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Foxtail lily (*Eremurus spectabilis* M. Bieb.) as Priority Species of Biodiversity for Food and Nutrition Project of Turkey

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ABSTRACT: "Mainstreaming biodiversity conservation and sustainable use for improved human nutrition and wellbeing" project is being carried out in three pilot site in Turkey. Mediterranean pilot site includes 4 cities as Antalya, Konya, İçel and Karaman. In the Mediterranean Region 20 species were found to be widely used both for human consumption and for medicinal purposes. Foxtail lily of in the Mediterranean Region of 20 species were selected as target species. The *Eremurus* genus is one of the important genera of the family *Liliaceae*, including over 40 species. Natural populations of this genus are widely distributed on dry and stony grazed hillsides. *E. spectabilis*, locally known as çiriş otu, çireş, dağ pırasası, yabani pırasa, güllük, kiris, sarı çiriş, sarı zambak is widely used in Turkey as a wild edible vegetable and has been traditionally used in folk medicine. Rural people in the Mediterranean Region are extremely experienced with inadequate yields due to climatic and inappropriate topographic conditions. People often use wild plants supplement their usual diets in the region. In this study, *E. spectabilis* have been analyzed for its nutrition value, antioxidant properties and socio-economic surveys.

Keywords: Wild edible plant, *Eremurus spectabilis*, foxtail lily, antioxidant activity, chemical content, socio-economic surveys.

Beslenme ve Gıda için Biyoçeşitlilik Projesi Hedef Türü Çiriş Otu (*Eremurus spectabilis* M. Bieb.)

ÖZ: "İnsan Beslenmesi ve Refahı İçin Biyolojik Çeşitliliğin Korunması ve Sürdürülebilir Kullanımı" projesi, Türkiye'de üç pilot bölgede yürütülmektedir. Akdeniz pilot bölgesi Antalya, Konya, İçel ve Karaman olmak üzere 4 şehri içermektedir. Akdeniz Bölgesi'nde beslenme ve tıbbi amaçlarla kullanılan 20 doğal tür hedef olarak seçilmiştir. *Eremurus* cinsi, 40'dan fazla türün dahil olduğu *Liliaceae* familyasının en geniş cinslerinden biridir. Bu cinsin doğal popülasyonları, kuru ve taşlı yamaçlara yayılmıştır. Çiriş otu, çireş, dağ pırasası, yabani pırasa, güllük, kiris, sarı çiriş, sarı zambak gibi yerel adlarla bilinen *E. spectabilis*, Türkiye'de yabani yenilebilir bir sebze olarak yaygın şekilde kullanılmaktadır ve geleneksel olarak halk tıbbında da kullanılmıştır. Akdeniz Bölgesi'nde kırsal kesimdeki insanlar, iklim ve uygun olmayan topografik şartlar nedeniyle beslenme diyetlerini tamamlamak için genellikle yabani bitkiler kullanmaktadır. Bu çalışmada *E. spectabilis*'in besin değeri, antioksidan özellikleri ve sosyo-ekonomik anket sonuçları incelenmiştir.

Anahtar Sözcükler: Yenilebilir yabani bitkiler, *Eremurus spectabilis*, çiriş, antioksidan aktivite, kimyasal içerik, sosyo-ekonomik.

INTRODUCTION

“Mainstreaming Biodiversity Conservation and Sustainable use for Improved Human Nutrition and Wellbeing” project is being carried out in four countries as Turkey, Brasil, Sri Lanka and Kenya. The main point of this project was to strengthen the conservation and sustainable management of agricultural biodiversity through mainstreaming into national and global nutrition, food and livelihood security strategies and programmes. In Turkey project has three pilot site including Mediterranean, Aegean and Blacksea regions. Mediterranean pilot site represented by 4 cities as Antalya, Konya, Içel and Karaman. In the Mediterranean Region 20 species were found to be widely used both for human consumption and for medicinal purposes and from among these species “Foftail lily” was selected as target species for the Mediterranean Region.

The *Eremurus* genus is one of the important genera of the family Liliaceae, including over 40 species. Natural populations of this genus are widely distributed on dry and stony grazed hillsides. *E. spectabilis*, locally known as ‘Çiriş otu, çireş, dağ pırasası, yabani pırasa, güllük, kiriş, sarı çiriş, sarı zambak’ is widely used in Turkey as a wild edible vegetable and has been traditionally used in folk medicine.

Eremurus spectabilis Bieb. geographically distributed in the region of South Asia and Central Asia, including Turkey, Iran, West Pakistan, Afghanistan, Iraq, Palestine, Lebanon, Syria and Caucasus. Foftail lily, belongs to the family of Liliaceae, is a perennial herbaceous plant with 1 m plant height. It grows at 1000-2750 in stepe, open scrub, limestone rocks and screes. Its tender shoots, buds and leaves have traditionally been used as vegetable in cooking in a wide variety of recipes. It is an important wild species for rural peoples both diets and livelihood.

