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Some Wild Edible Plants and Their Dietary Fiber Contents

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Abstract: Wild plants are important in terms of human nutrition and folk medicine in Turkey. Especially the ones collected from rural areas and sold in the market are rich sources of dietary fiber important for human health. In this study, the dietary fiber contents of 13 different plants consumed frequently were determined by enzymatic-gravimetric method. The lowest amounts of insoluble fiber was found in *Trachystemon orientalis* L. and *Nasturdium officinale* and the highest was found in *Polygonum cognatum*. *Nasturdium officinale* was determined to have the lowest amount of soluble fiber, whereas *Trachystemon orientalis* L. had the highest. The lowest amount of total dietary fiber was found in *Nasturdium officinale* and *Chenopodium album* L. and the highest was found in *Polygonum cognatum* Meisn. and *Trachystemon orientalis* L. Overall, it was shown in this study that edible wild plants are rich sources of both soluble and insoluble fibers which have been proven to have positive health effects and help prevent many frequently seen diseases. These results suggest that besides their current use, edible wild plants can also be utilized as ingredients in developing new functional food products.

Key words: Wild edible plants, dietary fiber, nutrition, health

INTRODUCTION

Turkey is one of the countries with the richest flora in Europe and Middle East due to its climate and geographical position, where wild edible plants have been used as a source of food from ancient times (Dogan *et al*., 2004). The Turkish flora consists of over 9000 plant species. Approximately 40 wild plants are consumed as vegetables in Turkey (Turan *et al*., 2003). These plants have been used as food, dye, ornamental and medicinal purposes by people since ancient times. Many local wild plants have been used as salad and vegetable dishes prepared in traditional recipes in Turkish cuisine. Wild plant species provide minerals, vitamins and essential fatty acids and enhance taste and colour in diets (Ozbucak *et al*., 2007), as well as being mainly a good source of dietary fiber.

Plant fibers are integral parts of many foods. Although they are usually considered to be non-nutritive, they have important influences on the metabolism of both carbohydrates and lipids. Fibers from various plant sources have very different chemical structures, physicochemical properties and physical states. These differences are important in determining the physiological effects of individual types of fiber. Based on water solubility or extractability, plant fibers can be divided into soluble fibers and insoluble fibers (Chen and Anderson, 1981). Soluble dietary fibers include pectic substances, gums, mucilage and some hemicelluloses, whereas cellulose, other types of hemicelluloses and lignin are included in the insoluble fraction (Elleuch *et al*., 2011).

Dietary fiber is from the family of carbohydrates, a non-starch polysaccharide, not digested in the small intestine but may be fermented in the colon into short chain fatty acids such as acetate, propionate and butyrate (Trinidad *et al*., 2006). Dietary fiber has been shown to have important health implications in the prevention for risk of chronic diseases such as cancer, cardiovascular diseases and diabetes mellitus (Mahattanatawee *et al*., 2006; Trinidad *et al*., 2006). Besides, dietary fiber has the ability to bind with bile acids and prevents its reabsorption in the liver, which inhibits cholesterol synthesis. Among the short chain fatty acids produced, butyrate enhances cell differentiation thus prevents tumor formation in the colon and propionate has been shown to inhibit the activity of the enzyme HMG CoA reductase, the limiting enzyme for cholesterol synthesis. Dietary fiber also enhances water absorption in the colon, thus prevent constipation (Trinidad *et al*., 2006). It has been reported that including fruits and vegetables in the human diet may be beneficial, based on their dietary fiber content, with regard to some cancers. The National Research Council set Dietary Reference Intakes for the first time for dietary fiber determining that “adequate intakes” (AI) for dietary fiber be based on 14 g dietary fiber per 1,000 calories. The Food and Drug Administration (FDA) set a daily reference value on food labels for fiber at 25 g for a 2,000 calorie diet. Five grams or more fiber per serving is considered a significant amount (Mahattanatawee *et al*., 2006).

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Edible wild plants consumed mainly by people in rural areas of Turkey are good sources of dietary fiber significant for human health. This study aimed to determine the dietary fiber levels of some edible wild plants commonly consumed in the Black Sea Region of Turkey. For that purpose, the soluble and insoluble dietary fiber contents of 13 different edible wild plants were determined by enzymatic-gravimetric method.

