Effect of Plant Densities and Cycocel on Fruit and Yield Attributes of Okra (Abelmoschus Esculentus. (L.) Moench) Cv. Parbhani Kranti

M. Jyothi* and T. B. Tambe

Department of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, (M.S.)-431 402, India

*Corresponding author

ABSTRACT

An experiment was conducted at College of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, during 2018 to know the effect of different plant densities (60 x 30 cm, 60 x 25 cm, 40 x 30 cm and 40 x 25 cm) and foliar spray of cycocel (0, 400, 600 and 800 ppm) on various fruit and yield attributes of okra. Experiment was laid in Factorial Randomized Block Design with three replications during summer season under shadenet house. The observations on fruit and yield attributes were recorded during investigation. Results revealed, that the significant effect of spacing levels on number of fruits per plant, fruit length, fruit yield per plot and fruit yield per hectare. Whereas, cycocel levels were found significant for the traits like days to first fruit set, days to first harvest, number of fruits per plant, average fruit weight, fruit length, fruit yield per plot and fruit yield per hectare. In case of interaction effects the characters like number of fruits per plant, average fruit weight, fruit length, fruit yield per plot and fruit yield per hectare was found significant. Remaining traits were not showed any significant performance under the experiment. The important characters like number of fruits per plant (9.38), average fruit weight (17.93 g), fruit length (8.26 cm), fruit yield per plot (10.28 kg) and fruit yield per hectare (16.13 Mt), were performed significantly maximum at 40 x 25 cm spacing with the foliar application of cycocel at 600 ppm. However, these characters were at par with the spacing 40 x 30 cm with the foliar application of cycocel at 800 ppm. Plant density either at 40 x 25 cm with cycocel at 600 ppm or 40 x 30 cm with cycocel at 800 ppm at 30 and 45 DAS was found better for yield in okra.

Keywords

Plant density, Cycocel, Spacing, Okra, Yield

Accepted: 07 September 2019
Available Online: 10 October 2019

Introduction

Okra (Abelmoschus esculentus (L.) Moench) is an annual vegetable crop belongs to the family Malvaceae. It’s adaptability to a wide range of growing condition made it popular among vegetable growers. Okra crop requires long warm growing season and it is susceptible to frost. The optimum day temperature for its better growth is between 25 to 40°C and that of night is over 22°C. It thrives in all kinds of soils but to well drained medium black and light clayey soils, rich in organic matter and favourable soil pH range
from 6.0 to 6.8 is more suitable for okra cultivation.

Increasing plant population increases yield per unit area of okra till a certain limit, beyond which resources for plant become limited and the yield decreases (Weimer, 1990). Planting with proper spacing increases yield quality and size of fruit. It has been observed that suitable planting spacing can lead to optimum okra fruit yield while improper planting spacing could result in relatively low yield and poor quality fruits (Maurya et al., 2013). Hossain et al., (2001) recommended that intra-row spacing for optimal okra fruit yield ranged from 20 cm to 40 cm. Therefore, optimum plant population is required for higher yields of okra.

Suitable planting spacing and cycocel can lead to optimum okra fruit yield while improper planting spacing could result in relatively low yield and poor quality fruits (Maurya et al., 2013). The present investigation was undertaken by aiming to produce better more yield of okra with specific standards viz. tenderness, 3 to 4 cm in length, uniform in size, dark green in colour, disease and pest free with better yield potential per unit area. Cycocel is growth retardant that inhibits both cell elongation and cell division It plays an important role of anti-gibberellin growth retardant. Appropriate plant densities coupled with foliar application of cycocel resulted in increasing fruit yield and quality in okra. Therefore, the present investigation was undertaken to study the effect of plant densities and cycocel on fruit and yield attributes of okra.

**Materials and Methods**

The investigation was undertaken at Instructional cum Research Farm of College of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani to know the effect of plant densities and cycocel on fruit and yield attributes of okra. The experiment was laid out in Factorial Randomized Block Design with three replications during summer season of 2018 under shade net house. Sowing was undertaken at four different spacing levels i.e 60 x 30 cm, 60 x 25 cm, 40 x 30 cm and 40 x 25 cm. Whereas, cycocel was applied as foliar spray at 30 and 45 days after sowing (DAS) at four different concentration levels i.e. 0 ppm (distilled water), 400, 600 and 800 ppm. All, recommended practices like nutrient and plant protection measures were given during the experiment. Different commercial characters of okra were recorded during growth of the crop viz. days to first fruit set, days to first fruit harvest, number of fruits per plant, average fruit weight, fruit length, fruit diameter, fruit yield per plant, fruit yield per plot and fruit yield per hectare. Collected information was subjected to statistical analysis to test the significance among the treatments on various characters of okra under study was done according to the procedure given by Panse and Sukhatme (1985).