In this article nutrition value, antioxidant properties and socio - economic surveys of *E. spectabilis*

has presented. The findings of our studies show that with great importance to nutrition for local people, *E. spectabilis* is thought to be important as an alternative vegetable in the future.

MATERIALS AND METODS

The study was conducted in Antalya, Mersin, Konya and Karaman provinces of Mediterranean Region, situated in the southern part of Turkey. Mediterranean climate is seen in Antalya and Mersin, Konya and Karaman has continental climate.

Questionnaire surveys were carried out for collecting ethnobotanic and socio-economic data by using face-to-face interviews with foftail lily collectors and consumers. Monographic research technique was used in the study. In this technique, data were collected through questionnaire survey, using face-to-face interviews with foftail lily collectors and consumers.

Foftail lily samples were taken from local markets for food composition analysis. Identification of the specimen was performed according to literature (Davis *et al.*, 1988). Macronutrients, vitamin C and minerals were assayed. Standard and/or published methods were used in the analysis. Protein, dietary fibre, fat and ash of samples were analyzed according to reference AOAC procedures (Anonymous, 2014). Quantitation of each element was performed by ICP MS after microwave digestion. The procedure described by Gokmen *et al.* (2000) was used for vitamin C analysis.

The antioxidant capacity studies were performed by DPPH (1, 1diphenyl-2-picryl hydrazyl) radical scavenging method and TEAC (Trolox Equivalent Antioxidant Capacity/ABTS Method) were expressed as Trolox equivalents with spectroscopic measurements. These methods were made by the Thermo Scientific™ Multiskan™ GO microplate reader supplied from the BFN Project. IC50 values were calculated from the concentration-effect linear regression curve (Cemeroglu, 2010).

RESULTS AND DISCUSSION

13 collector and 46 consumer questionnaires were finalized during this study. According to our results *E. spectabilis* is important for three main reasons for the local people of region: as a low priced, easily accessible food source and as a source of income. The results of the obtained data have been evaluated in terms of nutritional value and socio-economic importance of the foxtail lily plant.

Nutrition Value of *Eremurus spectabilis*

Edible parts of *E. spectabilis* analysed for nutrient composition. The macro-nutrient composition is given in Table 1 where values of nutrients are reported on a fresh weight basis. The energy and fat content was low. In previous study by Tosun *et al.* (2012), protein and ash content of *E. spectabilis* sample have been reported as 1.20 % and 0.87 %, respectively. These findings were higher than our results. The dietary fibre content (2.75 mg/100 g) was similar to the corresponding contemporary food such as leeks (3.01 g/100g) given in Turkish Food Composition Database, TURKOMP (Anonim, 2014).

Edible plants can contain macro- and microelements, which have beneficial health effects. The results of the elements of *E. spectabilis* in raw material were shown in Table 2. Potassium was considerably higher than sodium as is common in plant foods making these vegetables a good choice for diets poor in Na.

The iron content was found as 2.42 mg/100 g and this value is lower than the value (7.1 mg/100 g) reported by Tosun *et al.* (2012).

This can be attributed to the fact that mineral content may be influenced by environmental conditions such as soil composition, among other factors.

The particular nutritional importance of foxtail lily as a vegetable is high value of vitamin C (129.4 mg/ 100g fresh weight) but it should be noted that there will be reduction in Vitamin C content after preparation and cooking of foxtail lily.

Socio-economic Surveys of *Eremurus spectabilis* in Turkey

The ethno-botanic and socio-economic surveys were conducted at the Mediterranean Region in the villages, local markets, local restaurants as well as supermarkets. In order to obtain detailed socio-economic and traditional information on edible wild species and local varieties, preliminary surveys were conducted primarily in the region.

The socio-economic studies were conducted for detailed data with monography technic.

In the Mediterranean Region, the foxtail lily species do not have a lot of consumption. It is consumed approximately 1.5 kg per person and 4.5 kg per household per a year (Table 3).

According to consumption frequency; 53% of consumers consume 1-2 times a week, 31% once a month, 9% once every 15 days and 5% once 3-4 times a week (Figure 1).

According to the collector and consumer survey results; 70% of the collected amount is on the market. Its amount of the assigned to the home consumption is at about 4% level. 25% of the collected amount is used in animal feeding (Figure 2).

All of the collectors participating in the survey make the product direct sale to the consumer in the local markets which is located on average 55 km. There is no sale of vehicles/wholesalers since they are collected in low quantities (Table 4).

Table 1. Nutrient content per 100g edible portion of *E. spectabilis*.Tablo 1. Her 100g yenilebilir *E. spectabilis* için besin içeriği.