MATERIALS AND METHODS

In this research, the content of total, insoluble and soluble dietary fibers in edible parts of thirteen edible wild plants was studied. The plants' scientific names, local and English names, parts consumed and type of consumption are given in Table 1. The plants were harvested in April 2013 from 3 different regions in Black Sea Region, Samsun. The plants were washed, blotted dry and the non-edible portions were separated and discarded.

Chaerophyllum byzantinum Boiss. (fam. Apiaceae): Chaerophyllum byzantinum Boiss. (fam. Apiaceae) is a perennial herbaceous plant. It is an euxine/(montane) floral element endemic from North and Northwestern Turkey to Bulgaria. Its natural habitat are woody regions, river banks, moist ravines and ditch sides between 350 and 1,350 m. It is consumed as flavouring or vegetable (Gladis and Pistrick, 2011).

Bellis perennis L. (fam. Asteraceae): Bellis perennis L. (fam. Asteraceae) is a perennial native herbaceous plant in Brazil, Europe, Turkey, Cyprus, Azerbaijan and Syria. The flower heads close at night and in wet weather. It is variable in size of the capitulum and the color of ligules. It has red, red purple, white or pink flowers (Kavalcioglu *et al*., 2010).

The leaves grow in a rosette form Shoots develop from the axils of some leaves. Daisy can produce runner. The plants remain winter green and continue to grow. It has been used in folk medicine in the treatment of rheumatism and as an expectorant. Daisy is used medicinally for external application to wounds. This plant uses in the treatment of rheumatism and has an expectorant effect, anticonvulsant effects, antiecchymotic and antifungal effects (Zangenehgheshlaghi *et al*., 2012).

Trachystemon orientalis L. (fam. Boraginaceae): Trachystemon orientalis L. (fam. Boraginaceae) is distributed in East Bulgaria and West Caucasia and in various habitats in the Black Sea region in Turkey. The individuals of this species are 30-40 cm high, perennial hairy plant with rhizome root structure, broad-leaf and blue-red flower. Plant stems with flower buds and leaves are used extensively as a vegetable in different cities of Black Sea Region in Turkey. Also its roots and petioles are consumed as pickle. It is commonly grow up in 50 to 1000 m altitude, moist, shaded dense forests and river edges. The rhizomes of *T. orientalis* L. are used as reproductive organs in spite of it being a flowering species. The species occurs in habitats with low light intensity and so it cannot produce enough seed. In humans, it has the effects of enhancing urine, blood purifier and fewer-lowering. It consists of tannins, essential oil, nitrate salts, mucilage, saponins and resin (Akcin *et al*., 2004; Onaran and Yilar, 2012).

Nasturdium officinale (fam. Brassicaceae): Nasturdium officinale (fam. Brassicaceae) is a perennial plant that grows in Europe and some parts of Asia (Sadeghi *et al*., 2014). It is thrives in clear, cold water and is found in ditches and streams every where. Watercress is cultivated for its leaves, which are principally used as salad greens or garnishes. Connected to a creeping rootstock, the hollow, branching stem, 1-2 feet in length, generally extends with its leaves above the water. The smooth, somewhat fleshy, dark green leaves are odd-pinnate with 1-4 pairs of small, oblong or roundish leaflets. Watercress is a valuable source of vitamins and a good detoxifying herb. Its high content of vitamin C and minerals makes it a remedy that is particularly valuable for chronic illnesses. The plant is thought to stimulate the appetite and relieve indigestion, to help in cases of chronic bronchitis, to be generally stimulating and to act as a powerful diuretic (Shahrokhi *et al*., 2009). The leaves of the plant also are broadly used as a diuretic, expectorant and anti-diabetic agent. Several studies propose hepatoprotective and beneficial effects of watercress in the management of some types of cancer (Sadeghi *et al*., 2014).

