



Determination of the nutritional and seed properties of some wild edible plants consumed as vegetable in the Middle Black Sea Region of Turkey



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ABSTRACT

This study was carried out to determine the some nutritional and seed properties of three wild edible plants, namely, *Malva neglecta* (common mallow), *Polygonum cognatum* (knotweed) and *Trachystemon orientalis* (Abraham-Isaac-Jacob), consumed as vegetable in the Middle Black Sea Region of Turkey. In this study, the plants were collected from five different localities in four different provinces (Amasya, Ordu, Samsun and Tokat) of the region. As a result, the nutritional and seed properties of wild edible plants varied considerably depending on the species and locality. Nutritional analysis showed that the wild edible plants contained important levels of protein (15.71 to 19.96%), potassium (1219.19–1867.47 mg/100 g), phosphorus (56.89–195.86 mg/100 g), calcium (282.96–688.32 mg/100 g) and magnesium (112.54–165.79 mg/100 g). The length, width, thickness, geometric mean diameter, sphericity, surface area, volume, 1000 seed weight and bulk density of wild edible plant seeds varied from 1.71 to 3.11 mm, 1.37 to 1.83 mm, 1.00 to 1.61 mm, 1.41 to 2.06 mm, 0.60 to 0.85, 6.27 to 13.29 mm², 1.20 to 3.17 mm³, 1.40 to 3.41 g and 532.3 to 680.9 kg/m³, respectively. The germination rate and mean germination time of seeds changed from 36.33 to 64.67% and 7.00 to 12.67 day, respectively. The results clearly revealed that these wild plants had important nutritional properties. Thus, these wild plant species could serve as good and cheap food sources in human diet. Additionally, the findings of this study may provide useful information on nutritional composition and seed properties of these wild plants for researchers.

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1. Introduction

Plants have been commonly used as food sources by people since ancient times. There has been an increasing interest in wild edible plants in recent years all over the world (Aberoumand and Deokule, 2009), because these plants are good sources of proteins, minerals, vitamins, dietary fibers, carbohydrates, essential fatty acids, antioxidants, phenolic compounds and secondary metabolites (Imran et al., 2007; Khan et al., 2016). According the Food and Agricultural Organization, about one billion people particularly in developing countries depend on wild edible plants for their diets (Bharucha and Pretty, 2010).

Turkey is one of the richest countries of the world in terms of plant diversity due to its geographical structure and climate conditions. The Turkish flora contains over 10,000 plant species and many of them are endemic (Guner et al., 2000). Many wild edible plants are traditionally used in the human nutrition and consumed as vegetable in Turkey

(Yildirim et al., 2001; Sekeroglu et al., 2006; Akgunlu, 2012). The Black Sea Region located in the north of Turkey has also a great diversity of wild edible plants because the region is situated at the junction of Irano-Turanian and Euro-Siberian phytogeographic regions. Some of wild edible plants commonly consumed as vegetable in the region are *Malva neglecta* (common mallow), *Polygonum cognatum* (knotweed) and *Trachystemon orientalis* (Abraham-Isaac-Jacob). These wild plants emerge especially in the early spring and are sold at the local markets in the region. They contribute significantly to human nutrition particularly in the rural areas of this region. In addition to, they are the important sources of income for poor people.

Determination of the nutritional properties of wild edible plants is highly important in assessing their nutritional significance. Many studies carried out on wild edible plants have revealed that the nutritional composition of these plants could be comparable to or even sometimes superior to the cultivated vegetables (Yildirim et al., 2001; Turan et al., 2003; Sekeroglu et al., 2006; Kibar and Temel, 2016).

Seed quality is generally determined by a number of physical and chemical properties of seeds (Batistella et al., 2002). In recent years, scientists have made great efforts in evaluating physical properties of seeds and have pointed out their practical utility in machine and

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structural design (Amin et al., 2004). The knowledge of physical properties of seeds such as size, volume, shape, surface area, sphericity, bulk density, true density, porosity, 1000 seed weight, geometric mean diameter, terminal velocity, angle of repose, static and dynamic coefficients of friction is required for the design of planting, harvesting, handling, drying, cleaning, conveying, storing and processing equipment (Coşkuner and Karababa, 2007). The morphological and optical features of seeds are useful in quality inspection, identification, classification, discrimination and differentiation between cultivars (Majumdar and Jayas, 2000).

