Sustaining the Harvest: Challenges in MAP Production and Markets

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Abstract
Renewed interest in medicinal and aromatic plants during the past 20 years has brought surging markets and production opportunities for these plant species. To enhance and maintain market growth, however, MAP production systems, whether cultivated or collected, will need to ensure sustainable production of quality plant materials that have been wholesomely grown and processed. The growing familiarity of western consumers with medicinal and aromatic plants places a premium on standardized plant materials that are organically produced and meet expectations for efficacy. Currently, market demand for MAP is nurtured by consumer demographics and by favorable impressions of bioactivity, but this demand remains susceptible to myths, traditions, and science reports associated with the plant materials. By addressing the problems of standardization and verifiable marker compounds along with issues such as plant domestication, conservation, biotechnology, and others that affect plant cultivation, producers and processors can assure acceptable products reach the marketplace and crop production opportunities will continue to grow.

Introduction
A recent resurgence of interest in medicinal plants in many Western nations, the continued dependence of people in much of the world on these species, and the advent of a globalized economy has brought sustainability challenges to the medicinal plant trade. The modern market for medicinal plants has, in general, grown over the past 15 years (Fig. 1), but remains fragile, subject to governmental regulations, research findings, and media publicity along with the usual factors associated with supply and demand. Indeed, many challenges to the continued growth of the market exist, including appropriate education of consumers, assurances of high quality products, and availability of a sustainable supply of plant material.

The development of patentable, synthetic pharmaceuticals in the 1930s and 1940s in America and other Western countries (Table 1) resulted in the active abandonment of medicinal plants in health care, leaving new generations of both health care practitioners and the general populace with only a limited history, culture, and understanding about the appropriate use of medicinal species for preventing and treating human ailments (Craker and Gardner, 2003). Consumer confidence in pharmaceutical drug development, enhanced by the discovery of antibiotics and vaccinations that prevent or treat many diseases has lately decreased as drug costs escalate and major health problems, such as cancer, AIDS, cardiovascular disease, and numerous other problems continue to exist. An array of interests from medical professionals essentially committed to “modern” pharmaceuticals, consumers seeking alternative health care options, and herbalists promoting the use of medicinal and aromatic plants can convert challenges to market opportunities if growers and processors provide safe, useful plant products and educate consumers and health care professionals on benefits of medicinal plant products.

Education of consumers and healthcare practitioners about the correct use of medicinal and aromatic plants and plant extracts will help ensure the continued recognition of the value of these products. For example, Western consumers accustomed

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to taking a pharmaceutical drug and experiencing the effect of the drug within minutes to hours must learn that an herbal product that may take much longer to exhibit noticeable activity. Similarly, consumers and producers must replace the concept of taking drugs to treat pre-existing conditions with the concept of taking medicinal plants to improve general health and to treat both clinical and sub-clinical conditions. If consumers and health care providers are unfamiliar with the concepts of medicinal herb use, they cannot be expected to seek, recommend, or use these plants as medicine.

Consumer Demographics

As with any commodity, sales and use of medicinal plant products are influenced by the type of people that use these products. Indeed, a good share of the growth in sales of medicinal and aromatic plants and other natural products over the past 15 years can be attributed to the growth of certain demographic groups. Immigrants from Asia and Latin America have popularized a new palette of herbs and spices in restaurants and homes in the United States. This popularization has been such that U.S. spice consumption grew from 2 pounds per capita in 1976 to 3.2 pounds per capita in 1995 (Anonymous, 1998) (Fig. 2). Contributing to the increase in spice consumption is a change in lifestyle in many industrialized nations. The movement of women, historically the people responsible for meal preparation, from the home to workplace has altered traditional roles, requiring easier food preparation within the limited time available after work. In these instances, spices are frequently used to enhance the flavor of homemade and prepared meals.

A highly significant trend among consumers is the increase in consumers interested in environmental issues, the so-called “green” consumers (Roper, 2002). Such consumers are willing to pay a premium for eco-friendly products, including organic foods, recycled products, and herbal remedies. These consumers value natural alternatives to conventional products including foods and medicines, thus medicinal plant products and natural food flavorings are favored by these consumers.

Media Influences

Media stories featuring medicinal plants appear highly influential in consumer demand and acceptance of medicinal plants. While medicinal plants were featured positively in several highly publicized stories in the late 1990s (Greenwald, 1998; Johnson et al., 1997), many of the more recent stories have been negative with concerns focused on several plant species (such as kava and ephedra) (Burros, 2002; Strugatch, 2002), with few headlines highlighting the benefits or proper use of medicinal plants. Most of the negative stories are concerned with the lack of standardization of dose or with reports of results from poorly designed research studies (Brody, 1999).

Product Quality

The popularization of medicinal plants in Western nations during the 1990s encouraged the formation of numerous new companies producing herbal medicines. Unfortunately, the quality of the plant materials (including differences due to natural variation, cultivation practices, and post harvest handling) and processing vary among companies, and thus the quality of oils and other extracts is highly variable. Surveys by independent laboratories have demonstrated significant variation in the quality and reported content of packaged herbal remedies (Anonymous, 2001; ConsumerLab, 2002). News reporting of such variation undoubtedly lowers consumer and health care provider confidence in medicinal plant products.

Standardization of herbal products is the most commonly suggested solution for overcoming the natural variation of constituents in plant material. While standardization can help ensure product quality, recognized drawbacks to standardization exist. For example, in many plant species the active constituents of the species are not fully known. Secondly, a combination of plant constituents may be responsible for biological action of the plant or plant extract. Yet, if standard guidelines for marker compounds can be recognized and if plant selection, cultivation methodology, and processing can be
established within specified parameters, constituent variation within medicinal and aromatic plant products may be reduced, increasing consumer confidence in these plant materials.

