# EVALUATION OF AMERICAN COTTON COMPACT VARIETY (ARBC 64) UNDER HDPS WITH DIFFERENT NUTRIENT LEVELS

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## *ABSTRACT*

***A field experiment was conducted at Regional Agriculture Research Station, Nandyal, Andhra Pradesh during kharif 2015-16 on vertisols to optimize planting geometry and nutrient management schedule for American cotton variety ARBC 64 under high density planting system (HDPS) for maximizing the productivity under rainfed condition. The experiment was laid out in split plot design having nine treatments of planting geometry and fertilizer levels replicated thrice. Significantly higher seed cotton yield (1065 kg/ha) and higher number of bolls per square meter (53.1) was recorded with planting geometry of 60 cm x 10 cm and it was on par with spacing of 45 cm x 10 cm (980 kg/ha and 51.1, respectively). Higher seed cotton yield (1015 kg/ha) and higher number of bolls per square meter (51.6) was observed in 125% RDF and it was on par with 150 % RDF (1001 kg/ha and 45.4, respectively).***

***KEY WORDS: American cotton, fertilizer level, HDPS, planting geometry, seed cotton yield***

## INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is a very important commercial crop of India; it sustains the cotton textile industry which is perhaps the largest segment of organized industries in the country. India has the largest area in the world under cotton at 12.18 M ha and is the second largest producer in the world with 35.32 M bales. However, India's average cotton productivity is 493 kg lint/ha combining both irrigated and rainfed areas and is low when compared to other countries (Anonymous, 2013). Yield level in this crop keeps fluctuating year after year depending upon the problem of insect pest and diseases that are closely associated with the climatic conditions in the region. Since, the crop has long growth cycle, it has to pass through frequent rains and thus weeds also pose a serious problem. Initial slow growth, wide row spacing, high dose of chemical fertilizers combined with prostate nature of its growth permit early and severe crop-weed competition resulting in loss of yield to the tune of 45 to 85 per cent (Das, 2008). A High Density Planting System (HDPS) leading to more rapid

canopy closure and decreased soil water evaporation is becoming popular to address water scarcity challenges. The concept on high density cotton planting, more popularly called Ultra Narrow Row (UNR) cotton was initiated by Briggs *et al.* (1967). In many countries, narrow row plantings have been showing improvement in cotton productivity (Ali *et al.,* 2010). The obvious advantage of this system is earliness (Rossi *et al.,* 2004) since UNR needs less bolls / plant to achieve the same yield as conventional cotton and the crop does not have to maintain the late formed bolls to mature. The UNR cotton plants produce fewer bolls than conventionally planted cotton but retain a higher percentage of the total bolls in the first sympodial position and a lower percentage in the second position (Vories and Glover, 2006). The other advantages include better light interception, efficient leaf area development and early canopy closure which will shade out the weeds and reduce their competitiveness (Wright *et al.,* 2011). Hence, the study was carried out to find out suitable herbicides either alone or in sequence or in combination with cultural practices for proper and timely control of weeds in American cotton with HDPS under rainfed condition.