Chenopodium album L. (fam. Chenopodiacea): Chenopodium album L. (fam. Chenopodiacea) is an glabrous, mealy or glandular herb. This species is 15-100 cm of height. It occurs in the moisture places and the corn fields. The green leaves of the plant are consumed as vegetables by people, as well as being used as medical plant (Ozbucak *et al*., 2007) such as anti-inflammatory for kidney (Simsek *et al*., 2002); for blood-cleaning, preventing constipation, healing and against eczema and eye inflammations (Kaya *et al*., 2004).

Malva neglecta Wallr. (fam. Malvaceae): Malva neglecta Wallr. (fam. Malvaceae) is a perennial, herbecious and purple flowered plant. Its leaves are long and penniferous. It has a smooth smell and bland taste (Alan and Padem, 1989). It contains mucilage, glucose and pectin and has protective and softening effect due to its mucilage content (Kaya *et al*., 2004). It is used in folk medicine for preventing hemorrhoid and kidney inflammations (Simsek *et al*., 2002); respiratory and

digestion system irritations; decreasing the pain for boils and wounds (Kaya *et al*., 2004) and against throat inflammations, rheumatism, eczema, cough, common cold and bronchitis (Malyer *et al*., 2004).

Papaver rhoeas L. (fam. Papavereceae): Papaver rhoeas L. (fam. Papavereceae) is an annual herbecious plant of about 25-30 cm length with red flowers. Its fruits are yellow, dark and kidney shaped. Its petals contain gum, sugar, mucilage and alkaloids. Its dried leaves are consumed by mixing with honey. Syrup, liqueor and oral rinses are made from its flowers (Kaya *et al*., 2004). In folk medicine, it is used for bronchitis and breath shortness (Simsek *et al*., 2002); decreasing the symptoms of cough and cold (Kaya *et al*., 2004) and rheumatism (Kultur, 2007).

Polygonum cognatum Meisn. (fam. Polygonaceae): Polygonum cognatum Meisn. (fam. Polygonaceae) is a pink flowered perennial plant with its stem sloped along the soil. Its leaves are eliptical, short stemmed and generally sharp ended. Its flowers are stacked as clumps and of 4-5 mm length (Demir, 2006). It is widespread in the roadsides, the slopes, the cliffs and the cultivated lands. The fresh leaves and the stem of plant are consumed as vegetables. The dried plant is used in traditional medicine (Ozbucak *et al*., 2007).

Rumex patientia L. (fam. Polygonaceae): Rumex patientia L. (fam. Polygonaceae) is a plant with length of up to 30 cm and with leaves growing through the root. Petiols can rise up to 40-50 cm. Its flowers are small and green and located in the same order at the top. The seeds are bown colored. The plant is rich in vitamins A and C (Aktan and Bilgir, 1978) and used for diabetes (Simsek *et al*., 2002).

Rumex crispus L. (fam. Polygonaceae): Rumex crispus L. (fam. Polygonaceae) is a perennial plant with length 30-150 cm. Its leaves are acute and narrowly lanceolate to oblanceolate. Petioles are canaliculate above and their inflorescence is dense. The pedicels are longer than the fruiting perianth segments and articulate below the middle. Fruiting perianth segments cordate to triangular, at least one tuberculate, 4-5x 3-4 mm. It can grow on banks, marshes and waste places and can be found at altitudes of up to 2300 m. Its young leaves are cultivated in spring and used as a vegetable, whereas the seeds of this plant are cultivated in the summer and used in Turkish folk medicine (Yildirim *et al*., 2001) especially for the treatment of headache and to promote maturation abscess and wound healing (Kupeli *et al*., 2007). On the other hand, it has been reported by Guil *et al*. (1997) that *Rumex crispus* L. has caused fatal poisoning through ingestion of the plant material. Among the pathological findings were centrolobular hepatic necrosis and birefringent crystals in the liver and kidneys (Guil *et al*., 1997).

Smilax excelsa L. (fam. Smilacaceae): Smilax excelsa L. (fam. Smilacaceae) is a climbing scrub up to 20 m. It occurs in the deciduous forests, the scrubs and the roadsides (Ozbucak *et al*., 2007). Its leaves are in the shape of arrow with short petioles (Baytop, 1984). The shoots of the plant are consumed as vegetables (Ozbucak *et al*., 2007). It is also known as a medical and economic plant (Ozbucak *et al*., 2007) and used in folk medicine for treatment of breast cancer and stomach ache (Yesilada *et al*., 1999).

