Effect of technological intervention of line sowing on cumin
*(Cuminum cyminum L.)* yield in western Rajasthan

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Abstract

An on-farm trial (OFT) was conducted at three farmer’s field with three treatments in Lunawas Khara village of Luni Panchayat Samiti in Jodhpur district of Rajasthan during rabi 2011-12 to 2012-13 to assess the impact of line sowing in improving the productivity of cumin (variety GC-4). Technological intervention of line sowing was compared with recommended practice and existing farmers practice for yield maximisation and economic returns from cumin under irrigated condition on sandy loam soil. Results of the study revealed that yield attributes in terms of branches plant⁻¹, umbels plant⁻¹, umblets plant⁻¹ and grain yield plant⁻¹ increased by 43, 78, 51, and 77%, respectively with technological intervention of line sowing over farmers practice. The grain yield was increased from 458 to 810 kg ha⁻¹ during 2011-12 and 502 to 888 kg ha⁻¹ during 2012-13 with the technological intervention. The mean grain yield was recorded 77% higher than the farmers practice (480 kg ha⁻¹).

Key words: Cumin, farmers practice, line sowing, net return, yield, yield attributes

Introduction

Cumin (*Cuminum cyminum* L.) is an important seed spice crop of India and country ranks first in terms of acreage and production in the world. It is extensively grown in Gujarat, Rajasthan and some parts of Haryana and Madhya Pradesh during rabi season. The climatic conditions found in Rajasthan and Gujarat is more favourable for cumin cultivation than other parts of the country and is becoming more popular due to its profitability, short duration and greater potential to grow on saline soils. During 2012-13, Gujarat and Rajasthan account for 99.67% production of the country (Indian Horticulture Database, 2). In Rajasthan cultivation of cumin is confined to the western districts where climate remains drier during the ripening period of the crop. The districts of Jalore, Jodhpur, Jaisalmer, Barmer, Nagaur and Pali account for 92% of the area 90% of the production in Rajasthan during 2012-13 (Rajasthan Agricultural Statistics, 6). During the corresponding period cumin was grown on 106058 ha area in Jodhpur with an annual production of 44663 tonnes. Average productivity of cumin in the district was lower (421 kg ha⁻¹) than the national average (663 kg ha⁻¹) and Gujarat state (757 kg ha⁻¹) (Rajasthan Agricultural Statistics, 6). Besides agro-climatic constraints, low yield of cumin in the arid regions of Rajasthan attributed to poor spread of the production technology among farmers (Singh, 8). Moreover, farmers of the region are still doing the sowing with conventional practice of broad casting (Lal et al., 4) that resulted in lower yield due to poor germination, establishment and difficulty in carrying out inter cultural operations for weeding and pest control. Superiority of line sowing over broadcasting have been reported in literature elsewhere the results of which revealed that inter cultural operations like weeding, hoeing, spraying of agro-chemicals etc. are much easier in line sowing than the broadcast method (Sastry and Muthuswamy, 7). Hence, present study was conducted in the selected villages of Jodhpur district to assess the impact of line sowing in improving the productivity of cumin.

Materials and methods

An On Farm Trial (OFT) was conducted in Lunawas Khara village of Jodhpur district in agro-climatic zone Ia i.e. “Arid Western Plain” of western Rajasthan on three selected farmers’ field during rabi 2011-12 to 2012-13. The soil of sites was sandy loam in texture with low organic carbon (0.15-0.17%). The available nitrogen, phosphorus and potash were 138-147, 13-17 and 164-204 kg ha⁻¹, respectively. The pH of irrigation water was 8.6 with high electrical conductivity (3.42 dSm⁻¹). The OFT was conducted with three treatments viz., T₁, farmers practice (farmers own seed, broad cast sowing, imbalanced use of fertilizers i.e. no use of FYM and phosphorus), T₂, improved cultivar GC-4, broad cast sowing, 10 t FYM+ 30 kg N+ 20 kg P₂O₅ ha⁻¹ and T₃.
improved cultivar GC-4, line sowing at 30 cm, 10 t FYM + 30 kg N + 20 kg P₂O₅ ha⁻¹. The 0.40 ha field of each farmer was divided into two strips of equal size for allocation of T₁ and T₂ treatments. The sowing of cumin variety GC-4 was done in the second week of November in both the years using seed rate of 12 kg ha⁻¹ in T₁ and T₂ and 15 kg ha⁻¹ in T₁ (as was used by the farmers). The sowing was done in lines spaced at 30 cm apart in treatment T₁ whereas in T₂ and T₃, seeds were sown by broadcast method. A light irrigation was given just after sowing and second irrigation was given 7 days after the first irrigation. Subsequent irrigations were given at 12, 42, 72 and 90 days after sowing (DAS). Seed treatment was done with carbendazim @ 2 g kg⁻¹ seed. The 50% dose of recommended N and full dose of P₂O₅ and FYM were applied just before sowing and mixed thoroughly in to the soil. The remaining dose of N was applied in the standing crop at 35 DAS. The other crop management practices were performed as per standard recommendations of the region. Harvesting of crop was done in the last week of March and grain yield was recorded and converted in to kg ha⁻¹. The yield attributes in terms of plant height, branches plant⁻¹, umbels plant⁻¹ and grain weight plant⁻¹ were recorded from randomly selected five plants in each plot from three places corresponding to three replications. The economic analysis was done taking into account the prevailing cost of inputs and output. The ratio of benefit to cost was calculated by dividing the net return with total cost of cultivation. The Fisher’s least significant difference (LSD) was used to compare treatment means at p=0.05 level of significance.