## MATERIAL AND METHODS

A field experiment was conducted at Regional Agriculture Research Station, Nandyal, Andhra Pradesh during *kharif* 2015-16 on vertisols to optimize planting geometry and nutrient management schedule for American cotton variety ARBC 64 under high density planting system (HDPS) for maximizing the productivity under rainfed condition. Nandyal is situated at 15°29' N latitude and 78°32' E longitude with an altitude of 211 meters above the mean sea level. The mean annual rainfall at Nandyal is 839.7 mm varying from 537.2 mm (lowest) to 1176.6 mm (highest). The soil was deep black, moderately alkaline with a pH 8.2, low in available nitrogen (189 kg/ha), high in available phosphorous (70 kg/ha) and potassium (413 kg/ha). The experiment was laid out in split plot design having nine treatments of planting geometry and fertilizer levels and replicated thrice. The main plot treatments comprised of planting geometry 45 cm × 10 cm ($S_1$), 60 cm × 10 cm ($S_2$) and 75 cm × 10 cm ($S_3$), whereas sub plot treatments comprised of fertilizer levels: 100 % RDF (95-45- 45 NPK kg/ha) ($F_1$),125 % RDF (112.5-56.25-56.25 NPK kg/ha) ($F_2$) and 150 % RDF (135-67.5-67.5 NPK kg/ha) ($F_3$). The plot size was 6.0 x 3.0 m. Sowing was done on August 01, 2015 by dibbling method. Fertilizers were applied as per the protocol. 100 per cent P was applied as basal. The recommended N and K were applied in 3 splits at 30 days interval starting from 30 DAS. All other recommended package of practices was followed during the crop season. Regarding agronomic characters, ten competitive plants were randomly selected from each plot and observations on final plant population, plant height, number of monopodia and sympodia per plant, average sympodial length, bolls per square meter and boll weight, whereas seed cotton yield obtained from the net plot area at each picking was recorded and expressed in kg/ha. The experimental data obtained were subjected to statistical analysis by adopting Fisher's method of analysis of variance as outlined by (Gomez and Gomez, 2010). The level of significance used in 'F' test was at 5 per cent.

## RESULTS AND DISCUSSION

An amount of 482.9 mm rainfall was received in 25 rainy days

against the decennial rainfall of 628.5 mm during the crop period (Table 1). There was not much variation in weather during the cropping period like relative humidity, maximum and minimum temperature except higher evaporation (10.6 mm/day) during the month of July. The distribution of rainfall was not uniform during the crop period. During the crop period, moderately low rainfall coupled with long dry spell during the month July, August affected the cotton crop during vegetative and deficit soil moisture during October and November affected boll development stage. The continuous heavy rainfall in the month of September (277 mm in 10 rainy days) affected the flowering stage. Crop performance was not optimum in respect of yield parameters and seed cotton yield.

The plant population per net plot varied significantly with different spacings with higher population being recorded in 45 cm × 10 cm (222) and was lower in 75 cm × 10 cm (126). However, no significant difference was observed with different fertilizer levels with respect to plant population (Table 2). Plant height differ significantly among spacings. Higher plant height (95.7 cm) was observed in 75 cm × 10 cm spacing and lower plant height (85.4 cm) was observed in 45 cm × 10 cm spacing. There was no significant effect of different fertilizers levels on plant height. There was no significant effect of spacing and fertilizer levels on number of monopodia per plant, number of sympodia per plant and average sympodial length. Number of bolls per square meter differed significantly among different spacings. Higher number of bolls per square meter (53.1) was observed in 60 cm × 10 cm spacing and it was on par with 45 cm x 10 cm spacing (51.1). Significantly lower number of bolls per square meter (43.4) was observed in 75 cm × 10 cm spacing. There was significant effect of different fertilizers levels on number of bolls per square meter. Higher number of bolls per square meter (51.6) was observed in 125% RDF and it was on par with 150 % RDF (50.6). Significantly the lower number of bolls per square meter (45.4) was observed in 100 % RDF. Boll weight did not differ significantly due to different spacing and fertilizer levels. Significantly the higher seed cotton yield (1065 kg/ha) was recorded with spacing of 60 cm x 10 cm and it was on par with spacing of 45 cm x 10 cm (980 kg/ha). Higher seed cotton yield might be due more number of bolls per unit area (Shukla *et al.*, 2013; Sisodia and Khamparia, 2007). Significantly lower seed cotton yield (874 kg/ha) was recorded with spacing of 75 cm x 10 cm. Silva *et al.* (2012) and Rossi *et al.* (2007) also observed significant interaction between plant density and genotype and recommended a density dependent selection of genotypes. There was significant effect of different fertilizers levels on seed cotton yield. Higher seed cotton yield (1015 kg/ha) was observed in 125% RDF and it was on par with 150 % RDF (1001 kg/ha). Significantly lower seed cotton yield (903 kg/ha) was observed in 100 % RDF.

## CONCLUSION

American cotton variety ARBC 64 can be planted at 1,66, 666 plants/ha (60 x 10 cm) with 125 % RDF (112.5-56.25-56.25 NPK kg/ha) for maximizing its productivity on vertisols of southern India.

