Effect of Drip Fertigation on Growth, Yield Attributes and Yield of Cotton

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A field experiment was conducted at Agricultural College and Research Institute, Madurai, during rabi 2010-2011 to study the effect of drip fertigation on growth, yield attributes and yield of cotton. In this study, growth parameters such as plant height, leaf area index (LAI), sympodial branches, dry matter production, root length, root dry weight were found to be enhanced by drip irrigation at 100 per cent Pan Evaporation (PE) along with 100 per cent drip fertigation (Recommended Dose of Fertilizer (RDF) as Water Soluble Fertilizer (WSF)). This combination of drip irrigation 100 per cent PE with drip fertigation 100 per cent RDF as WSF also increased yield attributes such as number of bolls plant⁻¹, boll weight and seed cotton yield.

Key words: Cotton, Drip fertigation, Growth, Yield attributes, Yield.

Cotton, the king of fibers, occupies a prominent position as a commercial crop both in the developed and developing countries. India ranks first in cotton area and has enough potential to increase the productivity through management practices. According to CAB (2013) report cotton has been grown in an area of 119.78 lakh ha with a total production of 365 lakh bales and the average productivity was 518 kg/ha. Irrigation and fertilizers are the most important management factors which influence growth, plant development, yield and lint quality. Drip fertigation is a proven technology with the potential for increasing the crop productivity and conservation of resources. The yield increase in drip irrigation compared to conventional irrigation method varies from 20 to 100 per cent, whereas, saving in water ranges from 40 to 70 per cent, besides 50 to 60 per cent saving in labour (Sivanappan, 2004). Water saving includes irrigation of a smaller portion of the soil volume, decreased surface evaporation, reduced runoff from the drip field and controlled deep percolation loses below the crop root zone. Drip irrigation at 50 per cent of PE throughout the crop growth periods could save 50 per cent irrigation water and increase cotton productivity (Sankaranarayanan et al., 2010). Application of water soluble fertilizers (WSF) through drip irrigation system is gaining importance in present day agriculture to boost productivity of various crops (Yosef, 1999).

Materials and Methods

A field experiment was conducted at Agricultural College and Research Institute, Madurai during rabi 2010-2011 on drip fertigation in cotton with two irrigation regimes and six fertigation levels in split plot design with three replications. For testing cotton hybrid RCH-2 (BG II) was used. The main plot treatments consisted of two drip irrigation regimes viz., 75 per cent Pan Evaporation (PE) (I₁) and 100 per cent PE (I₂). The subplot treatments consisted of six fertigation levels viz., 75 per cent Recommended Dose of Fertilizer (RDF) as commercial fertilizers (F₁), 100 per cent RDF as commercial fertilizers (F₂), 125 per cent RDF as commercial fertilizers (F₃), 50 per cent RDF as WSF (F₄), 75 per cent RDF as WSF (F₅) and 100 per cent RDF as WSF (F₆). The RDF level was 150:75:75 kg NPK/ha. The growth parameters, yield attributes and yield were recorded and statistically analyzed.

Soil physio-chemical characteristics of the experimental field

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Textural composition (Per cent on moisture free basis) (Piper,1966)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay (%)</td>
<td>11.92</td>
</tr>
<tr>
<td>Silt (%)</td>
<td>11.93</td>
</tr>
<tr>
<td>Fine sand (%)</td>
<td>31.50</td>
</tr>
<tr>
<td>Coarse sand (%)</td>
<td>42.65</td>
</tr>
<tr>
<td>Textural class</td>
<td>Sandy clay Loam</td>
</tr>
</tbody>
</table>

Physical properties

<table>
<thead>
<tr>
<th></th>
<th>Bulk density (g cc⁻¹)</th>
<th>Available N (kg ha⁻¹) (Subbiah and Asija, 1956)</th>
<th>Available P (kg ha⁻¹) (Olsen et al., 1954)</th>
<th>Available K (kg ha⁻¹) (Stanford and English, 1949)</th>
<th>Organic carbon (%) (Walkley and Black, 1934)</th>
<th>pH (1 : 2 soil water suspension) (Jackson, 1973)</th>
<th>EC(dSm⁻¹) (1:2 soil water suspension) (Jackson, 1973)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.38</td>
<td>232.00</td>
<td>14.80</td>
<td>297.00</td>
<td>0.46</td>
<td>7.5</td>
<td>0.23</td>
</tr>
</tbody>
</table>

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Results and Discussion

Growth parameters

Growth parameters such as plant height, leaf area index, leaf water content, and dry matter production were influenced by irrigation regimes and fertigation levels (Table 1).

