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Growth Regulation Practices in High Density Planting System (HDPS) Cotton

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Cotton is one of the most important commercial crops, playing a vital role in the agricultural economy and providing livelihood to millions of farmers. Traditionally, cotton is cultivated under the normal planting system with wider spacing, which allows free vegetative growth but often results in longer crop duration, uneven maturity, and higher cost of cultivation. Despite its wide adoption, this system sometimes limits yield potential, especially under rainfed conditions. To overcome these limitations, the **High Density Planting System (HDPS)** has emerged as an improved approach to cotton cultivation. HDPS involves closer spacing and the use of compact, short-duration varieties, enabling a higher number of plants per unit area. This system promotes uniform growth and maturity, better use of sunlight and nutrients, reduced pest incidence in later stages, and higher productivity, making HDPS an attractive option for sustainable cotton production.

High Density Planting System (HDPS)

In conventional cotton cultivation, the crop is generally planted at a spacing of 120 cm between rows and 30–40 cm between plants, using about 2–3 seed packets per acre. Under this system, approximately 5,556 plants are accommodated per acre. In contrast, the High Density Planting System (HDPS) follows a closer spacing of 90 × 15 cm, with a seed rate of 5–6 packets per acre, resulting in about 29,629 plants per acre. HDPS cotton is best suited for compact, short-duration varieties (less than 150 days) with synchronized maturity. This system offers several advantages such as escaping late-season pest incidence due to shorter crop duration, higher yields because of increased plant population, reduced harvesting cost due to uniform maturity, and better suitability for rainfed conditions, especially in red and light soils.

Importance of Growth Regulation in HDPS Cotton

Growth regulation plays a crucial role in successful HDPS cotton cultivation. In the normal planting system (120×45 cm or 90×60 cm), wider spacing allows plants to grow freely, facilitating better flowering and boll formation. However, in HDPS, the narrow plant spacing (15 cm between plants and 90 cm between rows) often leads to excessive vegetative growth, overlapping branches, poor light penetration, reduced flowering and boll setting, formation of inferior quality bolls, and increased pest and disease incidence due to dense canopy. To overcome these challenges, growth regulation measures are essential. Proper use of Plant Growth Regulators (PGRs) helps to restrict excessive vegetative growth, promotes flowering and boll retention, and ensures uniform and timely crop maturity. Farmers adopting HDPS cotton should therefore be well informed and follow growth regulation practices carefully to achieve higher and sustainable yields.

PGR Spray Dosage

Spray	Canopy Management schedule	Dosage of commercial formulation (Mepiquat Chloride 5% AS)*	
1st Spray	Crop age at 40-45 days, plant height of 40-45 cm, match-head square stage, no drought stress	1.0 ml/litre of water	200 ml/acre
2nd Spray	15-20 days after first spray or 55 to 65 days crop	1.2 ml/litre of water	250 ml/acre
3rd Spray	Need based. In case of excessive growth in heavy soils or very fertile soils or due to excess rains/soil moisture	1.2 ml/litre of water	250 ml/acre

Use of Plant Growth Regulators

To control excessive growth and retain early-formed bolls, a growth regulator such as **Mepiquat Chloride** should be sprayed 2–3 times at different crop stages, depending on crop growth. The detailed guidelines are as follows:

Precautions during PGR Application

- The second and third sprays should be taken up only when the combined length of the top five internodes exceeds 20 cm (i.e., an average of 4 cm per internode).
- Ensure adequate soil moisture at the time of spraying. There should be no moisture stress for at least 10 days from the day of spray, and the crop should not be suffering from nutrient deficiency.
- Fifteen days after the first or second spray, observe the length of the top five internodes. If it is less than 20 cm, continue monitoring at weekly intervals.
- If the internode length again exceeds 20 cm, repeat the PGR spray.
- Care should be taken to correctly identify and measure the top five internodes; incorrect measurement may lead to improper application decisions.
- Do not spray PGR if early-formed squares or bolls are shedding due to moisture stress.
- Apply PGR by mixing it in 200 liters of water per acre.
- Do not mix PGR with any other chemicals such as insecticides, fungicides, or herbicides.
- Best results are obtained when there is no rainfall immediately after spraying.
- After PGR application, prevent grazing of livestock on cotton leaves for at least 30 days.
- PGR should not be sprayed on crops aged 90–100 days or older.

Proper adoption of these growth regulation practices is essential for maximizing the benefits of HDPS cotton cultivation and achieving higher productivity with better crop management.