Ascorbic Acid and Vitamin A Content of Edible Wild Plants of Ohio and Kentucky

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Fresh samples of 16 wild edible plants were assayed for Ascorbic Acid and 10 plants were assayed for Vitamin A. Many of the plants were found to be rich sources of these vitamins when compared with some common garden fruits and vegetables.

INTRODUCTION

There is a renewed awareness today of the value of natural resources, and this realization has led to experimentation with and an increased utilization of wild plants as food sources (3, 4, 6, 7, 8, 9, 13, 17). In some areas of the United States the utilization of such foods is not new. The practice has been handed down through generations and is undoubtedly a carry-over from the times when some pioneers and American Indians subsisted wholely on native foods. Wild spring greens are often available several weeks before garden varieties and are used extensively by individuals familiar with them. Dandelion and wild Asparagus are common foods to some people. Tender Poke greens and Lambs-quarters are consumed in such quantities by some families that they are a standard part of the diet—often being preferred to garden greens. Non-cultivated fruits such as blackberries, blueberries and plums are collected in sufficient quantities to be used in preserving for a winter home supply or for sale on the market. We utilize edible wild plants on a regular basis and, in fact, are delighted when various species are in their prime.

Books on wild edible plants often contain such statements as, "Rose hips are rich in vitamin C," or "Sassafras leaves are antiscorbutic," but only a few references have included quantitative analysis of tested wild foods of particular vitamins, minerals and/or other ingredients (1, 6, 12). Some references are difficult to locate (11) and some do not include details of the assay procedures (3, 6, 17). At best there is a paucity of information regarding the nutritive values of wild plants, and it is for the purpose of extending the knowledge of vitamin content of commonly consumed wild plants that the study was undertaken.

PLANTS USED

A selection of wild foods utilized in southern Ohio and northern Kentucky were analyzed for their content of the vitamin A precursor, β carotene, and ascorbic acid. The plants were chosen because of their availability at the time of the experiment and because their vitamin content was expected to be high. No effort was made to exhaust all the usable species of the area and no effort was made to follow the level of vitamins in the plants through their growing season, although there are values reported for several plants collected at different stages of development.

Table I lists the plants assayed with the following information—common names used in the southern Ohio and northern Kentucky area, the part of the plants used, and the time of year when the plants are usually collected for food. Specimens of all plants are on file in the herbarium of the University of Cincinnati.

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Table I

Vitamin A and Ascorbic Acid values for some edible wild plants

Name	Part Used	Season Collected	Vitamin A Units/100 g	Ascorbic Acid mg/100 g
Alliaria officinalis L. Cruciferae (Garlic Mustard)	(1) Leaves and tops just prior to flowing (2) Basal leaves	(1) Spring (2) All year	8,600 (3) 12,000 19.000	190
Allium vineale L. Liliaceae (Onion Grass)	Leaves	All year (best in early spring)		130
Allium tricoccum Ait. Liliaceae (Ramps or Wild Leeks)	Leaves	Spring		80
Barbarea vulgaris R. Br. & *Barbarea verna* Asch. Cruciferae (Winter Cress)	Basal leaves	Late winter and early spring		130 (1)
Capsella bursa-pastoris Medic. Cruciferae (Shepard's Purse)	Basal leaves of first year plants	Late winter and early spring	5,000	91
Cercis canadensis L. Leguminosae (Redbud, Judas Tree)	Flowers	Early spring		69 82
Chenopodium albidum L. Chenopodiaceae (Goosefoot, Lambs-quarters)	(1) Whole young plants (2) Tops of older plants	(1) Early spring (2) Later in year	14,000 16,000	130 66 (2) 71 (2)
Chyrsanthemum Leucanthemum L. Compositae (Ox-eye Daisy)	Basal	Late winter and early spring	7,000 12,000	23
Duchesnea indica Focke. Rosaceae (Indian Strawberry)	Leaves	All year (best in spring)		79
Glechoma hederacea L. Labiatae (Ground Ivy)	Leaves	All year	14,000	44
Lactuca scariola L. Compositae (Wild Prickly Lettuce)	Basal leaves	Early spring	9.700	41 44
Oxalis stricta L. Oxalidaceae (Sour Grass)	Leaves	All year		59 (2) 79 (2)
Physalis pubescens L. Solanaceae (Ground Cherry)	Ripe fruit only	Late fall and early winter	3,200 2,200	
Plantago major L. Plantaginaceae (Plantain)	Leaves	Early spring	10,000 11,000	19 (2) 19
Portulaca oleracea L. Portulacaceae (Purslane)	Overground plant prior to flowering	Spring and winter	6,100 8,300	26 (2)
Stellaria media Cyrill Caryophylaceae (Chickweed)	Overground plant	All year (best in spring)		37 49
Viola papilionacea Puesh. Violaceae (Common Blue Violets)	Basal leaves	All year (best in spring)	15,000 20,000	130 (2) 264

(1) Plants collected the day before the assay.
(2) Values from old plants that had gone to seed.
(3) Value from plants collected in late winter.