Sample Örnek	Moisture (g) Nem (g)	Fat (g) Yağ (g)	Protein (g) Protein (g)	Carbohydrate (g) Karbonhidrat (g)	Ash (g) Kül (g)	Dietary fibre (g) Diyet lifi (g)	Energy (kcal) Enerji (kcal)
<i>E. spectabilis</i> Çiriş	92.0	0.46	0.12	4.06	0.73	2.75	25.9

Table 2. Vitamin C and mineral contents of *E. spectabilis* (mg/100g fresh weight).Tablo 2. *E. spectabilis* için vitamin C ve mineral içeriği (mg/100g taze ağırlık).

Sample Örnek	Ca	Fe	Mg	P	Zn	K	Na	Cu	Vit C (mg/100g)
<i>E. spectabilis</i> Çiriş	76.0	2.42	15.23	42.8	0.36	263	1.48	0.08	129.4

Table 3. The annual consumption of target species foxtail lily (kg/year).

Tablo 3. Hedeflenen çiriş türünün yıllık tüketimi (kg/yıl).

Consumption per household (kg/year) Hanehalkı başına tüketim (kg/yıl)	Consumption per capita (kg/year) Kişi başına tüketim (kg/yıl)
4.5	1.5

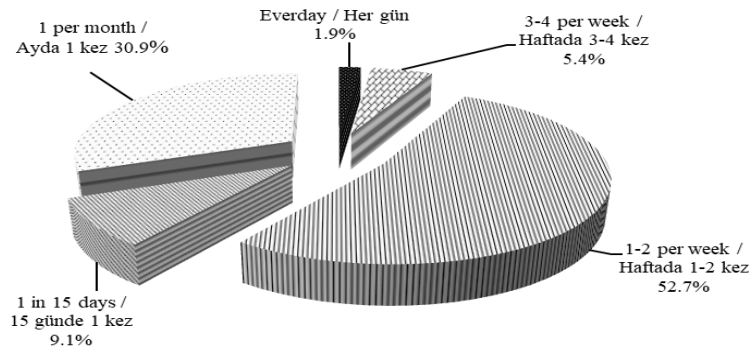


Figure 1. Consumption frequency of foxtail lily (%).

Şekil 1. Çiriş için tüketim sıklığı (%).

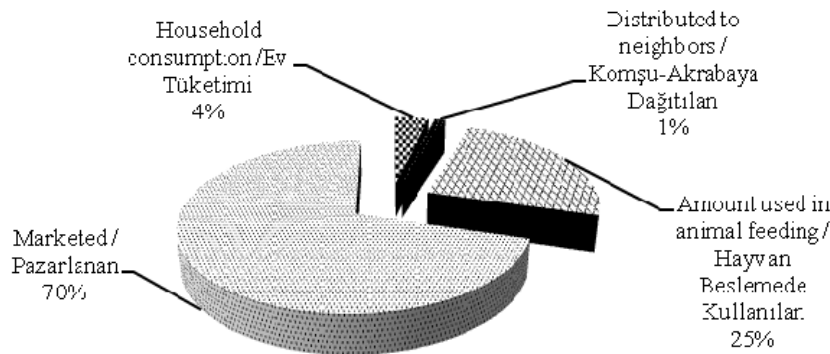


Figure 2. Use Type of foxtail lily.

Şekil 2. Çiriş kullanım tipleri.

Table 4. The foxtail lilly marketing status of collectors.

Tablo 4. Çiriş toplayıcılarının pazarlama durumu.

Average distance to market Pazara ortalama uzaklık (km)	Proportion of selling to consumers at local market Yerel pazardaki tüketicilere satış oranı (%)	Proportion of selling to trader at local market Yerel pazarda tüccara satış oranı (%)	Proportion of selling to trader at village Köyde tüccara satış oranı (%)
55	100	-	-

During surveys ethno-botanical information and the different type of dishes of wild edible plants were recorded from face to face questioners.

The aerial part of plants (Foxtail lilly) were collected from nature and used in salads. The plants are used for folk medicine to treat some ailments such as hemorrhoids and diabetics and also used as anti-dysuria and anti-hypertensive in our region of Turkey.

CONCLUSION

The findings of our studies shows that with great importance to nutrition for local people, *E. spectabilis* thought to be important as an alternative vegetable in the future. In recent years, domestic market sales of foxtail lily plant, which has been collected from nature and consumed mostly by local people, has also increased.

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This situation makes the foxtail lily plant an important source of livelihood for local people. In order to be delivered the foxtail lily plant to the more consumer are carried out post-harvest studies within the scope of the project. At the same time, on behalf of protecting our plant genetic resources, studies on the cultural production possibilities of the foxtail lily plant will be started as soon as possible.

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