However, the studies conducted on the nutritional (Turan et al., 2003; Civelek and Balkaya, 2013; Ceylan and Yücel, 2015; Koca et al., 2015) and seed properties (Önen et al., 2014) of *M. neglecta*, *P. cognatum* and *T. orientalis* commonly used as vegetable and play a significant role in the human nutrition are limited. Hence, the objective of this study was to determine the some nutritional (dry matter, pH, ash, protein, K, P, Ca and Mg content) and seed properties (length, width, thickness, seed shape index, geometric mean diameter, sphericity, surface area, seed volume, 1000 seed weight, bulk density, seed color, germination rate and mean germination time) of three wild edible plants, namely *M. neglecta*, *P. cognatum* and *T. orientalis* collected from four different provinces in the Middle Black Sea Region of Turkey.

2. Materials and methods

2.1. Plant materials

Some botanical properties of three wild edible plants used in the present study and ethnobotanical information about them are briefly explained below. The pictures related to wild edible plants and their seeds examined in the study is given in Fig. 1.

M. neglecta Wallr. is an annual herbaceous plant of the family Malvaceae. The plant is about 60 cm long. The leaves are orbicular and very shallow lobed and occur on long petioles along the stem. Flowers are pale pink, pale violet or white in leaf axils. In Turkey, its local names are “Ebegümeçi, Ebebgümeçi, Gömeç and Toluk”. This plant is usually widespread in all regions of Turkey. It grows naturally in the croplands, fields, roadsides and gardens up to 2000 m above mean sea

level. The leaves of the plant are consumed as vegetable. It is also used as a medicinal plant by people (Yücel and Tülükoğlu, 2000).

P. cognatum Meissn. is a perennial herbaceous plant belongs to the family Polygonaceae. The plant is 15–30 cm long and has a slender prostrate stem. Leaves are oblong-elliptic and often slightly mucronate. Flowers are pinkish and occur in bundles in the leaf axils. It is locally known as “Madımak, Kuşekmeği, Madımalak, Kayışkıran” in Turkey. This plant has a wide distribution area in Turkey and it is one of the widely consumed traditional wild edible plants particularly in the Central Anatolia Region (Onen et al., 2011). It grows between 720 and 3000 m above mean sea level. It is commonly found in both agricultural and non-agricultural areas such as field edges, roadsides, pastures, slopes, cliffs and industrial areas. The leaves and young shoots of plant are consumed as vegetable. It is also used for medicinal purposes (Yıldırım et al., 2003). The production of plant with seeds is quite difficult because of the seed dormancy. Recently, the cultivation of *P. cognatum* has been begun in Central Anatolia Region of Turkey to compensate the increasing demand (Onen et al., 2011).

T. orientalis (L.) G. Don. is a rhizomatous perennial herb of the family Boraginaceae. It has a height of 30–40 cm and blue-violet flowers and large leaves. It is locally called as “Kaldırayak, Hodan, Ispit, Kaldırık, Kaldırık, Kaldırık, Balıkotu, Acı Hodan and Doğu Hodanı” in Turkey. This species is generally distributed in the Black Sea Region of Turkey (Akçin et al., 2004). It grows widely in shady riverbanks, humid habitats and *Fagus* forests between 50 and 1000 m above mean sea level. The flowering branches, rhizomes, leaves and petioles of plant are consumed as vegetable. In addition to, stem and petioles of the plant are generally consumed as pickle (Yıldırım, 1994). This plant has also medicinal properties (Köse et al., 2010). The rhizomes of *T. orientalis* are used as reproductive organs although it is a flowering species. This species can't produce enough seed because it generally occurs in habitats with low light intensity.

2.2. Collection of plant materials, determination of nutritional and seed properties

Three wild edible plant species (*M. neglecta*, *P. cognatum* and *T. orientalis*) used as experimental material in this study were collected



Fig. 1. The wild edible plants and their seeds examined in the study.

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