**Industry Regulation**

To ensure quality and effective products standards for medicinal plant products must be enforced. Following Good Agricultural and Collection Practices (GACP) and Good Manufacturing Practices (GMP) should lead to better plant materials and extracts. In the U.S., however, adherence to such guidelines is voluntary (Clute, 2000). To enforce compliance, processors and consumers will need to demand plants grown under these conditions. To help address issues of product standardization and quality, businesses have joined to form third-party certifying agencies that assure the quality of herbal products (NNFA, 2002).

In some areas, over collection of plant material have endangered plant populations and genetic diversity. Although organizations such as the United Nations have recognized the problem and have initiated actions to limit trade in threatened plant species, enhanced efforts at local levels are needed. Those that collect plants must recognize the need for conservation and protection, while brokers and processors that purchase plants must recognize that populations of plant are not infinite. Protection of plants requires sharing the rewards from plant materials and germplasm with native people.

Domestication of collected plants would seem able to relieve the pressure on wild populations and maintain a sustainable harvest, yet, not all plants are easily adaptable to cultivation or to growth in the familiar rows of major crops. In such instances, cultivation methodology will need to adapt to the plant as opposed to adapting the plant to cultivation. American ginseng, for example, is being seeded and grown under natural conditions (minimum to no plot preparation or maintenance) in the Appalachian Mountains of America for later collection to meet market demands for wild ginseng. Growers in this region are meeting the challenge for a desired consumer product through adaptation of cultivation methodology to the plant.

**Future Markets**

Markets for medicinal and aromatic plants exist and adoption of these plants to meet needs should continue to expand opportunities for growers, collectors, and processors. Herbal medicines offer the promise of health care for many of the poor in the world, those without functioning health care systems and those where Western medicines are too expensive. As disease organisms become resistant to “modern” drugs, medicinal plants offer alternatives that may be effective. Western markets for medicinal and aromatic plants, especially in America, are extensive, but only as these plants become accepted and consumers recognize cost and health benefits as compared with other treatments.

In addition to health care, substantial markets exist in veterinary practices, pet foods, personal care, diet products, aphrodisiacs, food additives, industrial applications, and a host of other areas (Table 2). The decoding of the human genome promises new ways of diagnosing and predicting ailments and new a generation of therapeutics based on genes. Although the mechanism of action for many medicinal and aromatic plants is still unknown, these plants may well serve as a valuable source of designer drugs matched to human DNA and protein sequences associated with health problems.

Sustaining the harvest into the future is essential to reliably meet the needs for medicinal and aromatic plant materials. The provision of quality products to the market begins in the field by growers selecting, seeding, maintaining, and harvesting plants under conditions that will meet market requirements. The processor of medicinal and aromatic plants must maintain the quality plants and extracts by using appropriate storage, clean equipment, secure packaging, and timely deliveries to markets. Scientists must continue to identify constituents that can serve as distinctive markers for plant efficacy. Health professionals will need to accept that medicinal and aromatic plants have value in patient
care. Through continued work, the challenges can be met and the harvest can be sustained into the future.

**Literature Cited**


### Table 1. Pharmaceutical discoveries.

<table>
<thead>
<tr>
<th>Year</th>
<th>Type of drug</th>
<th>Drug name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1796</td>
<td>Smallpox vaccine</td>
<td>-------</td>
</tr>
<tr>
<td>1806</td>
<td>Alkaloid</td>
<td>Morphine</td>
</tr>
<tr>
<td>1860</td>
<td>Antiseptic</td>
<td>Carbolic acid</td>
</tr>
<tr>
<td>1884</td>
<td>Synthetic drug</td>
<td>Phenazone</td>
</tr>
<tr>
<td>1911</td>
<td>Chemotherapeutic agent</td>
<td>Arsphenamine</td>
</tr>
<tr>
<td>1935</td>
<td>Antibacterial</td>
<td>Sulfamidochrysoidine</td>
</tr>
<tr>
<td>1935</td>
<td>Sex hormone</td>
<td>Progesterone</td>
</tr>
<tr>
<td>1942</td>
<td>Antibiotic</td>
<td>Penicillin</td>
</tr>
<tr>
<td>1942</td>
<td>Antihistamine</td>
<td>Phenybenzamine</td>
</tr>
<tr>
<td>1949</td>
<td>Corticosteroid</td>
<td>Hydrocortisone</td>
</tr>
<tr>
<td>1975</td>
<td>Recombinant DNA technology</td>
<td>-------</td>
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### Table 2. U.S. markets for consumer products.

<table>
<thead>
<tr>
<th>Market category</th>
<th>Value ($U.S. billions)</th>
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<tbody>
<tr>
<td>Artificial sweeteners and fat replacers</td>
<td>1.2</td>
</tr>
<tr>
<td>Weight-loss supplements</td>
<td>0.9</td>
</tr>
<tr>
<td>Aphrodisiacs</td>
<td>2.0</td>
</tr>
<tr>
<td>Personal hygiene</td>
<td>37.0</td>
</tr>
<tr>
<td>Oral care</td>
<td>7.4</td>
</tr>
<tr>
<td>Pet foods</td>
<td>13.0</td>
</tr>
</tbody>
</table>

Sources: www.marketresearch.com; Obesity, Fitness & Wellness Week, March 6, 2004; www.globalchange.com/ viagra; www.sharedservicesnetwork.com - Developing the Basis for U.S. Personal Care
Figures

Sources: Blumenthal, 2001; Brevoort, 1998; Molyneaux, 2002; and Richman and Pier-Hocking, 2002.

Fig. 1. U.S. market for herbal supplements.

Source: U.S. Spice Trade Association, updated with data from the United States Department of Agriculture

Fig. 2. U.S. spice consumption 1980-2000.