**Results and Discussion**

**Effect of plant density**

The results of the experiment indicated that the significant effect of different plant densities were shown for the characters like number of fruits per plant, fruit length, fruit yield per plot and fruit yield per hectare. Whereas, other characters like days to first fruit set, days to first fruit harvest, average fruit weight, fruit diameter and fruit yield per plant were found non significant (Table 1). Number of fruits per plant were recorded significantly more at spacing of 40 x 25 cm (8.50) followed by 40 x 30 cm (8.40), whereas, fruit length was found significantly maximum in 40 x 30 cm (7.63) followed by 60 x 30 cm and 60 x 25 cm i.e. 7.61 cm and 7.54 cm, respectively. Characters like fruit yield

---

860
per plot (7.86 kg) and fruit yield per hectare
(13.36 Mt) was recorded at spacing of 40 x 25
cm followed by 40 x 30 cm (7.31 kg and 12.29
Mt, respectively). Similar results were also
reported by Maurya et al., (2013) and Ekwu et

**Effect of cycocel**

Cycocel showed significant effect on different
characters of okra like days to first fruit set,
days to first fruit harvest, number of fruits per
plant, average fruit weight, fruit length, fruit
diameter, fruit yield per plot and fruit yield per
hectare, whereas, fruit yield per plant was not
shown more difference among the treatments.
Number of fruits per plant was found
significantly maximum (8.50) at foliar
application of cycocel at 600 ppm followed by
800 ppm (7.90). Average fruit weight, fruit
length, fruit diameter, fruit yield per plot and
fruit yield per hectare were recorded
maximum at foliar application of cycocel at 600
ppm i.e. 18.75 g, 7.61cm, 18.75 cm, 7.65
kg and 12.69 Mt, respectively. These findings
are in agreement with those of Singh (2013),
Rajput et al., (2011), Munikrishnappa and
Shantappa (2009), Pateliya (2008) and Parmar

**Effect of interaction**

Interaction effects revealed that the traits like
number of fruits per plant, average fruit
weight, fruit length, fruit yield per plot and
fruit yield per hectare was found significant,
while other characters like days to first fruit
set, days to first fruit harvest, fruit diameter
and fruit yield per plant were not shown any
more differences among the treatments (Table
2).

Number of fruits per plant was exhibited
maximum and significant number (9.38) at
S₄C₃ i.e. spacing at 40 x 25 cm with the foliar
application of cycocel at 600 ppm. Whereas,

S₄C₄ (40 x 25 cm, cycocel at 800 ppm), S₃C₃
(40 x 30 cm, cycocel at 600 ppm) and S₄C₄
(40 x 30 cm, cycocel at 800 ppm) were also
found at par with S₄C₃ (40 x 25 cm, cycocel at
600 ppm) i.e. 9.16, 9.14 and 9.05 fruits per
plant per ha, respectively.

The characters like average fruit weight, fruit
length, fruit yield per plot and fruit yield per
hectare were also recorded significantly
maximum in S₄C₃ (40 x 25 cm, cycocel at 600
ppm) viz. 17.93 g, 8.26 cm, 10.28 kg and
16.13 Mt, respectively. Audus (1960) and
Kakade et al., (2010) were also reported
similar findings.

Among the treatments, significantly maximum
yield potential was reported from S₄C₃ (40 x
25 cm with the foliar application of cycocel at
600 ppm) treatment recorded 16.13 Mt per
hectare and whereas, plant density at S₃C₄ (40
x 25 cm with the foliar application of cycocel
at 800 ppm) and S₃C₃ (40 x 30 cm with foliar
application of cycocel at 600 ppm) were also
found at par with S₄C₃ (40 x 25 cm with the
foliar application of cycocel at 600 ppm) with
yield level of 15.97 Mt and 15.53 Mt per
hectare, respectively followed by S₃C₄ (40 x
30 cm with the foliar application of cycocel at
800 ppm) i.e. 14.11 Mt per hectare.

Whereas, S₁C₄ (60 x 30 with the foliar
application of cycocel at 800 ppm) and S₁C₁
(60 x 30 without the foliar application of
cycocel recorded significantly, the lowest i.e.
10.11 Mt and 10.24 Mt per hectare yield level
out of all the treatments under study. Similar
results were also reported by Maurya et al.,
(2013) and Ekwu et al., (2012).

