Chemical composition and antifungal activity of essential oils of *Tagetes minuta* (Asteraceae) against selected phytopathogenic fungi

Martin M. Gakuubi\(^1,2\), John M. Wagacha\(^1\), Saifuddin F. Dossaji\(^1\) and Wycliffe Wanzala\(^3\)

\(^{1,2}\) School of Biological Sciences, University of Nairobi; \(^3\) Department of Biology, Mwenge Catholic University; \(^3\) Department of Biological Sciences, Maasai Mara University

**INTRODUCTION**

- Phytopathogenic fungi cause enormous agricultural losses and are an important constraint to the attainment of food security.
- Management of plant pathogenic fungi has primarily relied on synthetic chemical fungicides.
- The is an urgent need for safe, affordable and eco-friendly alternatives to hazardous synthetic chemical fungicides.

**OBJECTIVES**

**Main objective:**
To determine the percentage yield and identity of the chemical composition of *Tagetes minuta* essential oils (EOs) and to evaluate the antifungal activity of the EOS against selected phytopathogenic fungi.

**Specific objectives:**
- To determine the percentage yields of crude essential oils extracted from leaves, flowers and stems of *Tagetes minuta*.
- To assess the antimicrobial effect of crude essential oils of *Tagetes minuta* against selected phytopathogenic fungi and bacteria.
- To characterize the chemical composition of the essential oils of *Tagetes minuta*.

**RESULTS**

1. **Percentage yield of *Tagetes minuta* essential oils**

<table>
<thead>
<tr>
<th>Batch No</th>
<th>Weight of plant material (Kg)</th>
<th>Weight of essential oil (g)</th>
<th>Percentage Yield (% w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.38</td>
<td>2.5883</td>
<td>0.0591</td>
</tr>
<tr>
<td>2</td>
<td>4.23</td>
<td>2.5416</td>
<td>0.0601</td>
</tr>
<tr>
<td>3</td>
<td>4.60</td>
<td>2.7383</td>
<td>0.0595</td>
</tr>
<tr>
<td>4</td>
<td>4.10</td>
<td>2.4115</td>
<td>0.0588</td>
</tr>
</tbody>
</table>

Mean = 0.0594 ± 0.0003

2. **Activity of the essential oils on fungal pathogens**

*Tagetes minuta* EOs showed potent antifungal activity against the test fungal species namely: *Aspergillus flavus* (A), *Aspergillus parasiticus* (B), *Fusarium solani* (C), *Aspergillus niger* (D) and *Fusarium oxysporum* (E).

3. **Chemical composition of the essential oils of *Tagetes minuta***

- Twenty compounds corresponding to 96% of the total essential oil and constituting a mixture of monoterpenes (70%) and sesquiterpenes (30%) were identified.
- The most abundant components were: (E)-Tagetone (11.8%), dihydrotagetone (10.7%), Allo-ocimene (8.8%) and (Z)-β-Ocimene (7.0%).
- Two sesquiterpenes; Elixene and Silphiperfol-6-ene are being reported for the first time in EOS of *T. minuta*.

**REFERENCES**


**CONCLUSION**

- The study demonstrated promising antifungal activity of *T. minuta* essential oils against the test fungi.
- The EOs have potential use as biopesticides and as alternative to synthetic fungicides.
- Further studies required to evaluate the applicability of the EOs in management of phytopathogenic fungi under field conditions.