

The Medicinal Plant Program: Education, Outreach, and Research

Zoë Gardner and Lyle E. Craker
Medicinal Plant Program, Department of Plant & Soil Sciences
University of Massachusetts
Amherst, MA 01003, U.S.A.

Keywords: Agricultural education, herbal remedies, ethnobotany

Abstract

Medicinal and aromatic plants represent a relatively new area of horticultural education with considerable student and grower interest. To meet the demand for classes and information, the University of Massachusetts has developed a series of horticultural classes and outreach efforts to support current and future farmers and research scientists in this area. Emphasis has been focused on establishing a fundamental understanding of the myth, tradition, and science that envelops medicinal and aromatic plant materials and building foundations in horticulture, ethnobotany, chemistry, plant identification, and applications related to medicinal and aromatic plants. An annual, student sponsored HerbFest is held on campus to develop student and public interest in medicinal and aromatic plants and plant products. Outreach activities at the University include providing grower information, writing and editing books, publishing journals, and working with elementary and secondary school children.

INTRODUCTION

Over the past 10 years, public interest in medicinal plants has greatly increased. Consumers and health care providers are interested in these plant materials for the potential health benefits, while growers see medicinal plants as potential crops for farm diversification. The increasing interest in these medicinal plant materials is reflected in the growth of the U.S. market for medicinal plant products, a market that rose from approximately \$25 million in 1991 to over \$4.1 billion in 2001 (Brevoort, 1998; Molyneaux, 2002). The rapid growth of the medicinal plant industry has produced challenges in the supply of appropriate raw materials and in the education of those involved with the medicinal plants, including growers, health care providers, and consumers. Through educational courses that include the cultivation, botany, chemistry, history, and traditional and current uses of medicinal plants, the University of Massachusetts Medicinal Plant Program seeks to educate future producers and users of medicinal plant products.

Education

During the past 14 years, the Medicinal Plant Program at the University of Massachusetts has developed from a single course on herbs to a program of four courses for undergraduate and graduate students. The original course, entitled "Herbs, Spices, and Medicinal Plants," began as a course primarily focused on culinary herbs, addressing a general curiosity about the use and origins of these plants. The course initially included units on the history, traditional uses, chemistry, cultivation and culinary applications of herbs and spices as well as a unit on the botanical origins of pharmaceutical drugs.

As medicinal plants have become repopularized in the U.S., students have become more interested in medicinal plants and in understanding the production and utilization of these plants for health care. To stay current with student interest, the Herbs, Spices, and Medicinal Plants course has been modified to include more information on medicinal plants, chemistry of secondary metabolites, pharmacology, trade and markets, and harvest and post harvest handling (Table 1).

Herbs, Spices, and Medicinal Plants includes a weekly laboratory section in which student grow their own herb plants, gaining hands-on experience in propagating, harvesting, analyzing, and processing plant materials (Table 2). A laboratory manual,

Exercises in Herb Science (Craker and Dinda, 1998), guides students through a set of exercises for each laboratory section. Emphasis is placed on learning to grow, use, and identify the plant material. A greenhouse on campus is used to house a large collection of culinary and medicinal herbs, and during the course of the semester students are required to learn to identify approximately 50 selected plant species.

The course culminates in an annual HerbFest celebration, a daylong event, open to the public, at which students display herb, spice, and medicinal plant related projects of their own design. HerbFest is an opportunity for students to delve into a particular area of interest and to share their new knowledge of medicinal plants with over 600 visitors, including members of the public, the University community, and visiting school groups. Student projects may be craft, culinary, medicinal or cosmetic in nature, and include such things as herbal candles and soaps, aromatherapy oils, mustards, herbal cold care treatments, essential oil extraction, henna dyes, and herbal lore presentations.

In addition to modifying the core course, three additional courses have been added to meet student interest: Ethnobotany, Medicinal Plants of New England, and the Business of Herbs. These courses provide students with a broad understanding of medicinal plants and related subject areas, giving students the skills to elucidate, identify, and process medicinal plants, and to effectively market processed products.

In Ethnobotany, students become familiar with the uses of medicinal plants in the context of traditional medical systems, such as traditional Chinese medicine, Ayurvedic medicine, and Amazonian medicine (Table 3). The processing and consumption of the plants is explained along with insights into methods of plant prospecting and ways to support the economies of indigenous communities that supply medicinal plant material and knowledge. Scientific evidence on the efficacy of traditional drug medicines is discussed, providing students an understanding of the modes of action of plant-based medicines and the value of traditional knowledge of plant materials. As appropriate, samples of medicinal plant products are brought to class so that students may examine and taste the products that are the focus of a particular lecture.

Medicinal Plants of New England, a field botany course, focuses on the identification, conservation, and sustainable use of local medicinal plants (Table 4). Through slide shows, field trips, and the creation of personal herbariums, students learn identification of native plants and plant habitats, the traditional medicinal uses of the plants, and methods for sustainable harvest of the plants. Harvested plant material is used in making tinctures and other herbal preparations.

In the Business of Herbs course, students learn market research and application with a focus on natural products (Table 5). Each student in the class creates a research-based marketing plan for a business of their own design. The highlight of this course is a trip to the annual Natural Products Expo trade show (an international show held each fall in Washington, D.C.) where students are able to talk with business owners, sales representatives, and non-profit groups about all aspects of business, product development, and trends in the natural products industry.