Falcaria vulgaris Bernh. (fam. Umbelliferae): Falcaria vulgaris Bernh. (fam. Umbelliferae) is an annual, biannual or perennual plant with 25-100 cm length. It is often found in dry areas, fruit and vegetable growing areas, farmlands and vineyards (Ustun and Tosun, 1997; Khazaei and Salehi, 2006). In addition to being consumed as vegetable, it is used for healing of skin ulcer, stomach disorders including peptic ulcer, liver diseases and stones of kidney and bladder in folk medicine (Khazaei and Salehi, 2006).

Urtica dioica L. (fam. Urticaceae): Urtica dioica L. (fam. Urticaceae) is an annual plant growing to 0.6 m tall shrub. It occurs as a perennial plant in temperate zones of Asia, America and Europe. It bears opposite, cordate, deeply serrate, pointed leaves which are downy underneath. Its flowers are monoecious and are pollinated by wind. The stem and leaves of the plant are covered with stinging trichomes. The plant generally grows on loose soil with organic matter rich in nitrogen and high phosphate levels for rapid growth. The plant has great economic potential due to its multi-utilitarian nature. It is also of great medicinal value (Bisht *et al*., 2012). It is used to treat stomachache in Turkish folk medicine. In addition, it is used to treat rheumatic pain and for colds and cough and is used against liver insufficiency (Gulcin *et al*., 2004). Its roots is used for nephritis, stomach ache, urea, prostatitis and baldness (Kultur, 2007). It has been reported that the fluid present in the trichomes consisting of histamine, 5-hydroxytryptamine, acetylcholine, small amount of formic acid and leukotrienes enters the skin and causes blistering (Bisht *et al*., 2012).

Moisture determination: The moisture content in all the fresh plants employed in the present study was determined by drying at 105°C to constant weight (AOAC, 2000). Analyses were done in triplicate.

Dietary fiber determination: The freeze-dried samples of various plants were pulverized using a Waring blender, to pass through a 100-mesh sieve. It was

analyzed by the AOAC enzymatic-gravimetric method (Prosky *et al*., 1992) using protease, heat-stable alpha-amylase and amyloglucosidase to remove protein and starch. Remaining residues were separated by centrifugation (15 min, 22°C, 3000 *g*) and the supernatants were dialyzed to avoid losses of soluble dietary fiber. Insoluble dietary fiber was quantified gravimetrically. The dietary fiber values were expressed as percentage of edible dry matter.

Statistics: The analysis results are means of three measurements. To verify the statistical significance of all parameters, the values of means, 95% confidence intervals of means and ±standard deviation were calculated. To compare several groups, analysis of variance (one way ANOVA) was used. p-values of less than 0.05 were considered statistically significant. Duncan's multiple range test was employed to examine the level of significance between each edible plants. All statistical analyses were performed with SPSS 16.0 programe.

RESULTS AND DISCUSSION

Table 2 shows the mean values of the soluble, insoluble and total dietary fiber contents with standard deviations. Soluble dietary fiber contents of all samples (except *Trachystemon orientalis* L.) were lower than the respective insoluble ones. The lowest amounts of insoluble fiber were found in *Trachystemon orientalis* L. (17.90 g/100 g, DW) and *Nasturdium officinale* (19.22 g/100 g, DW) and the highest was found in *Polygonum cognatum* Meisn. (32.27 g/100 g, DW) followed by the *Bellis perennis* L. (31.78 g/100 g, DW), *Falcaria vulgaris* Bernh. (31.12 g/100 g, DW) and *Rumex patientia* L. (28.84 g/100 g, DW). The lowest amount of soluble fiber was determined in *Nasturdium officinale* (2.09 g/100 g, DW), whereas the highest was found in *Trachystemon orientalis* L. (20.31 g/100 g, DW). *Nasturdium officinale* (21.31 g/100 g, DW) and *Chenopodium album* L. (24.45 g/100 g, DW) were determined to have the lowest total fiber content, whereas *Polygonum cognatum* Meisn. (42.26 g/100 g, DW) and *Trachystemon orientalis* L. (38.21 g/100 g, DW) had the highest amount.