It is concluded that the spacing at 40 x 25 cm
with the foliar applications of cycocel at 600
ppm at 30 and 45 DAS or spacing at 40 x 30
cm with the foliar applications of cycocel at
800 ppm at 30 and 45 DAS was found better
for fruit yield in okra.
### Table 1 Effect of plant densities and cycocel on fruit and yield attributes in okra

<table>
<thead>
<tr>
<th>Traits/ Treatment details</th>
<th>Days to first fruit set</th>
<th>Days to first fruit harvest</th>
<th>No. of fruits per plant</th>
<th>Average fruit weight (g)</th>
<th>Fruit length (cm)</th>
<th>Fruit diameter (mm)</th>
<th>Fruit yield per plant (g)</th>
<th>Fruit yield per plot (kg)</th>
<th>Fruit yield per hectare (MT/ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>60 x 30 cm</td>
<td>43.85</td>
<td>51.17</td>
<td>6.41&lt;sup&gt;c&lt;/sup&gt;</td>
<td>16.80</td>
<td>7.61&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12.59</td>
<td>115.11</td>
<td>6.14&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>S2</td>
<td>60 x 25 cm</td>
<td>43.28</td>
<td>51.11</td>
<td>7.60&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.96</td>
<td>7.54&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12.74</td>
<td>117.20</td>
<td>6.53&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>S3</td>
<td>40 x 30 cm</td>
<td>43.12</td>
<td>50.89</td>
<td>8.40&lt;sup&gt;a&lt;/sup&gt;</td>
<td>17.00</td>
<td>7.63&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12.75</td>
<td>118.31</td>
<td>7.31&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>S4</td>
<td>40 x 25 cm</td>
<td>42.48</td>
<td>50.53</td>
<td>8.50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.27</td>
<td>7.28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>12.88</td>
<td>122.93</td>
<td>7.86&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>C.D @ 5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.36&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>0 ppm</td>
<td>43.78&lt;sup&gt;a&lt;/sup&gt;</td>
<td>51.70&lt;sup&gt;c&lt;/sup&gt;</td>
<td>6.30&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.63&lt;sup&gt;d&lt;/sup&gt;</td>
<td>7.28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.63&lt;sup&gt;d&lt;/sup&gt;</td>
<td>113.36</td>
<td>6.02&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>C2</td>
<td>400 ppm</td>
<td>43.10&lt;sup&gt;a&lt;/sup&gt;</td>
<td>51.00&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.80&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.05&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.57&lt;sup&gt;a&lt;/sup&gt;</td>
<td>17.05&lt;sup&gt;c&lt;/sup&gt;</td>
<td>119.15</td>
<td>7.62&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>C3</td>
<td>600 ppm</td>
<td>43.05&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>50.80&lt;sup&gt;b&lt;/sup&gt;</td>
<td>8.50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.85&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.61&lt;sup&gt;a&lt;/sup&gt;</td>
<td>18.75&lt;sup&gt;a&lt;/sup&gt;</td>
<td>121.3</td>
<td>7.65&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>C4</td>
<td>800 ppm</td>
<td>42.80&lt;sup&gt;b&lt;/sup&gt;</td>
<td>50.20&lt;sup&gt;d&lt;/sup&gt;</td>
<td>7.90&lt;sup&gt;c&lt;/sup&gt;</td>
<td>17.69&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>17.69&lt;sup&gt;b&lt;/sup&gt;</td>
<td>120.12</td>
<td>7.18&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>C.D @ 5%</td>
<td>0.885*&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.915*&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.489*&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.415*&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.177*&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.359*&lt;sup&gt;a&lt;/sup&gt;</td>
<td>NS</td>
<td>0.375*&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.591*&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Within a treatment group, means in a column followed by the same letter(s) are not significantly different using CD at 5% level of probability. NS = Not Significant, * = Significant. S= Spacing levels, C= Cycocel levels