As the U.S. herb industry and student interests continue to change, courses in the Medicinal Plant Program will also change. Tentative future courses include Traditional Chinese Medicine and advanced instruction in ethnobotany and herbal sciences.

Outreach

The outreach component of the Medicinal Plant Program seeks to reach a wide audience outside of the University. The peer-reviewed *Journal of Herbs, Spices and Medicinal Plants* and books on the production, harvest, and primary processing, of aromatic, culinary, and medicinal plants are used to provide timely and practical information to researchers and growers. In addition to the annual HerbFest celebration, students in Herbs, Spices, and Medicinal Plants create and implement herb-related lessons for local nursery and elementary school groups. Faculty and staff of the Medicinal Plant Program present talks at professional, educational, and growers conferences. Technical support is provided to local growers producing herb crops.

Research

Graduate students, post-doctorates, and professors in the Medicinal Plant Program conduct research in areas relating to medicinal plants. Current and recent research projects, which focus primarily on environmental factors influencing plant growth and constituent production, include studies on the effect of environmental stresses on essential oil production and composition, production practices for Chinese medicinal plants in the northeastern U.S., the effects of heavy metals on seed germination and early growth of aromatic plants, and the genetic diversity of black cohosh (*Actaea racemosa* L.) and goldenseal (*Hydrastis canadensis* L.).

DISCUSSION

With supporting coursework in appropriate areas, students completing the Medicinal Plant Program are well equipped to enter careers relating to medicinal plants and will have the background necessary to become medicinal plant growers, natural products chemists, ethnobotanists, university researchers, natural products business owners, or herbally-knowledgeable health care providers. Similar research and education programs at other colleges and universities, utilizing the expertise of resident professors and researchers, would aid in the creation of the knowledge base necessary for the successful reintroduction of medicinal plants into healthcare and agricultural systems in the U.S. and abroad.

Literature Cited

- Brevoort, P. 1998. The booming U.S. botanicals market. *HerbalGram* 44:33-47.
Craker, L.E. and Dinda, K. 1998. *Exercises in Herb Science*. HSMP Press. Amherst, MA.
Molyneaux, M. 2002. Consumer attitudes predict upward trends for the herbal marketplace. *HerbalGram* 54:64-65.

Tables

Table 1. Annotated syllabus for Herbs, Spices, and Medicinal Plants course.

Introduction to herbs
Terminology of herbs
Herbs in history
Herbs in myth & magic
Commercial use of herbs
Botany of herbs
Chemistry of herbs
Culture of selected species
Harvesting of herbs
Post-harvest operations
Market demands for herbs
Spices
Herbal remedies
Pharmaceutical drugs
HerbFest celebration

Table 2. Laboratory themes and exercises for Herbs, Spices, and Medicinal Plants course.

Production

Production techniques and safety precautions for field, greenhouse, and hydroponic systems

Propagation

Propagation by seed, cutting, division, and tissue culture

Identification

Identification and classification of plants and seeds using dichotomous keys and herbarium voucher samples

Growth and Physiology

Optimization of photosynthesis and use of growth regulators

Transplanting and Landscaping

Techniques for transplanting, and basic concepts and methods of herb garden design

Maintenance and Pest Control

Optimization of plant production through growth maintenance, pest controls, and soil amendments

Harvesting and Processing

Harvesting and processing of herbs, including the making of herbal vinegars, mustards, and herbal dyes

Essential Oils

Extraction of essential oils and the creation of herbal products utilizing essential oils

Chemistry

Identification of flavonoids, saponins, coumarins, and aldehydes

Evaluation and Standardization

Utilization of organoleptic, chemical, and gas chromatograph methods for identifying and analyzing herbs and herbal extracts

Pharmacognosy

Making medicinal herb products including lip balms, insect repellent, and aromatherapeutic blends

Field Experience

Field trips to an herb production facility, an herbarium, and a book collection that includes historic herbals

Table 3. Annotated syllabus for Ethnobotany course.

Introduction to plant medicines

Medicinal herbs & their uses

North American Native medicines

Amazonian shamanic medicines

Kava production & traditions

Herbal aphrodisiacs

Coffee and chocolate

Healing spices: garlic, ginger and chilies

Ayurvedic medical traditions

Chinese tonic herbs

Scientific research and cultural significance of medicinal plants

Ethnobotany of hallucinogenic plants

Discovering new medicinal plants

Table 4. Annotated syllabus for Medicinal Plants of New England course.

Traditional medicines of New England
Conscientious wildcrafting
Conservation of medicinal plants
Tree species of New England
Field trip I – Habitats of threatened plants
Field trip II – Botanical sanctuaries and conservation

Table 5. Annotated syllabus for Business of Herbs course.

Introduction to the herbal industry
Product marketing
Factors influencing the U.S. herb market
 Field trip: Natural Products Expo - Talk with
 company representatives and business
 owners to understand the U.S. herb industry
Industry and macro trends
 Field trip: Chinese herbalist - Learn about
 service-based natural products business and
 trends in alternative medicine use
Company positioning
 Field trip: Dietary supplement manufacturer -
 Discuss positioning and market strategy with
 company's marketing director
Marketing strategies
 Field trip: Herb shop - Discuss retail marketing
 of herbs with business owner
Presentation of student marketing plans