The soluble, insoluble and total dietary fiber contents of the analysed edible wild plants had statistically significant differences ($p<0.05$). It was mentioned by Khanum *et al*. (2000) that the wide variation in dietary fiber contents observed was dependent on several factors such as type of plants, stage of maturity, varietal differences and environmental and seasonal factors.

As the dietary fiber contents of the edible wild plants analysed were compared with the values reported by other research groups, it was seen that the total and soluble fiber contents were in accordance with and the insoluble fiber values were lower than those reported by Khanum *et al*. (2000) for leafy vegetables (amaranthus, cabbage, cauliflower, fenugreek leaves, shepu and spinach). The dietary fiber cotents for other food materials reported in the literature were lower than our results (Li *et al*., 2002; Ramulu and Rao, 2003; da Silva and Ciocca, 2005; Falade *et al*., 2005; Gyurova *et al*., 2007), whereas the total and soluble dietary fiber contents reported for fenugreek seed (Kumar and Maliakel, 2008) were higher.

Total dietary fiber constituted 38.21 g/100 g dry matter of *Trachystemon orientalis* L. and soluble dietary fiber was its major fraction (20.31 g/100 g, DW). The high proportion of soluble fraction in the *Trachystemon orientalis* L. dietary fiber in comparison with some plants, vegetables, fruits and cereals, was noticeable. The edible wild plants analysed are generally consumed in spring. They start to germinate after winter and loose their freshness as its gets hotter. Therefore, the soluble and insoluble dietary fiber contents are expected to be different in spring time where the plants are consumed and the following summer times. Accordingly, the sampling was made in spring times when the plants are mostly consumed.

Khanum *et al*. (2000) analyzed legumes, leafy vegetables, roots and tubers, gourds and other vegetables for total, soluble and insoluble dietary fiber contents, both before and after cooking. They reported the total dietary fiber content of uncooked products was found to be highest in leafy vegetables (35-52%) and gourds (32-54%) followed by leguminous vegetables (31-43%), roots and tubers (15-40%) and other vegetables (21-41%). The soluble and insoluble fractions in these vegetables ranged from 4.3-8.4 and 30.3-45.0%, 5.4-10.0 and 26.9-44.3%, 1.4-8.0 and 28.1-35.4%, 2.5-15.1 and 10.0-28.3% and 1.0-12.3 and 19.9-28.9%, respectively.

Li *et al*. (2002) analyzed sugar and soluble and insoluble dietary fiber contents of 70 highly consumed foods. They determined that among the cereal grains and pasta, soluble dietary fiber ranged from none detected to 1.54 g/100 g and insoluble dietary fiber ranged from 0.08 to 3.32 g/100 g; total dietary fiber content varied between 0.34 g/100 g for cooked white rice and 3.94 g/100 g for yellow corn meal. For fruits, soluble dietary fiber ranged from 0.04 to 4.50 and insoluble dietary fiber ranged from 0.03 to 11.81 g/100 g; total dietary fiber content varied between 0.40 g/100 g for orange juice and 12.72 g/100 g for guava. Legumes contained the highest amount of dietary fiber (mostly as insoluble dietary fiber); soluble dietary fiber ranging from 0.09 to 1.38 g/100 g and insoluble dietary fiber ranging from 4.02 to 10.56 g/100 g. Total dietary fiber content varying between 4.53 g/100 g for canned cowpeas and 10.65 g/100 g for cooked split peas. For cooked vegetables, soluble dietary fiber ranged from 0.13 to 1.85 g/100 g and insoluble dietary fiber ranged from 1.06 to 4.21 g/100 g; total dietary fiber content varied between

