur, and Hathnoora of Sangareddy district.

These farmers were chosen based on their involvement in either HDPS or traditional cotton cultivation, ensuring a representative sample. The data were analyzed using frequency and percentage analysis to understand the adoption levels, benefits, and challenges of HDPS in enhancing cotton productivity.

Results and Discussion

Agronomic Characteristics

The results indicate that HDPS, closer spacing system cotton required a higher seed rate (2.5-3 kg/acre) compared to traditional cotton (1 kg/acre). The closer planting in HDPS aims to maximize space and optimize light interception. The spacing used for HDPS cotton (90 x 15 cm or 90 x 30 cm) was significantly narrower than traditional cotton (90 x 60 cm or 110 x 45 cm), reflecting the system's goal of increasing plant density and enhancing yield potential (Prasad *et al.*, 2023) [1].

Farmers adopted more mechanized sowing practices for HDPS cotton using pneumatic planters, which ensured uniform plant distribution. Traditional cotton, in contrast, was sown manually, leading to less uniform plant spacing. As a result, HDPS cotton had a higher number of plants per meter row length (6) compared to traditional cotton (2), contributing to an increased plant population and higher yield potential.

HDPS cotton exhibited fewer sympodial branches per plant (7-8) compared to traditional cotton (11-12), likely due to the closer spacing, which encourages more vertical growth. Similarly, the number of number of plants per square metre in HDPS and CS is more compare to traditional practices.

Pest Incidence

Pest management was a key consideration in both cotton systems. HDPS cotton showed a significantly lower occurrence of pink bollworm due to short duration of cotton, which is a major pest in traditional cotton systems, especially due to its late harvest period. In contrast, pests like jassids, aphids, and whiteflies were more prevalent in HDPS cotton due to the microclimate created by the dense planting(Prasad *et al.*, 2023) [1]. These pests affect the photosynthetic capacity of plants, potentially reducing yields. However, the closer planting and early maturity of HDPS cotton helped mitigate the risk of bollworm infestations.

Farmers applied plant growth regulators (PGRs) like Mepiquat Chloride 45 and 65 days after sowing to manage vegetative growth in HDPS cotton. This helped maintain optimal plant height and promoted reproductive growth (sympodial branches). Traditional cotton, however, did not receive PGR treatment, which may have contributed to taller plants and more branches, but without the same level of growth control as in HDPS cotton.

Crop Duration and Yield Potential

HDPS cotton exhibited a shorter crop duration of 150 days, compared to the traditional cotton's 180 days, enabling quicker harvesting. This shorter growing season allows farmers to cultivate a second crop such as Bengal gram, safflower enhancing overall farm productivity and income. In contrast, the longer duration of traditional cotton limits the opportunity to grow a second crop in the same season. In terms of yield, HDPS cotton achieved 12-14 quintals per acre in light red soils, whereas traditional cotton produced 7-9 quintals per acre under black soils. Additionally, HDPS cotton required fewer pickings (1-2) compared to traditional cotton (3-4), reflecting its faster maturation. While the number of pickings may be lower, the overall yield potential is higher for HDPS due to the increased plant population, which compensates for the fewer pickings.

Table 1: Comparison Between HDPS Cotton and Traditional Cotton (Average of 40 Farmers)

Package and Practice	HDPS Cotton	Traditional Cotton
Soil Type	Light Red, Chalka Soils	Black Soils
Rainfed / Irrigated	Rainfed	Rainfed
Seed Rate (Kg/acre)	2.5-3	1
Date of Sowing	June	June
Spacing (cm)	90 x 15, 90 x 30	90 x 60, 110 x 45
Sowing Method Adopted	Pneumatic Planter (or) Manual	Manual
Number of Plants per Meter Row Length	6	2
Spraying of PGR (Mepiquat Chloride)	Yes	No
Average Number of Sympodial Branches/Plant	7-8	11-12
Average Number of Monopodial Branches/Plant	1	2-4
Major Insect Pests Noticed Above ETL	Jassids, Aphids, Whiteflies	Pink Bollworm, Tobacco Bollworm
Number of Pickings	1-2	3-4
Crop Duration	150 days	180 days
Second Crop	Bengal gram, Safflower, Maize	-

Table 2: Yield Comparison Between HDPS Cotton and Traditional Cotton

Particulars	HDPS Cotton	Traditional Cotton
Average No. of Bolls/Plant	15-20	30-40
Average Kapas Weight (g/boll)	4.5-5	4.5-5
Average Yield/Acre (Quintals)	12-14	7-9

Conclusion

The findings suggest that HDPS cotton offers significant potential for improving cotton productivity in India, particularly in rainfed regions like Telangana. While HDPS cotton requires higher seed rates and closer spacing, it provides benefits such as higher plant density, faster maturity, reduced pink bollworm incidence, and the possibility of a second crop. However, the increased pest pressure from Jassids, aphids, and whiteflies may require more intensive pest management strategies.

Traditional cotton cultivation offers more branches and multiple pickings but is more vulnerable to bollworm infestations and requires longer crop durations. Ultimately, the decision to adopt HDPS or traditional cotton depends on farmers' specific goals, such as optimizing yield potential, reducing pest risks, and enabling the possibility of a second crop.

References

1. Prasad YG, Venugopalan MV, Ramakrushna GI, Pande R, Nagrale DT. High density planting system for cotton, CICR Technical Bulletin 2023/2 (English). 2023. p. 1-8.
2. Ranapanga G, Ramanjaneyulu AV, Nagabhushanam U,

Ramprasad B, Kamalakar J, Yakadri M. HDPS Cotton: Challenges and Opportunities in India. Chron Bioresour Manag. 2023;7(Dec 4):061-065.
3. The Cotton Corporation of India. The Cotton Corporation of India. [cited 2022]. Available from: www.cotcorp.gov.in
4. Change GE. Energy Nexus 2023: 10 Energy Policy 2023: 178-183 Energy Strategy Reviews 2023: 49 Engineering Science and Technology, an International Journal 2023: 42 Environment Quality Management 2023: 33 (2). Advances in Colloid and Interface Science. 2023:318.
5. Kuzmin A. Preface: Energy and Environment, for Sustainability and Technological Progress. Int. J. Energy Clean Environ. 2016;17(2-4).