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The ethnobotany, systematics and morphological studies of the genus *Ornithogalum* that naturally grows in Kahramanmaras province of Southern Turkey

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Abstract

The specimens of the genus *Ornithogalum* L. (Asparagaceae) were collected from Kahramanmaras province in Southern Turkey between 2012 and 2013 during the PhD study. As a result of detailed examination and definitions of the collected specimens, it was determined that these specimens belonged to 19 species of two subgenera: "Subgenus *Ornithogalum* and Subgenus *Beryllis*'. The identification key of the species was conducted, distributions in Kahramanmaras have been shown on the maps and photographs of each species from natural habitats have been presented. During the study, information was obtained from the local people about their local names and uses.

Keywords

Kahramanmaras, local uses, *Ornithogalum*, Southern Turkey, vernacular names.

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INTRODUCTION

The genus *Ornithogalum* L. (Asparagaceae) was revised by Cullen (1984) in the Flora of Turkey and the East Aegean Islands, in which 22 species were recognized. It was divided into four subgenera: *Beryllis* (Salisb.) Baker, *Ornithogalum*, *Myogalum* (Link) Baker and *Caruelia* (Parlatore) Baker. After publication of the Flora, 42 new taxa have been added to the Turkish flora by various authors (Davis *et al*., 1988, Speta 2000a, 2000b, Ozhatay 2000, Dusen & Sumbul 2002, 2003, Dusen & Deniz 2005, Uysal *et al*., 2005, Ozhatay & Kultur 2006, Dalgıc *et al*., 2006, Varol 2008, Bagcı *et al*. 2009, Yildirimli 2009, Koca & Yildirimli 2010, Ozhatay *et al*., 2011, Bagcı *et al*., 2011, Mutlu & Karakus 2012, Demirci & E.Kaya 2014, Demirelma, 2020). Thus, the total number of species has increased to 64. *Ornithogalum* species are known as vernacular names such as "köpek soğanı, tükrük otu, akyıldız soğanı, itdirseği, kurtsoğanı, akbaldır, sabunotu, çiğdem çiçeği, karga sarımsağı, eşek susamı, it keseri, sakarca" (Guner *et al*., 2012). *Ornithogalum* species are named as "akyıldız" in Kahramanmaras (Demirci & Ozhatay, 2012). Bulbs of *Ornithogalum* have been used as an emetic since Dioscorides. *Ornithogalum* species have been used as medicine and are thought to be poisonous (Baytop 1999). However, it has been determined that the leaves of *Ornithogalum* species are cooked and consumed as food in some regions of Turkey (Demirci & Eroglu Ozkan, 2017). The herb of *O. narbonense* was used as food in Mediterranean area (Rivara *et al.*, 2006). The bulbs of *O. umbellatum* was used as food in Italia and Balkans ((Tizio *et al.*, 2012; Novella *et al.*, 2013). It was determined that bulbs are poisonous in Jordan (Al'Quarayn, 2005). In Southern Italy, bulbs are eaten (e.g. *Ornithogalum pyrenaicum* (Scherrer *et al*., 2005, Salerno *et al*., 2006). Kahramanmaras is situated at the south part of Taurus Mountains in the Southern Turkey. Its plant diversity is very rich because its localization lies in meeting point of three phytogeographic regions. While Irano-Turan elements are found in the east, Mediterranean elements are common in the south. Some formations of the Euro-Siberian geographical region can also be seen in humid areas (Ozhatay *et al*., 2008; 2009; Yildiz, 2006; Demirci, 2014; Demirci and Eroglu Ozkan, 2017). Bulbs of *Ornithogalum* have been used as medicine and food in Kahramanmaras (Demirci and Ozhatay, 2012). The ethnobotanical studies of Turkey were scanned and uses and vernacular names of *Ornithogalum* species are given in Table 1.

Table 1: The uses and vernacular names of *Ornithogalum* species in Turkey.

