



Native American medicinal plants, chemical constituents of *Osmorhiza chilensis* and *Clematis hirsutissima*
by John Robert Kern

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE
in Chemistry
Montana State University
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Abstract:

This thesis comprises an investigation into the chemical constituents of *Osmorhiza chilensis* (Mountain Sweet Cicely), a plant used as a medicinal herb, and *Clematis hirsutissima* (Sugar Bowls), employed as a horse restorative and medicinal herb by Native Americans of the Northwest Rocky Mountains.

Compounds isolated and characterized from *Osmorhiza chilensis* are: anethole, 20, estragole, 21, 3,4-dimethoxy eugenol, 22, falcarindiol, 4, and 3-Q-methyl falcardiniol 18.

One compound, anemonin, 25, was isolated and characterized from *Clematis hirsutissima*.

[Chemical Diagrams not captured by OCR]

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John R. Kew

Date

June 15, 1982

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To my parents

NATIVE AMERICAN MEDICINAL PLANTS. CHEMICAL CONSTITUENTS OF
OSMORHIZA CHILENSIS AND CLEMATIS HIRSUTISSIMA

by

JOHN ROBERT KERN

A thesis submitted in partial fulfillment
of the requirements for the degree

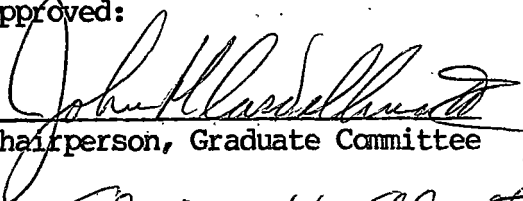
of

MASTER OF SCIENCE


in

Chemistry

Approved:


Chairperson, Graduate Committee


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MONTANA STATE UNIVERSITY
Bozeman, Montana

June, 1982

ACKNOWLEDGMENT

The author wishes to thank Dr. John H. Cardellina II for his guidance, support and humor throughout this thesis project. Special thanks to Dr. P. W. Jennings and his research group for their help with the mass spectrometer and the NMR spectrometer. The many probe changes and useful information on operating the NMR were greatly appreciated. I would also like to thank Dr. Bradford P. Mundy for his constant encouragement, and for help with the catalytic reductions. Thanks must also go to Ms. Peggie Riley for typing the manuscript.

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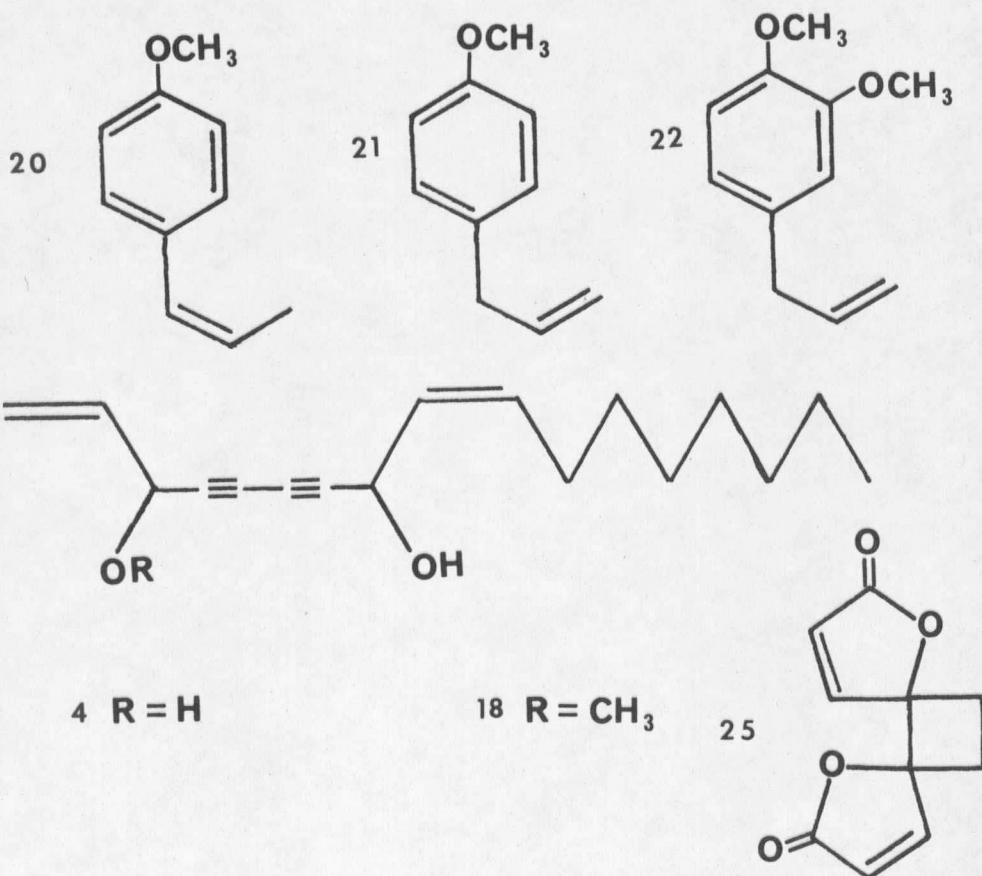
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ABSTRACT

This thesis comprises an investigation into the chemical constituents of *Osmorhiza chilensis* (Mountain Sweet Cicely), a plant used as a medicinal herb, and *Clematis hirsutissima* (Sugar Bowls), employed as a horse restorative and medicinal herb by Native Americans of the Northwest Rocky Mountains.