![Table 1. Effect of drip irrigation regimes and fertigation levels on growth parameters of Cotton](image)

Table 2. Effect of drip irrigation regimes and fertigation levels on yield attributes and yield of Cotton

Higher number of sympodial branches were recorded under drip irrigation of 100 per cent PE with 100 per cent RDF as WSF through drip fertigation (\(I_r F_x\)) (36.0 at harvest). The higher number of bolls were recorded under drip irrigation at 100 per cent fertigation of 100 per cent RDF as WSF (\(I_r F_x\)) (5089 kg at harvest). Fertilizers applied through drip irrigation as water soluble fertilizers in desired split doses throughout the crop growing period, according to its requirements, might have enhanced availability of nutrients by the continuous supply of nutrients up to 120 DAS. This might have reflected on the plant growth rate and higher DMP. These results are also in agreement with the findings of Shanmugam et al. (2007).

Yield attributes

Yield attributes such as number of sympodial branches, number of bolls and boll weight were influenced by irrigation regimes and fertigation levels (Table 2).

![Table 2. Effect of drip irrigation regimes and fertigation levels on yield attributes and yield of Cotton](image)

Higher boll weight of 6.0 g was recorded under drip irrigation at 100 per cent PE with drip fertigation of 100 per cent RDF as WSF (\(I_r F_x\)) which recorded 40.0 bolls plant\(^{-1}\).

The higher boll weight of 6.0 g was recorded under drip irrigation at 100 per cent PE with drip fertigation of 100 per cent RDF as WSF (\(I_r F_x\)) (5089 kg at harvest). Fertilizers applied through drip irrigation as water soluble fertilizers in desired split doses throughout the crop growing period, according to its requirements, might have enhanced availability of nutrients by the continuous supply of nutrients up to 120 DAS. This might have reflected on the plant growth rate and higher DMP. These results are also in agreement with the findings of Shanmugam et al. (2007).
fertigation of 100 per cent RDF as WSF. This might be due to the fact that the adequate nutrients supplied from these treatments had created more conducive environment for the roots to absorb the nutrients more effectively, when compared to drip fertigation of 100 per cent RDF as commercial fertilizers. The growth parameters were also higher under this treatment, which might have contributed to higher yield. This might also be due to more photosynthesis, ultimately increase in dry matter with an increase in the amount of fertilizer level. This sort of favourable effect of higher NPK dose on yield attributes was also noted by Halemani et al. (2004). Thind et al. (2011) reported that application of drip irrigation resulted in an average increase of 5 per cent in seed cotton yield as compared to check-basin.

**Seed cotton yield**

Combined effect of drip irrigation at 100 per cent PE with 100 per cent RDF as WSF (\(I_{1}F_{2}\)) registered higher seed cotton yield of 2381 kg ha\(^{-1}\). This was followed by drip irrigation at 75 per cent PE with 100 per cent RDF as WSF (\(I_{2}F_{1}\)), which recorded 2172 kg ha\(^{-1}\) of seed cotton yield. (Table 2).

The increase in cotton yield with drip irrigation at 100 per cent PE were mainly attributed to greater and consistent availability of soil moisture and nutrients, resulting in better crop growth, yield components which ultimately, reflected on the seed cotton yield. Increased yield might be due to application of water soluble fertilizer, which favoured uptake of nutrients associated with increased growth and yield attributes. Similar results were expressed by Janat and Somi (2001).

**Conclusion**

Among the irrigation regimes, drip irrigation at 100 per cent PE recorded higher growth rate and yield attributes. Drip fertigation of 100 per cent RDF as WSF (\(I_{1}F_{2}\)) recorded higher yield and yield attributes. Hence, based on this study, it could be concluded that drip irrigation of 100 per cent PE with fertigation of 100 per cent RDF as WSF (\(I_{1}F_{2}\)) would be an ideal practice to achieve higher productivity in hybrid cotton.

**References**


crop production, held at university of Agricultural Sciences, Dharwad. Pp 153-55.


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