METHODS

Collection of plant material.[2] Parts of the plant suitable and most desirable for human consumption were used in all cases. In general this consisted of young, tender parts; discolored and insect-damaged portions were discarded. Most of the samples were collected just prior to or during the flowering period, because it was expected that the vitamin content would be at its highest level at that time (1, 14). Some plants were not at their prime when the field trips were made or when the assays were being done, and for that reason portions were collected from some older plants, ones that had gone to seed, with this difference noted in Table I. All plants were collected within a 50-mile radius of Cincinnati and taken directly to the laboratory. The analysis was done immediately upon arrival and, with one exception as noted on Table I, all values reported are for fresh samples.

Chemical assays, Vitamin C. The method used for the ascorbic acid determination was that of the Association of Vitamin Chemists (2, 15), a 2,6-dichloroendophenol method that measures only reduced ascorbic acid. The dehydroascorbic acid method of Roe and Oesterling (2) was not used because the plants usually were analyzed within ten or fifteen minutes of collection and, consequently, the amount of dehydroascorbic acid would have been small in comparison with what it would have been in older or frozen samples. The dehydroascorbic acid method is open to question because the biological activity of the vitamin is impaired once the ascorbic acid is oxidized to the dehydro form in the plant leaf (16).

Vitamin A. The method used for the assay of a vitamin A precursor follows that of Strohocker and Henning (14) and the Association of Vitamin Chemists (2). Extracted carotene was measured against a highly purified sample of "100% type VI beta-carotene obtained from carrots"[3] using a Spectronic 20 spectrophotometer at wave length 436 nm. Carotenes from several samples were collected and measured against the purified beta-carotene standard using a Coleman U.V. spectrophotometer, Model 124. The scans of the extracted carotenes were qualitatively indistinguishable from that of the standard, indicating that beta-carotene was the principal extracted carotene. Units of vitamin A were calculated by multiplying the mcg/100 g of beta-carotene by 1.6 (2).

[2] The authors are indebted to Warren Wells, Chief Naturalist, Hamilton County Park Board, for help in identifying several plants used in this study.

[3] Sigma Chemicals.

RESULTS

Results of the assays are seen in Table I. For those plants of which a single collection was made, a single value is given. This value represents the average of three assayed portions. For those plants having unusually high vitamin contents, additional collections and assays were performed. Only the high and low values obtained from the various different collections are given.

CONCLUSIONS AND DISCUSSION

The carotene values of ten edible wild plants were determined. On a weight basis, six had higher values for carotene than spinach (16), which is reported to have the highest vitamin A level of the widely marketed garden vegetables (see Table II). For the following plants—*Alliaria officinalis, Capsella bursa-pastoris, Chenopodium albidum, Chrysanthemum leucanthemum, Glechoma hedaracea, Lactuca scariola, Plantago major, Portulaca oleracea,* and *Viola papilionacea*—each could provide for at least a daily dietary allowance (5,000 units) of vitamin A (5) in a 100 g sample. One collection of *Viola papilionacea* contained

TABLE II

VITAMIN A AND ASCORBIC ACID VALUES FOR SOME COMMON GARDEN FRUIT AND VEGETABLES (15)

	Vitamin A, Units/100 g	Ascorbic Acid mg/100 g
Celery	240	9
Iceberg lettuce	330	6
Leaf lettuce	1,900	18
Green onions	2,000	32
Green peppers	240	128
Spinach	8,100	51
Oranges	200	50
Tomatoes	900	23

a daily dietary allowance in a 25 g quantity.

The ascorbic acid values of 16 edible wild plants were determined. When compared with oranges, on a weight basis, ten of the wild plants had higher values of vitamin C: *Alliaria officinalis, Allium vineale, Allium tricoccum, Barbarea vulgaris, Capsella bursa-pastoris, Cercis canadensis, Chenopodium albidum, Duchesnea indica, Oxalis stricta,* and *Viola papilionacea.* Each would provide more than a daily dietary amount of vitamin C in a 100 g sample of the food for an average man or for a woman during pregnancy and lactation (60 mg) (5).[4]

The edible wild plants tested have relatively high carotene or ascorbic acid values or both and could be useful components of the diet, particularly for rural families. Most of the plants are found in abundance in Ohio and Kentucky, and collection of a mess for a family sufficient to provide a daily dietary allowance of the vitamins would be a relatively easy task. Many of the plants may be collected in late winter or early spring when commercial sources of fresh foods may be scarce or expensive and a supply of vitamins from purchased foods may be relatively low. Preferably the plants should be consumed prior to wilting or aging so that the palatability and vitamin content would be high.

[4] One sample of *Oxalis stricta* had a value of 59 mg/100 g, which would be one milligram short of the recommended daily dietary allowance.

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