Scientific name	Used parts	Vernacular name	Uses	Province	References
O. armeniacum Baker	Leaves, flower	Soryaz	Food, eaten cooked	Antalya	Bulut 2006; Guner *et al.*, 2012
O. lanceolatum Labill.	Whole plant	Bulumbışık	Eaten as vegetable	Mersin	Baytop 1999; Guner *et al.*, 2012
O. narbonense L.	Bulb, leaves	Akbaldır	Eaten as vegetable	Igdır	Altundag 2009; Guner *et al.*, 2012
	Bulb	Akbaldır	Eaten cooked	Erzurum	Aksakal and Kaya 2008; Guner *et al.*, 2012
	Leaves	Akbaldır	Eaten cooked	Sakarya	Koyuncu 2005; Guner *et al.*, 2012
	Leave, bud	Akbaldır	Acnedisease, emetic,diuretic, cardioactive	Adana	Ozer *et al.*, 2001; Guner *et al.*, 2012
	Leave, bud	Akbaldır	Eaten cooked	Adana	Ozer *et al.*, 2001; Guner *et al.*, 2012
	Leave	Akbaldır	Eaten as vegetable	Siirt	Yapici *et al.*, 2009; Guner *et al.*, 2012
	Herb	Akbaldır	Food	Inner Anatolia	Dogan et al., 2004; Guner et al., 2012
O. oligophyllum E.D.Clarke	Bulb, leave	Kurtsoğanı	Eaten cooked	Igdır	Altundag 2009; Guner *et al.*, 2012
	Leave, shoot	Kurtsoğanı	-	Amasya	Cansaran and Kaya, 2010; Guner *et al.*, 2012
	Scape, leave	Kurtsoğanı	Eaten cooked	Blacksea region	Ozbucak *et al.*, 2006; Guner *et al.*, 2012
O. platyphyllum Boiss.	Bulb, leave	Dağ akyıldızı	Eaten cooked	İzmit	Kizilarslan and Ozhatay 2012; Guner *et al.*, 2012
	Scape, leave	Dağ akyıldızı	Eaten cooked	Blacksea region	Ozbucak *et al.*, 2006; Guner *et al.*, 2012
O. pyrenaicum L.	Whole plant	Eşek susamı	Animal food	Aksaray	Ertug 2000; Guner *et al.*, 2012
O. sigmoideum Freyn. & Sint.	Whole plant	Sakarca	Eaten cooked	İzmit	Kızılarslan and Ozhatay 2012; Guner *et al.*, 2012
	Scape, leave	Sakarca	Eaten cooked	Blacksea region	Ozbucak *et al.*, 2006; Guner *et al.*, 2012
Ornithogalum sp.	Whole plant	Akyıldız	Eaten as vegetable	Ordu	Turkan *et al.*, 2006; Guner *et al.*, 2012
O. sphaerocarpum A.Kern	Leave, bud	Salkım sakarca	-	Amasya	Cansaran and Kaya 2010; Guner *et al.*, 2012
O. umbellatum L.	Whole plant	Sunbala	-	Aksaray	Ertug 2000, Guner *et al.*, 2012
	Bulb	Sunbala	Boil and acne disease	Usak	Deniz *et al.*, 2010; Guner *et al.*, 2012

MATERIALS AND METHODS

The *Ornithogalum* specimens were collected from Kahramanmaras province (Figure 1) between 2012 and 2014. Approximately 200 *Ornithogalum* specimens were collected as a result of field studies in the research area (Demirci, 2014). Characteristics such as distribution areas, habitats, leaf widths, perigon shapes and color, tepals shape, filaments length, capsule shapes were recorded in the natural habitat. Photos of the general appearance, leaves, flowers and capsules of the specimens were taken. The flowering and fruiting specimens that were required for laboratory studies were collected from the field, pressed and dried in accordance with herbarium techniques. Herbarium specimens were kept in the Herbarium of the Faculty of Pharmacy of Istanbul University (ISTE).