Results and discussion

Yield and yield attributes

The yield attributes increased considerably with the technological intervention of line sowing compared to farmers practice (Table 1). Yield attributes were also recorded significantly higher with recommended practice over farmers practice. The branches plant⁻¹, umbels plant⁻¹, umblets plant⁻¹ and grain yield plant⁻¹ increased by 43, 78, 51, and 77%, respectively with technological intervention (T₃) over farmers practice (Tᵢ). Plant height was however recorded 12% lower with T₃ than the farmers practice (30.28 cm). The grain yield was recorded significantly higher with the interventions of line sowing compared to farmers’ existing practices. The grain yield increased by 43, 78, 51, and 77%, respectively with umbels plant⁻¹, umblets plant⁻¹ and grain yield plant⁻¹. The branches plant⁻¹, number of branches plant⁻¹, number of umbels/umblets plant⁻¹ and number of seed plant⁻¹. These findings are in accordance with the results of Yadav and Khurana (10) who reported improvement in grain yield of fennel to the tune of 38% with line sowing over broadcast sowing.

Economic analysis

Pooled data of economic analysis presented in Table 2 revealed that on pooled basis, an amount of ₹ 69384 ha⁻¹ was obtained as net return under trials conducted with technological intervention of line sowing (T₃) which was 96% higher than the farmers practice. The net return of Rs. 10063 alone was obtained from the intervention of line sowing in the study over broadcast method of sowing which is calculated by subtracting the net return obtained from Tᵢ and T₂. Similarly, highest B:C ratio of 1.89 was also recorded with technological intervention of line sowing. Since economic yield is the function of grain yield and sale price (Mahmood et al. 5), higher grain yield with treatment T₃ (Technological intervention) contributed in obtaining of maximum net return as well as B: C ratio over rest of the treatments under the study.

Conclusion

From the study it is inferred that yield of cumin could be increased by sowing the crop in lines that facilitated
Table 1: Effect of different interventions on the yield attributes of cumin at farmers field during rabi 2011-12 to 2012-13

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Plant height</th>
<th>Branches plant</th>
<th>Umbels plant</th>
<th>Umblets plant</th>
<th>Grain weight (mg plant⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₂</td>
<td>27.34</td>
<td>30.70</td>
<td>29.02</td>
<td>6.39</td>
<td>6.94</td>
</tr>
<tr>
<td>T₃</td>
<td>24.72</td>
<td>28.28</td>
<td>26.50</td>
<td>7.32</td>
<td>7.58</td>
</tr>
<tr>
<td>SEm±</td>
<td>0.45</td>
<td>0.29</td>
<td>0.27</td>
<td>0.15</td>
<td>0.20</td>
</tr>
<tr>
<td>CD (P&lt;0.05)</td>
<td>1.34</td>
<td>0.86</td>
<td>0.76</td>
<td>0.45</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Where T₁=Farmers practice (farmers own seed, broad cast sowing, imbalanced use of fertilizers), T₂=improved cultivar GC-4, broad cast sowing, 10 t FYM+ 30 kg N+ 20 kg P₀ha⁻¹, T₃=improved cultivar GC-4, line sowing at 30 cm, 10 t FYM + 30 kg N + 20 kg P₀ha⁻¹ F₁=Farm 1, F₂=Farm 2 and F₃=Farm 3.

Table 2: Effect of different interventions on the grain yield and economics of cumin at farmers' field during rabi 2011-12 to 2012-13

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Grain yield (kg ha⁻¹)</th>
<th>Gross return (₹ha⁻¹)</th>
<th>Net return (₹ha⁻¹)</th>
<th>Net B: C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>458</td>
<td>502</td>
<td>480</td>
<td>57250</td>
</tr>
<tr>
<td>T₂</td>
<td>720</td>
<td>767</td>
<td>744</td>
<td>90042</td>
</tr>
<tr>
<td>T₃</td>
<td>810</td>
<td>888</td>
<td>849</td>
<td>101208</td>
</tr>
<tr>
<td>SEm±</td>
<td>25</td>
<td>27</td>
<td>18</td>
<td>3173</td>
</tr>
<tr>
<td>CD (P&lt;0.05)</td>
<td>76</td>
<td>80</td>
<td>53</td>
<td>9513</td>
</tr>
</tbody>
</table>

Where T₁=Farmers practice (farmers own seed, broad cast sowing, imbalanced use of fertilizers), T₂=improved cultivar GC-4, broad cast sowing, 10 t FYM+ 30 kg N+ 20 kg P₀ha⁻¹, T₃=improved cultivar GC-4, line sowing at 30 cm, 10 t FYM + 30 kg N + 20 kg P₀ha⁻¹ F₁=Farm 1, F₂=Farm 2 and F₃=Farm 3.
plants favourable aerial and below ground environment for their full development. Similarly, lines sowing also make it convenient to carry out many agricultural operations during the crop growth. Thus line sowing is recommended to obtain higher grain yield and economic return from cumin crop along with recommended practices of cultivation in the zone.

Acknowledgement
The authors are grateful to the farmers of Lunawas Khara, Jodhpur for their active participation in the on farm trials and highly thankful to the Director, Central Arid Zone Research Institute, Jodhpur for providing all the necessary facilities to carry out the work.

References