Table 1: Wild edible plant species and their utilized parts and type of use

Botanical name (English/Turkish)	Parts used	Popular use (prevalence of use)
Chaerophyllum byzantinum Boiss. (Mendek)	Leaves	Cooked with onion and rice, soup
Bellis perennis L. (Daisy/Papatya)	Leaves	Cooked with onion and rice or bulgur. Prepared as herbal tea
Trachystemon orientalis L.	Stems, rizoms,	Fried with onion and egg. Leaves are rolled with rice (or bulgur)
(Abraham-Isaac-Jacob/Kaldirayak, hodan)	leaves, flowers	inside (sarma). Consumed as pickles
Nasturdium officinale (Watercress/Su teresi)	Fresh above ground	Prepared as salad freshly
Chenopodium album L. (Goosefoot, lamb's quarters/Sirken)	Aerial parts	Boiled, roasted with onion and egg
Malva neglecta Wallr. (Common mallow/Ebegumeci, komec)	Leaves	Cooked with onion and rice. Fried with onion and egg
Papaver rhoeas L. (Corn poppy/Gelincik)	Young shoots	Cooked with onion and rice. Roasted with onion and egg
Polygonum cognatum Meisn. (Knot-grass/Madimak)	Young shoots	Cooked with onion and rice or bulgur
Rumex patientia L. (Patience dock/Efelik, evelik, labada)	Young leaves and stems	Roasted with onion, egg and spice. Leaves are rolled with rice (or bulgur) inside (sarma)
Rumex crispus L. (Curly dock/Yazi pancari)	Young shoots	Cooked with onion and rice or bulgur
Smilax excelsa L. (Sarsaparilla/Kircan)	Aerial parts	Roasted with onion and spice. Consumed as pickles
Falcaria vulgaris Bernh. (Sickle-weed/Kazayagi)	Young shoots	Cooked with onion and rice or bulgur
Urtica diocia L. (Nettle/Isirgan)	Aerial parts, leaves	Soup, stewed, in stews or omelettes. Roasted to fill pastry. Prepared as herbal tea

Table 2: Dietary fiber contents of wild edible plants

Samples	Dry matter (g/100 g)	Insoluble fiber (g/100 g, DW)	Soluble fiber (g/100 g, DW)	Total fiber (g/100 g, DW)
Chaerophyllum byzantinum Boiss	13.46±0.98^{ab}	27.89±2.02^{bc}	4.35±1.12^{ef}	32.24±3.14^{cde}
Bellis perennis L	8.31±0.68^{d}	31.78±1.74^{a}	2.63±0.15^{ef}	34.41±1.73^{bcd}
Trachystemon orientalis L	10.49±1.58^{cd}	17.90±2.75^{f}	20.31±2.29^{a}	38.21±1.08^{ab}
Nasturdium officinale	8.99±2.53^{d}	19.22±0.59^{f}	2.09±0.57^{f}	21.31±0.52^{h}
Chenopodium album L	9.06±2.80^{d}	20.15±1.51^{ef}	4.29±1.84^{ef}	24.45±3.10^{gh}
Malva neglecta Wallr	12.71±2.71^{abc}	26.53±1.32^{cd}	2.52±1.74^{ef}	29.05±0.47^{efg}
Papaver rhoeas L	8.05±1.63^{d}	23.86±1.69^{d}	5.67±4.02^{cd}	29.53±4.00^{def}
Polygonum cognatum Meisn	10.15±0.40^{cd}	32.27±2.06^{a}	9.99±1.48^{b}	42.26±1.87^{a}
Rumex patientia L	7.86±0.94^{d}	28.84±2.48^{abc}	8.19±1.79^{bc}	37.03±4.18^{bc}
Rumex crispus L	8.52±0.73^{d}	26.78±1.92^{cd}	5.39±1.05^{def}	32.17±2.29^{cde}
Smilax excelsa L	9.94±0.36^{cd}	23.69±1.16^{de}	8.64±1.75^{bc}	32.33±2.48^{cde}
Falcaria vulgaris Bernh	10.86±0.24^{bcd}	31.12±3.73^{ab}	4.07±0.59^{ef}	35.19±4.31^{bc}
Urtica diocia L	13.74±1.66^{a}	23.60±1.63^{de}	3.25±1.27^{ef}	26.85±2.80^{fg}

2.05 g/100 g for boiled white potato and 5.23 g/100 g for cooked lima beans. Vegetables, which are eaten raw, have a lower total dietary fiber content when compared to their cooked counterpart or cooked vegetables in general. The soluble dietary fiber for raw vegetables ranged from 0.10 to 0.77 g/100 g and insoluble dietary fiber ranged from 0.88 to 3.06 g/100 g; total dietary fiber varied between 0.98 for iceberg lettuce and 3.50 g/100 g for broccoli.