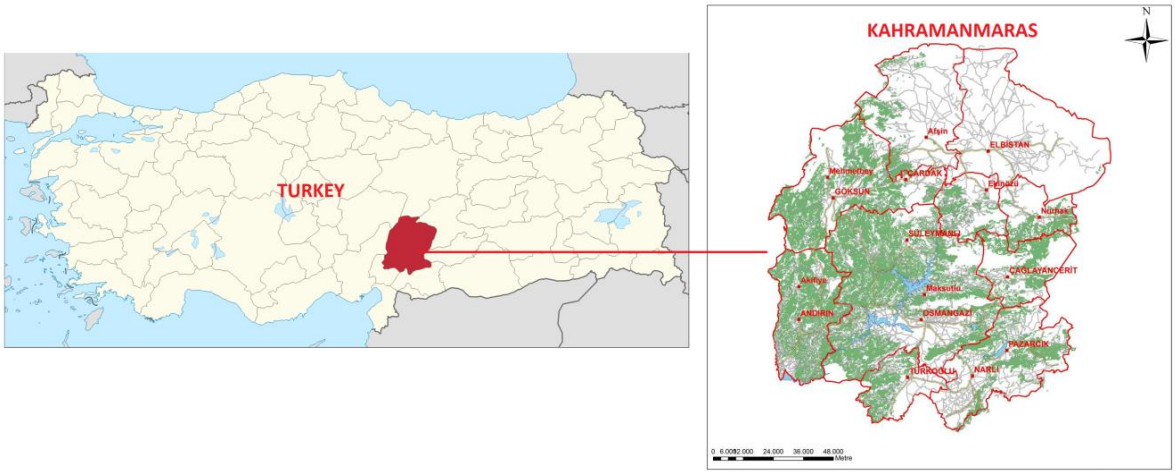

Figure 1: The map of Kahramanmaras province in Turkey.

RESULTS AND DISCUSSION

As a result of our studies, it was determined that 18 *Ornithogalum* species have been found to grow naturally in Kahramanmaras province. The identification key of these species and distribution maps have been given with the photographs of each species taken from natural habitats. *Ornithogalum* species determined in previous floristic studies from the research areas consist of 11 species. These are: *O. alpigenum* Stapf., *O. comosum* L., *O. lanceolatum* Labill., *O. montanum* Cirillo, *O. narbonense* L., *O. orthophylum* Ten., *O. platyphyllum* Boiss., *O. sigmoideum* Freyn & Sint., *O. sorgerae* Wittmann, *O. sphaerocarpum* A.Kern *and* *O. umbellatum* L. In this study, it was determined that 8 more *Ornithogalum* species were distributed in

Kahramanmaras. Additional floristic new records are as follows:

One new record for Turkey: *Ornithogalum pedicellare* Boiss. & Kotschy, the species is recorded as endemic to North Cyprus (Hand *et al*, 2011). Five new records for the province Kahramanmaras: *O. vasakii* Speta (endemic), *O. oligophyllum* E.D.Clarke, *O. neurostegium* Boiss. & Blanche, *O. balansae* Boiss. (endemic), *O. hajastanum* Agapova.

In our study, the genus *Ornithogalum* was grouped under 2 subgenera: *O.* subgen. *Ornithogalum* and *O.* subgen. *Beryllis*. The identification keys of the *Ornithogalum* species are given below. The distribution of the species is shown on the map of Kahramanmaras (Figure 2).

The identification key for subgenus *Beryllis* and subgenus *Ornithogalum*

1. Long racemose and multiflowered inflorescences, tepals usually with a green band visible on the abaxial side……..……. Subgenus: *Beryllis*

1. wide and short corymbose or pseudocorymbose raceme;tepals white on the adaxial face bearing a central green band on the abaxial face…….. Subgenus: *Ornithogalum*

A. Subgenus: *Beryllis* (Salisb.) Baker Syn: *Loncomelos* Speta

Ornithogalum subgen. *Beryllis* (Salisb.) Baker includes about 160 species (cf. Wittmann 1985) distributed in the Mediterranean basin and Western Asia and is characterized by the long racemose and multiflowered inflorescences, tepals usually with a green band visible on the abaxial side –at least partially–, capsules subrounded in transversal section and seeds irregularly compressed with rugose testa. This subgenus has been recently treated as the genus Loncomelos Rafinesque by Speta (2000, 2001, 2006. 2010, 2011) and Martínez-Azorín *et al*. (2011), which differs from *Ornithogalum* sensu stricto by clear differences regarding inflorescence, fruit and seed morphology. Five taxa belonging to this subgenus have been distributed in Kahramanmaras.

The identification key of *Ornithogalum* species (Subgenus *Beryllis*) distributed in Kahramanmaras

1. Perianth segments 6-11 mm, racem 17-55 flowered, and flowers rotate or not…… **2**

2. Perianth segments 6-9 mm, racem 30-55 flowered, flowers not rotate. ***O. sphaerocarpum***

2. Perianth segments 6-11mm, racem 17-25 flowered, flowers rotate……***O. sorgerae***

1. Perianth segments 9-16 mm, racem more than 75, flowers not rotate…….. **3.**

3. Pedicels patent in fruit, arcuate in upper part ……..... ***O. magnum***

3. Pedicels are not erect in fruit, parallel of scape or not…….**4.**

4. Tepals with green stripe, racemes 25-75 flowered, style 2.7- 4mm…. ***O. narbonense***

4. Tepals with wide green stripe, racemes 25-50 flowered, styles 2.5mm ***O. hajastanum***

O. hajastanum, *O. magnum*, *O. narbonense* species are shown in Figure 3. Figure 4 shows *O. sorgerae*, *O. sphaerocarpum* species.

