Allelopathic Activity of Iranian Native Medicinal and Aromatic Plants by Using Cotton Swab Method

Somayeh Mirmostafaee*[1], Majid Azizi* , and Yoshiharu Fujii*[2]

[1]Horticultural Department, Ferdowsi University of Mashhad (FUM) – Horticultural Department, Agricultural Faculty, Ferdowsi University of Mashhad, Mashhad, Iran., Iran
[2]Tokyo University of Agriculture and Technology (TUAT) – Japan

Abstract

In recent years, awareness of the harmful effects of herbicides have persuaded researchers to seek for a suitable replacement of chemical herbicides. One of these alternatives is natural compounds. So using allelopathic compounds as a novel strategy reduces the chemical herbicides consumption. This study was aimed to identify strong allelopathic activity among medicinal and aromatic plants (MAPs). Through one of the modern bioassay methods "Cotton Swab Method" which is used for evaluating volatile compounds, this experiment was conducted as a randomized complete design with four replicates. The essential oils (EOs) were applied in two different concentration 2μl and 5μl per 25ml glass vial on lettuce seed germination. In this context a total of 104 EOs of MAPs were evaluated. Germination parameters (germination inhibition percentage, seed vigor, seed germination index (SGI), T50, mean germination time, speed of germination and germination speed index) were evaluated. The results showed that 15 samples such as *Origanum majorana*, *Zataria multiflora, Thymus daenensis, Melissa officinalis, Pelargonium graveolnes,* and *Pimpinella anisum* had very strong inhibitory effect on lettuce seed germination (%80-100 inhibition). Based on T50 results, 12 samples such as *Rosmarinus officinalis*, *Artemisia scoparia*, and *Nepeta binaludensis* were highly effective on seed germination delay (More than 200%). So it can be concluded that there are very strong germination inhibitor EOs especially in Lamiaceae and Asteraceae families. According to the GC-MS analysis, components such as terpinen, thymol, carvacrol, citronellal, citronellol, geraniol and anethole were the main constituents of the strong inhibitor EOs. Moreover, camphor, p-cymene, β-pinene and 1,8-cineole were the main constituents in strong EOs which postpone seed germination. These results showed that cotton swab can be used as a rapid and suitable method for detecting allelopathic properties in volatile compounds. Furthermore, natural volatile ingredients of the mentioned MAP are good candidates as bio-herbicides.

Keywords: Medicinal and Aromatic Plants, Allelopathic Properties, Cotton Swab Method, Essential Oil, Organic Cultivation

*Speaker