Ramulu and Rao (2003) investigated total, insoluble and soluble dietary fiber contents of twenty-five common fruits and nine mango varieties by enzymatic and gravimetric method. They reported that the total and insoluble dietary fiber contents ranged from 0.6 to 0.3% in watermelon and 10.9 and 9.1% in sapota, respectively. The soluble dietary fiber content ranged from 0.3% in watermelon to 2.4% in fig. They reported results indicate that fruits such as fig, mango, orange, papaya and sweet lime are rich sources of soluble dietary fiber.

da Silva and Ciocca (2005) determined the dietary fiber contents of wheat, oats, triticale, barley, rye, corn and sorghum cultivars by enzymatic-gravimetric method. The highest soluble, insoluble and total dietary fiber contents were determined in rye (4.52, 16.01 and 20.53 g/100 g, respectively), the lowest soluble and total dietary fiber content in sorghum (0.49 and 11.45 g/100 g) and the lowest insoluble fiber in oats (8.64 g/100 g).

Falade *et al.* (2005) determined soluble, insoluble and total dietary fiber contents of some fruits (banana, grapefruit, orange and pineapple), amaranthus vegetable and a legume (*Vigna unguiculata*). They found total dietary fiber was very low in all the fruit samples. It ranged from 1.3 to 1.7 g/100 g in fresh weight samples. Soluble dietary fiber ranged between 0.2 g/100 g for banana and 0.8 g/100 g for orange and pineapple. The insoluble dietary fiber content of fruit samples were between 0.5 to 1.3 g/100 g, while amaranthus and cowpea had insoluble dietary fiber contents of 3.3 g/100 g and 13.3 g/100 g, respectively.

Gyurova *et al.* (2007) analyzed dietary fiber contents of Bulgarian vegetables. They determined the highest amounts of insoluble fiber in red turnip (5.86%), the highest amounts of soluble fiber in leek (3.71%) and the highest amounts of total fiber in the turnip (4.38%).

It has been reported by Kumar and Maliakel (2008) that fenugreek seed was rich in soluble (25-28%), insoluble (20-24%) and total dietary fiber (48-50%) content. They compared the soluble and insoluble fiber content of fenugreek seed by other research findings and reported that its soluble fiber content is richer than that psylium seed (22-25%), guar seed (22-25%), soya bean

(16-18%), oats (5-8%) and wheat (1-2%) and the insoluble fiber content was higher than those of psylium seed (1-3%), guar seed (12-15%), soya bean (2-5%), oats (5-8%), wheat (9-12%).

Conclusion: From the results obtained in this study, it is evident that edible wild plants are rich sources of dietary fiber. Among the plants tested, *Polygonum cognatum* Meisn. appeared to have the highest dietary fiber content, followed by *Trachystemon orientalis* L. and *Rumex patientia* L. Basically, all wild plants studied have excellent total dietary fiber contents which are comparable to and mostly higher than those of other foods like vegetables, legumes, seeds and fruits.

These results suggest that besides the use of edible wild plants in folk medicine and as source of food in salad and vegetable dishes, they can also be utilized as ingredients in the food industry. Recently, studies on developing food with functional ingredients increased and such products took place in the market with high consumer acceptance. Soluble and insoluble dietary fiber may be two of these functional ingredients, the appropriate concentrations of which can have positive health effects and prevent many of the metabolic syndromes frequently seen across the globe. Some commercial productions have already been achieved with dietary fibers as functional ingredients. It is suggested that edible wild plants may also be utilized as rich sources of these functional ingredients and their use in highly consumed food materials in appropriate concentrations may be studied.

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