### Table 2 Interaction effect of plant densities and cycocel on fruit and yield attributes of okra

<table>
<thead>
<tr>
<th>Traits/ Treatment details</th>
<th>Days to first fruit set</th>
<th>Days to first fruit harvest</th>
<th>No. of fruits per plant</th>
<th>Average fruit weight (g)</th>
<th>Fruit length (cm)</th>
<th>Fruit diameter (mm)</th>
<th>Fruit yield per plant (g)</th>
<th>Fruit yield per plot (kg)</th>
<th>Fruit yield per hectare (MT/ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>S1 C1</td>
<td>44.73</td>
<td>52.80</td>
<td>7.44&lt;sup&gt;c&lt;/sup&gt;</td>
<td>15.91&lt;sup&gt;c&lt;/sup&gt;</td>
<td>6.86&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12.01</td>
<td>104.18</td>
<td>6.61&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>T2</td>
<td>S2 C1</td>
<td>44.47</td>
<td>51.85</td>
<td>8.07&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.06&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.03&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.45</td>
<td>111.07</td>
<td>6.96&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T3</td>
<td>S3 C1</td>
<td>43.87</td>
<td>51.80</td>
<td>8.16&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16.64&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.22&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.45</td>
<td>115.29</td>
<td>7.03&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T4</td>
<td>S4 C1</td>
<td>43.53</td>
<td>51.61</td>
<td>8.19&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16.73&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.25&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.44</td>
<td>116.89</td>
<td>7.11&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T5</td>
<td>S5 C2</td>
<td>43.51</td>
<td>51.60</td>
<td>8.18&lt;sup&gt;c&lt;/sup&gt;</td>
<td>16.74&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.27&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.65</td>
<td>117.31</td>
<td>7.11&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T6</td>
<td>S6 C2</td>
<td>43.27</td>
<td>51.01</td>
<td>8.27&lt;sup&gt;c&lt;/sup&gt;</td>
<td>16.99&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.29&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.71</td>
<td>117.48</td>
<td>7.23&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T7</td>
<td>S7 C1</td>
<td>43.20</td>
<td>51.00</td>
<td>8.31&lt;sup&gt;d&lt;/sup&gt;</td>
<td>16.99&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.31&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.75</td>
<td>118.94</td>
<td>7.36&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T8</td>
<td>S8 C1</td>
<td>43.07</td>
<td>50.81</td>
<td>8.34&lt;sup&gt;c&lt;/sup&gt;</td>
<td>17.05&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.38&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.82</td>
<td>119.71</td>
<td>7.40&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T9</td>
<td>S9 C2</td>
<td>42.93</td>
<td>50.80</td>
<td>8.78&lt;sup&gt;c&lt;/sup&gt;</td>
<td>17.08&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.70&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12.86</td>
<td>121.01</td>
<td>7.45&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>T10</td>
<td>S10 C3</td>
<td>42.53</td>
<td>50.20</td>
<td>9.14&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>17.50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7.95&lt;sup&gt;d&lt;/sup&gt;</td>
<td>12.91</td>
<td>123.69</td>
<td>9.22&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T11</td>
<td>S11 C3</td>
<td>42.07</td>
<td>48.93</td>
<td>9.38&lt;sup&gt;c&lt;/sup&gt;</td>
<td>17.93&lt;sup&gt;c&lt;/sup&gt;</td>
<td>8.26&lt;sup&gt;d&lt;/sup&gt;</td>
<td>12.97</td>
<td>132.13</td>
<td>10.28&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T12</td>
<td>S12 C4</td>
<td>42.87</td>
<td>50.61</td>
<td>8.85&lt;sup&gt;d&lt;/sup&gt;</td>
<td>17.12&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.71&lt;sup&gt;d&lt;/sup&gt;</td>
<td>13.00</td>
<td>121.27</td>
<td>8.44&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T13</td>
<td>S13 C4</td>
<td>42.73</td>
<td>50.60</td>
<td>8.90&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.42&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.72&lt;sup&gt;d&lt;/sup&gt;</td>
<td>13.02</td>
<td>121.34</td>
<td>8.84&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T14</td>
<td>S14 C4</td>
<td>42.60</td>
<td>50.50</td>
<td>9.05&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>17.49&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.86&lt;sup&gt;c&lt;/sup&gt;</td>
<td>13.04</td>
<td>123.37</td>
<td>9.22&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T15</td>
<td>S15 C4</td>
<td>42.20</td>
<td>49.87</td>
<td>9.16&lt;sup&gt;c&lt;/sup&gt;</td>
<td>17.59&lt;sup&gt;b&lt;/sup&gt;</td>
<td>8.13&lt;sup&gt;b&lt;/sup&gt;</td>
<td>13.24</td>
<td>124.44</td>
<td>10.18&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>C.D @ 5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.751*&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.182*&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Within a treatment group, means in a column followed by the same letter(s) are not significantly different using CD at 5% level of probability. NS = Not Significant, * = Significant. S= Spacing levels, C= Cycocel levels
References


How to cite this article: