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Research Article

Determination of the Nutrition Contents of the Wild Plants Used as Vegetables in Upper Çoruh Valley

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Abstract: This study was undertaken in order to investigate wild plant species locally consumed as food in Upper Çoruh Valley. The plant species were collected in the late winter and spring, and their taxonomic identifications were made. The plants identified were *Plantago minor* L., *Polygonum bistorta* L., *Astrodaucus orientalis* L., *Camelina rumelica* Boehm., *Lathyrus tuberosus* L., *Galium rotundifolium* L., *Chenopodium album* L. and *Chenopodium album* L. Analyses were carried out to evaluate the nutritional values of the plant parts. The highest dry matter, ascorbic acid, nitrogen, protein, phosphorus and potassium contents were determined to be 20.87 g.100 g^{-1}, 161.25 mg.100 g^{-1}, 1.08 g.100 g^{-1}, 6.75 g.100 g^{-1}, 66.09 mg.100 g^{-1} and 1544.38 mg.100 g^{-1} in *L. tuberosus*, respectively. *A. orientalis* had the highest iron (7.12 mg.100 g^{-1}), manganese (0.90 mg.100 g^{-1}) and copper (0.47 mg.100 g^{-1}) contents. *C. album* was the richest in magnesium and sodium contents. Calcium was abundant in all species. The maximum amount of zinc was determined to be 1.57 mg.100 g^{-1} in *C. rumelica*.

Key Words: edible wild plants, nutritional value, Çoruh Valley

Yukarı Çoruh Vadisinde Sebze Olarak Kullanılan Yabani Bitkilerin Besin Değerlerinin Belirlenmesi

Özet: Bu araştırmada, yukarı çoruh havzasında sebze olarak kullanılan 8 yabani bitki türü (*Plantago minor* L., *Polygonum bistorta* L., *Astrodaucus orientalis* L., *Camelina rumelica* Boehm., *Lathyrus tuberosus* L., *Galium rotundifolium* L., *Chenopodium album* L. ve Sisymbrium officinale L.) tespit edilmiştir. Kış sonu ve ilkbaharda toplanan bitkiler teşhisi yapıldıktan sonra besin değerlerinin saptanması amacıyla birtakım analizlere tabi tutulmuşlardır. Kuru madde, askorbik asit, azot, protein, fosfor ve potasyum içeriği bakımından *L. tuberosus*; demir, mangan ve bakır içeriği bakımından *A. orientalis*; mağnezyum ve sodyum içeriği bakımndan *C. album*; çinko içeriği bakımından ise *C. rumelica* incelenen diğer bitkilere oranla daha zengin bulunmuştur.

Anahtar Sözcükler: yenen yabani bitkiler, besin değeri, Çoruh Vadisi

Introduction

Modern agricultural technology and marketing have caused a reduction in the genetic diversity of plant species, especially in vegetables, worldwide (Peron, 1992; Sun and Hang, 1998; Hang et al., 1998). Wild plants with a desired gene (resistance to diseases etc.) may be used in breeding programmes. Williams (1993) emphasized the need to preserve new plant resources to broaden the biological diversity in human nutrition.

Recently a resurgence of interest has developed in wild species for their possible medicinal values in diets. Wild plant species provide minerals, fibre, vitamins and essential fatty acids and enhance taste and colour in diets. In addition, they have anti-bacterial, hepatoprotective and anticarcinogenic properties, and therefore having medicinal values (Green, 1992; Bianco et al., 1998).

The Turkish flora consists of over 9,000 species. These plants are traditionally used as food and fuel

(Wetherilt and Pala, 1994). Many local wild plants have been used as salad and vegetable dishes prepared in traditional recipes in Turkish cuisine (Wetherilt, 1992). Approximately 40 wild plants are consumed as vegetables in Turkey (Abak and Düzenli, 1989). Çolakoğlu and Bilgir (1977) and Gürses and Artık (1984) pointed out that some plants used as vegetables in the Aegean region contain significant amount of minerals and vitamins. Furthermore, in the north-east and south-west of Turkey, wild plants consumed as vegetables and their mineral and ascorbic acid contents were investigated in relation to their nutritional values in previous studies (Alan and Padem, 1989; Alan and Padem, 1990; Padem and Yıldırım, 1996).

The aim of this study was to determine the wild plants consumed as vegetables in Upper Çoruh Valley and to investigate their nutritional value.

Materials and Methods

Eight wild plants growing in Upper Çoruh Valley and their use as edible plants were investigated in this study in 1999 (Table 1). The plant species were collected from cultivated fields, roadsides and pastures. Taxonomic identifications of these plants were made by Assoc. Prof. Dr. Hüseyin Zengin according to "Flora of Turkey (Davis, 1965-1985; Davis et al. 1988)" in Atatürk University, Faculty of Agriculture, Department of Plant Protection. After harvesting, plants were separated into two groups: edible and discarded parts. The latter generally consisted of older leaves that were removed during normal food preparation. Ascorbic acid content and pH of the plants were determined according to Anon (1988). All plant materials were dried in an oven at 65ºC until a constant mass was reached and then they were ground for chemical analysis (Williams, 1993). Total nitrogen was determined using the micro-Kjeldahl method. After plant samples were wet-fired with nitric-perchloric acid, P was determined spectrophotometrically. K, Ca, Mg, Fe, Na, Mn, Zn and Cu contents were determined using an atomic adsorption spectrophotometer. Protein contents of the plant species were determined by multiplying N contents by a coefficent of 6.25 (Kacar, 1972; Frank, 1975).

Results

Type of use and edible parts of collected plants are reported in Table 1. Dry matter varied depending on the plants. The maximum dry matter content (20.87 $g.100g^{-1}$) was observed in *Lathyrus tuberosus* L. while *Chenopodium album* L. had the lowest (11.89 $g.100g^{-1}$). The highest pH value (6.50) was found in *Astrodaucus orientalis* L. and the lowest (3.50) in *Polygonum bistorta* L. Ascorbic acid contents differed in the plant species tested, ranging from 161.25 mg.100g-1 in *Lathyrus tuberosus* L. to 11.25 $mg.100g^{-1}$ in *Plantago minor* L. *Galium rotundifolium* L. contained the lowest protein value (3.50 $g.100g^{-1}$), whereas *Lathyrus tuberosus* L. had the highest (6.75 $g.100g^{-1}$) (Table 2). All species studied appeared to have exceptionally high levels of protein when compared with the common vegetables (spinach, cabbage, parsley and lettuce) presented in Table 3 (Lorenz and Maynhart, 1980; McCollum, 1992).

The values of minerals which are important for human nutrition are presented in Table 4. *Lathyrus tuberosus* had the highest concentration of N (1.08 $g.100g^{-1}$) followed by *Polygonum bistorta* (0. 71 $g.100g^{-1}$), *Astrodaucus orientalis* L. (0.67 $g.100g^{-1}$) and *Camelina*

Table 1. Wild plant species and their utilized parts.

Scientific name	Family	Common name	Edible part(1)	Type of use(2)
Plantago minor L.	Plantaginaceae	Siğil yaprağı	L	C
Polygonum bistorta L.	Polygonaceae	Ekşili	L S	C, S
Astrodaucus orientalis L.	Umbelliferae	Gımmi	S R	S
Camelina rumelica Boehm.	Cruciferae	Gelincik	L	C, S
Lathyrus tuberosus L.	Leguminosae	Gazgız	L S	S
Galium rotundifolium L.	Rubiaceae	Sarmaşık	L S	C
Chenopodium album L.	Chenopodiaceae	Loputa	L	C
Sisymbrium officinale L.	Cruciferae	Yabani marul	L	C

(1) Edible Portion: L=leaves, S=stems, R=roots
(2) Kind of Use: C=cooked, S=raw as salads

Table 2. Contents of dry matter (g.100g^{-1}), ascorbic acid (mg.100g^{-1}), protein (g.100g^{-1}) and pH of wild plant species(1).

Species	Dry Matter	Ascorbic Acid	PH	Protein
P. minor	17.19	11.25	5.84	3.56
P. bistorta	17.23	54.37	3.50	4.44
A. orientalis	16.31	14.25	6.50	4.19
C. rumelica	13.12	33.75	5.68	4.00
L. tuberosus	20.87	161.25	5.48	6.75
G. rotundifolium	12.65	53.62	5.37	3.50
C. album	11.89	42.38	6.32	3.69
S. officinale	14.64	61.13	6.04	3.69

(1) The values presented in this table are on dry weight for the protein and on fresh weight for the dry matter and ascorbic acid

Table 3. Protein (g.100 g^{-1}) mineral and ascorbic acid contents (mg.100 g^{-1}) of some selected cultivated vegetables.

Species	Protein	P	K	Ca	Fe	Na	Mg	Ascorbic acid
Lettuce	1.6	25	264	68	1.4	9	11	18
Spinach	2.9	51	470	93	3.1	71	66	51
Parsley	2.2	63	727	219	6.2	45	14	172
Cabbage	1.2	29	233	49	0.4	20	21	47

The values shown in this table are cited from Lorenz and Maynhart (1980) and McCollum (1992).

Table 4. N (g.100 g^{-1}) and the other mineral concentrations (mg.100 g^{-1}) of wild plant species(1).

Species	N	P	K	Mg	Ca	Na	Fe	Zn	Mn	Cu
P. minor	0.57	60.74	714.53	52.43	307.70	1.54	5.03	0.88	0.68	0.09
P. bistorta	0.71	45.37	542.88	48.24	152.77	1.77	6.10	0.84	0.85	0.09
A. orientalis	0.67	48.39	1145.61	48.30	268.03	3.26	7.12	0.85	0.90	0.47
C. rumelica	0.64	49.86	1025.98	45.67	207.30	1.88	3.66	1.57	0.39	0.08
L. tuberosus	1.08	66.09	1544.38	43.13	228.87	2.01	2.54	0.60	0.78	0.07
G. rotundifolium	0.56	34.57	853.88	30.78	169.08	2.59	2.51	0.48	0.32	0.05
C. album	0.59	46.37	855.29	112.17	178.75	4.14	4.79	0.75	0.55	0.04
S. officinale	0.59	47.33	578.28	35.14	179.58	1.46	2.29	0.49	0.36	0.05

(1) The values presented in this table were on dry weight for the N and on fresh weight for the other minerals.

rumelica (0.64 g.100g^{-1}). With regard to P, the richest source was found in *Lathyrus tuberosus* (66.09 mg.100g^{-1}) followed by *Plantago minor* (60.74 mg.100g^{-1}), *Camelina rumelica* (49.86 mg.100g^{-1}) and *Astrodaucus orientalis* (48.39 mg.100g^{-1}). *Galium rotundifolium* had the lowest concentration of P (34.57 mg.100g^{-1}). When compared with several cultivated vegetables, *Lathyrus tuberosus* had a higher P content (Tables 3 and 4).

K content varied on the basis of species. The lowest K content was determined to be 542.88 mg.100g^{-1} in *Polygonum bistorta*. The highest content of K (1544.38 mg.100g^{-1}) was in *Lathyrus tuberosus*. *Astrodaucus orientalis* with 1145.61 mg100g^{-1} and *Camelina rumelica* with 1025.98 mg.100g^{-1} were superior to the other wild plant species. All wild species showed higher K contents than lettuce, spinach and cabbage. Mg values ranged from 112.17 mg.100g^{-1} in *Chenopodium album* to 30.78

mg.100g^{-1} in *Galium rotundifolium*. *Plantago minor* contained the highest Ca value (307.70 mg.100g^{-1}), whereas *Polygonum bistorta* had the lowest value (152.77 mg.100g^{-1}). Ca and Mg levels of the wild plants studied were often higher than those of cultivated greens (Tables 3 and 4).

Species varied in their Na content averaging 4.14, 3.26, 2.59 and 2.01 mg.100g^{-1} for *Chenopodium album*, *Astrodaucus orientalis*, *Galium rotundifolium*, and *Lathyrus tuberosus*, respectively and 1.46 mg.100g^{-1} for Sisymbrium officinale. With respect to Fe content, *Astrodaucus orientalis* with 7.12 mg.100g^{-1} was the richest, followed by *Polygonum bistorta* L. (6.10 mg.100g^{-1}), *Plantago minor* (5.03 mg.100 g^{-1}) and *Chenopodium album* (4.79 mg.100g-1) (Table 4).

Camelina rumelica had the highest Zn value (1.57 mg.100g^{-1}), whereas *Galium rotundifolium* had the lowest (0.48 mg.100g^{-1}). The highest content of Mn was in *Astrodaucus orientalis* (0.90 mg.100g^{-1}). On the other hand, the lowest Mn content was found in *Galium rotundifolium* (0.32 mg.100g^{-1}). The Cu value of *Astrodaucus orientalis* (0.47 mg.100g^{-1}) was 5-10 times higher than that of the others. The Cu contents of *Galium rotundifolium* and *Sisymbrium officinale* were similar (0.05 mg.100g^{-1}); *Chenopodium album* contained the lowest Cu content (0.04 mg100g^{-1}) (Table 4).

Discussion

Data obtained from wild plants show that they have a very high nutritional potential, and their nutritional value is greater than that of some green cultivated vegetables presented in Table 3. With respect to their mineral content, these wild plants may offer a better nutritional potential. For instance, *Lathyrus tuberosus* is a very important source of ascorbic acid, protein, N, P and K. Ca was abundant in all species studied.

Splittstoesser (1990) reported that 60 mg vitamin C, 750 mg Ca and 10 mg Fe are required daily by humans. Therefore, 37 g *Lathyrus tuberosus*, 244 g *Plantago minor* and 140 g *Astrodaucus orientalis* could meet the daily recommended vitamin C, Ca and Fe requirements. Many studies suggest a relationship between high dietary K intake and lower blood pressure and protection from the risk of stroke (Splittstoesser, 1990; Williams, 1993). Due to the high content of K, all species could meet the daily K requirements of an adult.

There are many choices of vegetable sources, but today many of them are neglected because of the preference towards uniform characteristics in modern agricultural technology and marketing. Therefore, it is of utmost importance to determine the wild plants locally consumed as vegetables.

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