



University of Kentucky
UKnowledge

International Grassland Congress Proceedings

XXI International Grassland Congress / VIII
International Rangeland Congress

Allelopathic Effect of Volatile Oil of *Artemisia scoparia*

Tian Zhou
Maoming University, China

Yongjun Hu
Northeast Normal University, China

Defu Han
Northeast Normal University, China

Shangyi Tian
Northeast Normal University, China

Jixun Guo
Northeast Normal University, China

Follow this and additional works at: <https://uknowledge.uky.edu/igc>



Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/21/16-1/44>

The XXI International Grassland Congress / VIII International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Allelopathic effect of volatile oil of *Artemisia scoparia*

Tian Zhou^{1,2}, Yongjun Hu^{2,3}, Defu Han^{2,3}, Shangyi Tian², Jixun Guo²

¹College of Chemistry and Life Science, Maoming University, Maoming 525000, China. ²Institute of Grassland Science Northeast Normal University, Key Laboratory of Vegetation Ecology, MOE, P.R. China, Changchun, 130024, China.

³Department of Biology, Changchun Normal College, Changchun, 130032, China. E-mail: gjixun@nenu.edu.cn

Key words: *Artemisia scoparia*, volatile oil, allelopathy

Introduction Allelopathy is defined as a process involving secondary metabolites produced by plants, micro-organisms, viruses, and fungi that influences growth and development of biological systems. Allelopathy is a new marginal area of ecological and chemical research. *Artemisia scoparia*, an annual or biannual herbaceous plant with a strong smell, is widely distributed in fields, roadsides and wastelands in China. It can be observed in symbiotic communities with other plants, but always with comparative advantage where the growth of other plants is inhibited. The purpose of this study was to investigate whether the allelopathy have some function in the formation and successions of *A. scoparia* communities. *A. scoparia* contains considerable volatile oils, the main compositions of which are usually terpene compounds which impart important allelopathic properties. In this study, the compositions of *A. scoparia* volatile oils were analyzed. Gramineae, Cruciferae and Leguminosae plants were used as controls to investigate the allelopathic effects of *A. scoparia* volatile oil on seed germination and the growth of roots and shoots of germinants. The objectives were to evaluate the chemical ecology of *A. scoparia*, in an effort to reduce the influence of *A. scoparia* to other plants.

Materials and methods Fresh stems and leaves of *Artemisia scoparia* were cut into 2cm sections and dried. The yellow volatile oil was extracted by vapor distillation, and analyzed with GC and GC/MS.

Results The results showed *A. scoparia* volatile oil had different degrees of inhibition to the seed germination of radish, clover, Chinese cabbage and maize. The germination of radish seed was inhibited obviously, the final germination rate of volatile oil group is 72% only, and 27.3% lower than control group. In germination experiment of the corn seed, volatile oil group had no obvious difference compared with control group. The volatile oil had different degrees inhibition to the growth of shoots and roots of germinants of four tested species, and reduced the elongation of shoots and roots of germinants. The inhibition on the growth of shoots and roots of clover was the most obvious, their length decreased 32.7 and 50.4% compared with control group respectively. The inhibition on the corn was not obvious. It is proved that the different family plants have different resistance to allelopathic substance. The mean yield of the volatile oil was 0.38% (V/DW). 37 species of compounds were identified and constituted 86.90% of the total mass. There were 12 species of terpene compounds, which were the main components and constituted 45.04% of the volatile oil from *Artemisia scoparia*. The contents of 10 chemical components were more than 1.5% as: 2,5-Ethano [4,2,2] propella-3,7,9-triene, Spathulenol, Caryophyllene, eugenol methyl ether, Caryophylleneoxide, Capillin, +/- -trans-Nerolidol, (8)beta-Farnesene, 2-methyl-6-p-tolyl-hept-2-ene and Germacrene.

Conclusions There are some relations between the inhibition of volatile oil on seed germination and shoots growth and higher content of terpene compound in volatile oil. The terpene compounds form "terpene cloud" through volatilization to affect the plant seed germination and the growth of shoots. The mechanism of toxicity and inhibition of the terpene were: 1) Binding up GA activity, inhibiting growth of plant; 2) Interfering the normal function of mitochondrion, hindering the metabolism to carry on; 3) Affecting the function of the cell membrane, interfering the absorption of plant to mineral material; 4) Destroying the complexation within the nourishment absorption process, making nutrient can't through the membrane system. Study the allelopathy of *A. scoparia*, not only has the theory meaning of the biology, but has an important value to use biological technique guiding agriculture practice.

Reference

Yang Yuesheng, Futsuhara Yuzu. 1991. Inhibitory effects of volatile compounds released from rice callus on soybean callus growth: allelopathic evidence observed using in vitro cultures. *Plants Sci* 77:103-110.