EFFECT OF FOLIAR SPRAY OF DIFFERENT GROWTH REGULATORS ON YIELD AND YIELD ATTRIBUTES OF SAFFLOWER

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ABSTRACT

Four different growth regulators were evaluated on safflower, cv. Bhima to study the effect on yield and yield contributing characters. Application of 10 ppm kinetin at 20 DAS stage was found significantly superior for seed yield and other characters like number of branches per plant, number of capitula per plant, number of seeds per capitula. Seed oil content was significantly higher with 10 ppm kinetin applied at 30 DAS stage. TIBA although inhibited stem elongation showed significant increase in yield and yield contributing characters. The other treatments like 50 ppm GA and 1 per cent SA applied at 30 DAS stage, showed increased seed yield by 6.74 and 4.24 per cent over control. The increase in seed yield by application of growth regulators was attributed to the increase in characters like number of branches per plant, number of capitula per plant and harvest index.

Yield being a complex character governed by different yield contributing characters. The growth regulators are known for increasing the flowering, bud setting, fruit set, fruit size, tillering, branching, plant vigour and yield. Safflower is highly drought tolerance crop but it possess a problem in that it remains in resette form for about 20 to 30 days after germination. Once shooting begins, the plant makes rapid growth both in height as well as branching (Madrap et al., 1992). Hence, the growth substances if sprayed at a proper time and in a proper concentration, will modify the growth pattern which may ultimately help to break resette habit to boost up yield potential.

The favourable increase in growth, development and yield of safflower was due to foliar spray of growth regulators (Potter et al., 1993). However, most of the work with growth regulators was done on crops like cotton, peas, beans, groundnut and soybean. Therefore, the experiment was carried out to study the effect of foliar spray of growth regulators on yield and yield attributes safflower.

A field experiment was carried out at the Department of Agril. Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during rabi season of 1998-99. The experiment was laid out in Randomised Block Design with a three replications and safflower cv. Bhima was tested with four different growth regulators, sprayed 20 and 30 days after sowing and a control. The details of treatments were given below.

Spraying at 20 DAS stage
- T1: 50 ppm GA
- T2: 1% Succinic acid
- T3: 500 ppm TIBA
- T4: 10 ppm Kinetin
- T5: control (without any spray of growth regulator).

Spraying at 30 DAS stage
- T6: 50 ppm GA
- T7: 1% Succinic acid
- T8: 500 ppm TIBA
- T9: 10 ppm Kinetin
- T10: control (without any spray of growth regulator).

Observations regarding plant height, number of branches per plant, number of capitula per plant and post harvest characters such as 100 seed weight, seed yield per plant, seed yield per hectare were recorded from five representative plants, which were previously selected randomly and labelled from each treatment per replication and maintained properly. The oil
Table 1. Effect of foliar spray of different growth regulators on yield and yield attributes of safflower

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Plant height (cm)</th>
<th>No. of branches per plant</th>
<th>No. of capitula per plant</th>
<th>No. of seeds per capitula</th>
<th>100 seed weight (gm)</th>
<th>Seed yield per plant (gm)</th>
<th>Seed yield/ha (kg)</th>
<th>Biological yield index (%)</th>
<th>Harvest index (%)</th>
<th>Oil content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 DAS</td>
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<td></td>
<td></td>
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<tr>
<td>50 ppm GA</td>
<td>109.60</td>
<td>39.93</td>
<td>38.93</td>
<td>25.33</td>
<td>5.48</td>
<td>54.99</td>
<td>610.93</td>
<td>63.20</td>
<td>28.32</td>
<td>31.10</td>
</tr>
<tr>
<td>1% SA</td>
<td>126.66</td>
<td>34.13</td>
<td>32.40</td>
<td>27.72</td>
<td>6.53</td>
<td>55.45</td>
<td>616.04</td>
<td>91.73</td>
<td>30.68</td>
<td>26.04</td>
</tr>
<tr>
<td>500 ppm TIBA</td>
<td>99.86</td>
<td>37.73</td>
<td>37.80</td>
<td>28.24</td>
<td>6.63</td>
<td>68.64</td>
<td>762.59</td>
<td>83.26</td>
<td>33.52</td>
<td>29.03</td>
</tr>
<tr>
<td>10 ppm Kinetin</td>
<td>100.26</td>
<td>49.60</td>
<td>48.20</td>
<td>30.10</td>
<td>6.12</td>
<td>75.07</td>
<td>834.11</td>
<td>97.40</td>
<td>32.22</td>
<td>32.05</td>
</tr>
<tr>
<td>30 DAS</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>50 ppm GA</td>
<td>119.53</td>
<td>49.66</td>
<td>44.63</td>
<td>28.20</td>
<td>5.55</td>
<td>71.72</td>
<td>796.80</td>
<td>102.90</td>
<td>33.63</td>
<td>32.12</td>
</tr>
<tr>
<td>1% SA</td>
<td>115.80</td>
<td>43.93</td>
<td>32.93</td>
<td>24.53</td>
<td>6.31</td>
<td>70.05</td>
<td>778.33</td>
<td>122.40</td>
<td>34.01</td>
<td>29.10</td>
</tr>
<tr>
<td>500 ppm TIBA</td>
<td>99.80</td>
<td>31.06</td>
<td>32.63</td>
<td>29.85</td>
<td>4.83</td>
<td>59.11</td>
<td>645.66</td>
<td>79.26</td>
<td>29.12</td>
<td>22.12</td>
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<tr>
<td>10 ppm Kinetin</td>
<td>105.13</td>
<td>34.93</td>
<td>35.13</td>
<td>29.78</td>
<td>5.55</td>
<td>63.49</td>
<td>705.57</td>
<td>103.40</td>
<td>34.53</td>
<td>33.11</td>
</tr>
<tr>
<td>Control</td>
<td>112.40</td>
<td>49.20</td>
<td>43.26</td>
<td>24.17</td>
<td>6.36</td>
<td>67.19</td>
<td>746.48</td>
<td>126.40</td>
<td>33.88</td>
<td>31.01</td>
</tr>
<tr>
<td>F test</td>
<td>Sig.</td>
<td>Sig.</td>
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<td>Sig.</td>
</tr>
<tr>
<td>SE (in m)</td>
<td>0.0360</td>
<td>0.1608</td>
<td>0.1871</td>
<td>0.1022</td>
<td>0.0112</td>
<td>0.3085</td>
<td>3.7914</td>
<td>0.3553</td>
<td>0.3443</td>
<td>0.0858</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>0.1111</td>
<td>0.4957</td>
<td>0.5764</td>
<td>0.3151</td>
<td>0.0347</td>
<td>0.9508</td>
<td>11.6835</td>
<td>1.0951</td>
<td>1.0302</td>
<td>0.2644</td>
</tr>
</tbody>
</table>

