HS892

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Medicinal Use of Citrus[1]

J.J. Ferguson[2]

Introduction

The herbal and medicinal value of plants appears in all early records of human activity, from the Chinese 5000 years ago, to the herbalists, apothecaries, pharmacists, and physicians of all succeeding generations, to modern use of herbs, their extracts, and synthetic products to treat minor ailments and diseases today. It is not surprising that the taxonomic family to which citrus belongs, the Rutaceae, which includes approximately 160 genera and 1,700 species, has been used in herbal medicine.

Herbs are usually defined as garden plants used secondarily in cooking for flavoring, seasoning, and garnishes for food. Herbs and herbal products have also been used medicinally for curative, preventive, remedial, and therapeutic purposes, as foods and as dietary supplements. The distinctions between herbal use and medicinal use overlap and have become blurred and therefore have to be interpreted within context.

Ethnobotany Research

During the 1990s, university and corporate researchers from developed countries have been combing the world for herbal medicines and crops that could be a significant source of new pharmaceuticals. In some cases, they have been accused of pirating age-old herbal remedies from native cultures. Court cases have resulted and in some cases, patents have been revoked. From this renewed interest in herbal use of plants, the new academic discipline of ethnobotany has emerged. Ethnobotany can be generally defined as the study of how people of a particular culture and region make use of indigenous or native plants.

Using an ethnobotanical approach for her Master of Science thesis at the University of Florida, Alexandra Paul collected 1,100 medicinal uses of citrus and related species from ninety-one countries and cultural groups. Her theory was that citrus and related plants that appeared in many cultural groups were more likely to have biological activity and related uses than plants that appeared in fewer cultural groups. In other words, she used a statistical approach to demonstrate that a number of citrus species were used for similar purposes in different locations and by different cultural groups. She relied

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2. J.J. Ferguson, professor, Horticultural Sciences Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

on observational reports as well as published biochemical, medical, and pharmacological research to establish and suggest that specific citrus species do, in fact, have specific medicinal uses. She also provided voluminous tables listing medicinal uses according to disease/use category, medicinal use, use location, and pharmacological/research summaries with supporting references.

She reported that the seven following disease categories had a statistically significant number of areas for reported uses: diseases of the blood and blood-forming organs; diseases of the musculoskeletal system and connective tissue; diseases of the respiratory system; diseases of the endocrine systems; nutritional, metabolic diseases and immunity disorders; infectious and parasitic diseases; injury and poisoning; symptoms, signs, and ill-defined conditions.

Recent research has focused on the biological activity of compounds found in citrus species, including compounds called flavanoids, carotenoids and limonoids, especially in terms of their effects on citrus palatability and anti-cancer activity.

Citrus flavonoids have potential antioxidant (prevents aging), anti-cancer, antiviral, anti-inflammatory activities, effects on capillarity, and cholesterol-lowering ability. The principal carotenoids in pink grapefruit are lycopene and beta-carotene. Lycopene-containing fruits and vegetables have been shown to contribute to a significant reduction in prostate and mammary cancer risk.

Recent studies have further shown that limonoids inhibit the development of cancer in laboratory animals and in human breast cancer cells as well as reducing cholesterol. Researchers have also suggested that, if ingested, limonoids may not be absorbed in the large intestine, and therefore could be distributed throughout the body, with beneficial effects. Since some limonoid compounds, called liminoid glycosides, are stable at high temperatures, new products incorporating these compounds could include juices, cosmetics, gums, breads, and cookies. Since mixed limonoid glucosides can be isolated in large quantities from citrus molasses, seeds, and other by-products from citrus processing plants, a supply of these compounds is readily available. Of possible interest to grapefruit growers, the concentration of these compounds varies with cultivar, harvest time, and plant tissue.

In citrus species, limonoids are produced in leaves and transported to fruit and seeds, with limonoid concentration highest in the earliest stages of growth of leaves and fruit and highest in seeds during fruit growth and maturation. In leaves and fruit, total limonoid content increases during growth and maturation and decreases after maturation. In contrast, limonoid concentration does not decrease in seeds after fruit maturity, indicating that seeds act as storage tissues for these compounds. Interestingly, grapefruit seeds have a higher limonoid concentration on a weight basis than orange and lemon seeds. Ironically, seedy white grapefruit cultivars like 'Duncan', that have been pushed out in favor of seedless pink and red grapefruit, may have greater medicinal value because of high limonoid glycosides in seeds than seedless pink and red cultivars.

Another interesting note is that concentrations of all three classes of compounds (flavonones, carotenoids, and limonoids) vary with the fruit of different grapefruit cultivar and harvest time, with pink and red cultivars generally having greater concentrations than white cultivars earlier in the season. In one report, the highest concentration of flavonoids was found in 'Thompson' grapefruit followed by 'Rio Red'. But the levels of other compounds like lycopene, a carotenoid, were highest in 'Rio Red' and 'Star Ruby' grapefruit during early harvest stages (August to October), declining in middle (November to January), and late season (February to June). However, carotene levels were higher at late season in both cultivars. If medicinal use of these compounds increases, grapefruit growers may manage some of their groves more to maximize production of these biologically active compounds rather than for boxes of mature fruit per acre.

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