Compounds isolated and characterized from *Osmorhiza chilensis* are: anethole, 20, estragole, 21, 3,4-dimethoxy eugenol, 22, falcariindiol, 4, and 3-O-methyl falcariindiol 18.

One compound, anemonin, 25, was isolated and characterized from *Clematis hirsutissima*.



PART I

Osmorhiza chilensis

INTRODUCTION

1. Historical

Osmorhiza chilensis (Mountain Sweet Cicely), a small perennial herb indigenous to the temperate and mountainous regions of the Northern Hemisphere, was used by Flathead (1), Crow (2), Blackfoot (3) and Thompson (4) Indian nations for the treatment of colds, pneumonia, sore throats, toothaches and stomachaches. The roots of Osmorhiza chilensis were usually brewed into a tea which, when imbibed, provided soothing relief for these maladies.

Osmorhiza chilensis is a member of the family Umbelliferae, probably the first family of flowering plants to receive general recognition (5). This family is widely represented in the pharmacopoeias of many European, Asian and North American cultures. With the renewed interest today in the use of herbal medicines, a wide variety of umbelliferous plants are still in use as medicinal agents. Umbelliferous plants are aromatic plants, that is, almost all of them exhibit distinctive odors and flavors. Many umbelliferous plants are used as spices and herbs in cooking (see Table 1). A few, however, are poisonous - the most famous is Conium maculatum (Poison Hemlock), which, according to legend, caused the death of Socrates.

Table 1. Common Umbelliferous Plants and Their Uses. (6)

| <u>Species</u> | <u>Uses</u> |
|--|--|
| Carrots (<u>Daucus carota L.</u>) | Food, Flavoring, Medicinal: Diuretic, Excitant, Stimulant. Jaundice, Dropsy. |
| Parsnips (<u>Pastinaca sativa L.</u>) | Food, Medicinal: Tonic and Carminative. |
| Celery (<u>Apium graveolens L.</u>) | Food, Flavoring, Medicinal: Gout, Sciatic Pain, Diuretic, Sedative. |
| Caraway (<u>Carum carvi L.</u>) | Flavoring, Medicinal: Stimulant, Stomachic, Carminative, Diuretic, Scabies. |
| Parsley (<u>Petroselinum crispum Miller</u>) | Flavoring, Medicinal: Diuretic, Stimulant, Carminative. |
| Chervil (<u>Anthriscus cerefolium L.</u>) | Flavoring, Medicinal: Diuretic, Depurative (e.g., for cancer). |
| Fennel (<u>Foeniculum vulgare Miller</u>) | Flavoring, Medicinal: Stimulant, Tonic, Stomachic, Carminative. |
| Dill (<u>Anethum graveolens L.</u>) | Flavoring, Medicinal: Carminative, Diuretic, Stimulant. |
| Coriander (<u>Coriandrum sativum L.</u>) | Flavoring (Soap and Perfume), Medicinal: Carminative, Diuretic, Aphrodisiac, Nervous Disorders. |

Table 1. Continued

| | |
|--|--|
| Cumin (<u>Cuminum cyminum L.</u>) | Flavoring, Medicinal: Antispasmodic, Astringent, Stimulant, Carminative, Stomachic, Diuretic, Emmenagogue. |
| Anise (<u>Pimpinella anisum L.</u>) | Flavoring, Medicinal: Aromatic, Stimulant, Carminative, Diaphoretic, Stimulate Secretion of milk. |
| Dog Parsley (<u>Aethusa cynapium L.</u>) (Dog Poison) | Medicinal: G. I. Tract Problems, Convulsions, Sedative. |
| Poison Hemlock (<u>Conium maculatum L.</u>) | Medicinal: Carminative, Diuretic, Aphrodisiac, Nervous Disorders. |
| Cowbane (<u>Cicuta virosa L.</u>) | Medicinal: Diuretic, Carminative. |
| Hemlock Water (<u>Oenanthe crocata L.</u>) Dropwort | Medicinal: Epilepsy, Stupefying Fish. |

2. Chemistry of Umbelliferous Plants

Umbelliferous plants, throughout the course of some 200 years of chemical investigations, have exhibited a wide variety of chemical constituents. The "aromaticity" of certain umbellifers is reflected in their essential oils. These essential oils contain monoterpenes, sesquiterpenes and phenylpropanoids. Another large class of natural products found in umbelliferous plants are coumarins. Coumarins have been isolated from over 160 umbellifer species. Approximately 125 of the 200 known coumarins have been isolated and characterized from umbelliferous plants (7). Triterpenes and saponins comprise another large class of compounds found in this family. Other important classes of compounds found in umbelliferous plants include the fatty seed oils, polyols, oligosaccharides, phenylpropanoids and flavonoids.

Naturally occurring acetylenes also represent a significant class of compounds in umbelliferous plants. Of the approximately 650 naturally occurring acetylenes (isolated from 15 different families of higher plants, as well as from algae and microorganisms), approximately 80 have been isolated from different species of the Umbelliferae (8).

The majority of acetylenes isolated from umbelliferous plants are the C₁₇-chain compounds related to falcarinone 1, isolated by Bohlmann (9) from Falcaria vulgaris in 1961. A limited number of C₁₃- and C₁₅-chain acetylenes have been isolated from several species (10).

