INTRODUCTION

Dill (Anethum graveolens L.) is an annual aromatic herb of the Umbelliferae family, grown widely throughout Europe, America and Asia for use as a fresh herb and for the production of essential oil, which is extensively used by the food industry for flavouring foods and beverages (Clark and Minns 1984). Studies of aroma composition have concentrated mainly on the seeds, which is a rich source of anethole. Wheeler and Boumanvest (1993) reported that dill, being a seed and canyone yield increased with increasing nitrogen (N) fertilization. Moreover, Singh et al. (1987) concluded that oil content of the whole plant was highest at the time of seed filling after flowering and related to N application. Dill and also contains essential oil, the main component of which is piperitenone (Hopotat et al. and Litsky 1983). Therefore, the aim of the present study was to examine the effect of different factors (N-fertilization, season of cultivation and stage of harvest) on plant biomass, and yield and composition of essential oil derived from the foliage.

MATERIALS AND METHODS

Seeds of dill (Anethum graveolens L.) were sown in October (winter crop) and January (summer crop) and the plants were transplanted to a substrate of peat and perlite (1:1) on 30 and 38 days later, respectively. Nitrogen (N0, N1, N2, N3) was applied weekly as four levels of 0, 150, 300, 450 ppm N in a completely randomized experimental design. Plant height and leaf number were recorded at harvest, 15 and 35 days after the first and second sowing, respectively. The foliage was weighed and the essential oils were isolated by hydrodistillation in a Clevenger apparatus and analyzed by GC-MS as described by Perrot et al. (2009) using a HP-5 column (30 m × 0.32 mm, 0.25 μm film thickness) with a temperature program gradually increased from 60°C to 220°C with a rate of 3°C/min.

RESULTS

The plants of the winter crop were taller at harvest than those of the summer crop due to the longer growth period. The foliage fresh weight and number of leaves per plant increased with increasing fertilization in the winter, whereas plant height decreased. By contrast, plant growth was not affected by N level in the summer.

Table 1. Mean height of plants (cm), leaf number per plant and plant weight (g)

<table>
<thead>
<tr>
<th>CROP</th>
<th>N0</th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
<td>130.65</td>
<td>129.16</td>
<td>111.46</td>
<td>104.97</td>
</tr>
<tr>
<td>150 ppm</td>
<td>128.16</td>
<td>14.17</td>
<td>18.45</td>
<td>21.36</td>
</tr>
<tr>
<td>300 ppm</td>
<td>111.46</td>
<td>133.39</td>
<td>162.48</td>
<td>167.36</td>
</tr>
<tr>
<td>450 ppm</td>
<td>52.13</td>
<td>9.03</td>
<td>102.51</td>
<td>101.69</td>
</tr>
</tbody>
</table>

The essential oil concentration within the foliage was low (<0.3 ml/100 g fresh weight). Oil concentration was highest at 650 ppm N than all of the other N levels in the summer but independent of N application in the winter.

CONCLUSION

Based on the N rates used here, it is concluded that for a long-cycle winter crop (108 days), 450 ppm N is optimal for biomass and foliar oil yield. A balanced oil concentration was reached in a shorter summer crop (93 days) due to a lower N rate may be employed.

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REFERENCES