content was recorded by using Soxhlet's method described by Sankaram (1965).

Yield being a complex character governed by different yield contributing characters (Table 1). The data show that 1 per cent SA at 20 DAS and 30 DAS stage and 50 ppm GA applied at 30 DAS stage recorded significant increase in plant height i.e. 126.66, 115.80 and 119.53 cm respectively over control (112.40 cm) and it ranged from 99.80 to 126.66 cm among various treatments. Malleshappa et al. (1989) noted that the greatest contribution of plant height to yield in safflower. TIBA is growth retardant therefore, it inhibit stem elongation.

None of the growth regulator treatments showed increased number of branches per plant over control (49.20) except 500 ppm GA (49.66) at 30 DAS stage. It was also observed that application of 1 per cent succinic acid at 20 DAS stage, decreased the number of branches significantly, similar findings were also reported by Deokar et al. (1981).

It is very clear that, height of stem gave rise to number of branches and branches finally produced flowers, buds and capitula on the plant. The application of growth regulators like 10 ppm kinetin at 20 DAS and 50 ppm GA at 30 DAS stage recorded significantly increase in number of capitula per plant i.e. 48.20 and 44.63 over control (43.26 per plant). Sounda et al. (1977) reported highest yield of No. 7-13-3 cultivar because of more number of head per plant and highest test weight.

All the growth regulator treatments showed significant increase in number of seed per capitula over the control (24.17). Application of 10 ppm kinetin at 20 DAS stage recorded higher number of seeds per capitula and in other treatments, it ranged from 24.53 to 30.10. It was mostly influenced by number of branches and number of capitula per plant.

The treatment differed significantly for 100 seed weight by different growth regulators. It ranged from 4.83 to 8.51 g. The test weight, 2.7 to 7.3 g. was reported by Madrap et al. (1992) and Patel et al. (1996). From the results, it was observed that number of seeds per capitula and 100 seed weight have maximum direct effect on seed yield and similar conclusion was noted by Solanki et al. (1979). The seed yield per plant ranged from 54.89 to 75.07 g. per plant in various growth regulator treatments. The application of 10 ppm kinetin at 20 DAS stage, 50 ppm GA and 1 per cent SA at 30 DAS stage showed significantly more seed yield i.e. 75.07, 71.72 and 70.05 g per plant respectively over control (67.19 g/plant).

Application of 100 ppm kinetin at 20 DAS, 50 ppm GA and 1 per cent SA at 30
DAS stage, recorded significantly higher seed yield per hectare i.e. 834.11, 796.80 and 778.33 kg respectively and it was due to maximum height, number of branches, number of capitula and highest number of seeds per capitula. The biological yield per plant ranged from 63.20 to 122.40 g. per plant in various treatments while the range of harvest index (HI) was 28.32 to 34.53 per cent. In harvest index, the significant differences were observed by application of growth regulator treatments but none of the treatments recorded significantly higher HI than control.

The yield and seed oil content are complex characters. Application of different growth regulators showed significant differences for oil content. Oil content mainly depends on number of branches, number of capitula, number of seeds per capitula and 100 seed weight etc. (Parmeshwarappa, 1993 and Nie et al., 1991). All these characters were found significantly superior in plants, treated with 10 ppm kinetin 30 DAS stage and oil content was 33.11 per cent.

It is summatised that in safflower growth regulators like 10 ppm kinetin applied at 20 DAS stage, 50 ppm GA and 1 per cent SA applied at 30 DAS stage increased seed yield by 11.2, 6.74 and 4.24 per cent over the control. The increase in seed yield by these treatments was due to the increase in number of branches per plant, number of capitula per plant and harvest index.

REFERENCES