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**Table 1: Particulars of weather parameters during crop period (July-December, 2015)**

| Month | Actual | | Decennial | | Deviation (%) | Temperature (°C) | | Relative Humidity (%) | | Average Wind Speed (km/ sec) | Evaporation (mm/day) | Bright Sunshine Hours Per Day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rain Fall (mm) | Rainy Days | Rain Fall (mm) | Rainy Days | | Maximum | Minimum | 08.30 Hours | 17.30 Hours | | | |
| July | 54.2 | 4 | 166.6 | 9.6 | -67.5 | 37.4 | 26.3 | 70.0 | 40.9 | 13.5 | 10.6 | 10.2 |
| August | 82.3 | 7 | 167.5 | 8.5 | -50.9 | 35.3 | 25.2 | 78.6 | 46.7 | 10.0 | 6.5 | 10.4 |
| September | 277.0 | 10 | 155.5 | 7.5 | +78.1 | 33.9 | 24.9 | 80.1 | 61.2 | 5.5 | 4.1 | 9.2 |
| October | 34.1 | 1 | 99.0 | 5.7 | -65.5 | 34.5 | 23.8 | 79.5 | 55.9 | 3.7 | 5.4 | 8.0 |
| November | 32.4 | 3 | 37.9 | 2.8 | -14.5 | 31.4 | 22.1 | 81.8 | 58.6 | 4.3 | 4.4 | 5.4 |
| December | 2.9 | 0 | 2.0 | 0.2 | +45.0 | 31.8 | 19.1 | 85.9 | 54.7 | 3.9 | 4.4 | 8.5 |
| **Total** | **482.9** | **25** | **628.5** | **34.3** | **-23.2** | | | | | | | |

**Table 2: Effect of spacing and fertilizer levels on growth and yield parameters in cotton cv. ARBC 64**

| Treatments | Final Plant Population (Nos./ Net Plot) | Plant Height (cm) | Number of Monopodia | Number of Sympodia | Average Sympodial Length (cm) | Bolls / $m^2$ | Boll Weight (gm) | Seed Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|
| **Spacing** | | | | | | | | |
| **$S_1$- 45 x 10 cm** | 222 | 85.4 | 1.4 | 15.4 | 28.2 | 51.1 | 2.96 | 980 |
| **$S_2$ - 60 x 10 cm** | 166 | 93.7 | 1.3 | 16.6 | 30.2 | 53.1 | 3.04 | 1065 |
| **$S_3$ - 75 x 10 cm** | 126 | 95.7 | 1.3 | 17.3 | 33.2 | 43.4 | 3.21 | 874 |
| **S.Em ±** | 3.2 | 3.5 | 0.08 | 0.65 | 1.4 | 1.8 | 0.12 | 30.4 |
| **CD (p=0.05)** | 12.6 | NS | NS | NS | NS | 7.2 | NS | 119 |
| **Fertilizer levels** | | | | | | | | |
| **$F_1$ – RDF (95- 45- 45 NPK kg/ha)** | 172 | 87.6 | 1.4 | 15.8 | 30.2 | 45.4 | 2.94 | 903 |
| **$F_2$- 125% RDF (112.5-56.25-56.25 NPK kg/ha)** | 167 | 94.6 | 1.2 | 16.8 | 30.8 | 51.6 | 3.18 | 1015 |
| **$F_3$- 150% RDF (135-67.5-67.5 NPK kg/ha)** | 175 | 92.6 | 1.3 | 16.5 | 30.6 | 50.6 | 3.09 | 1001 |
| **S.Em ±** | 6.4 | 3.0 | 0.08 | 0.68 | 1.2 | 1.5 | 0.11 | 28.2 |
| **CD (p=0.05)** | NS | NS | NS | NS | NS | 4.6 | NS | 87 |
| **Interaction Effect** | NS | NS | NS | NS | NS | NS | NS | NS |
| **CV (%)** | 11.2 | 9.8 | 17.7 | 12.5 | 11.8 | 9.2 | 10.8 | 8.7 |

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