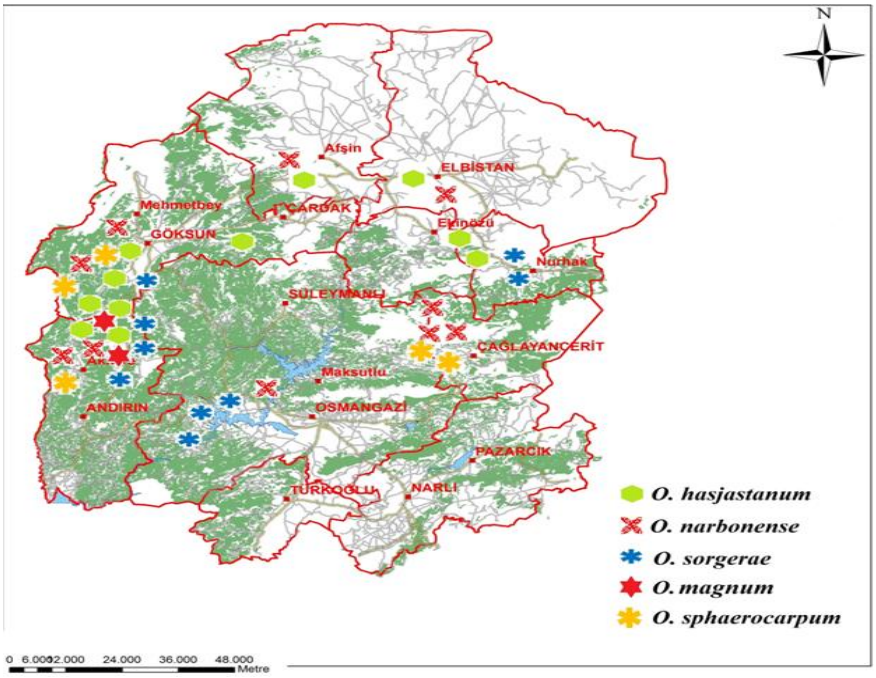

Figure 2: *Ornithogalum* species of the subgen. *Beryllis* distributed in Kahramanmaras.

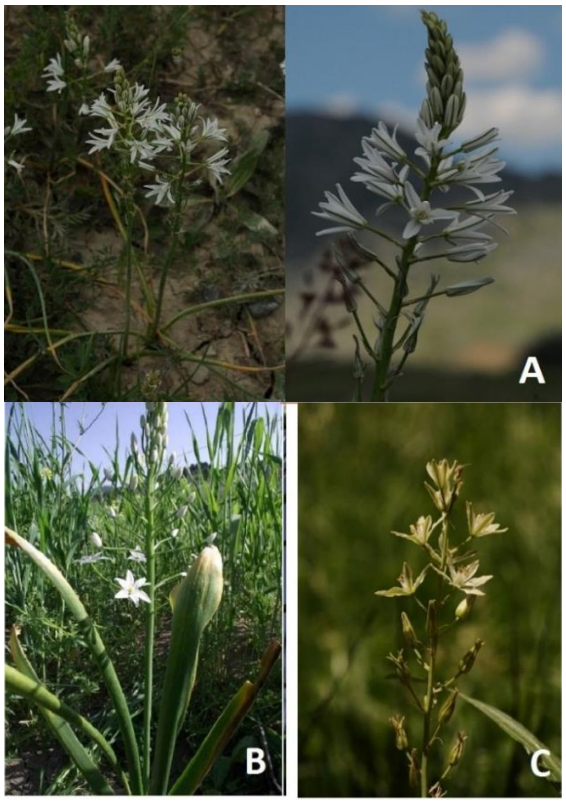

Figure 3: *Ornithogalum* species of the subgenus: *Beryllis* in Kahramanmaras;
A: *O. hajastanum*, B: *O. magnum*, C: *O. narbonense*.

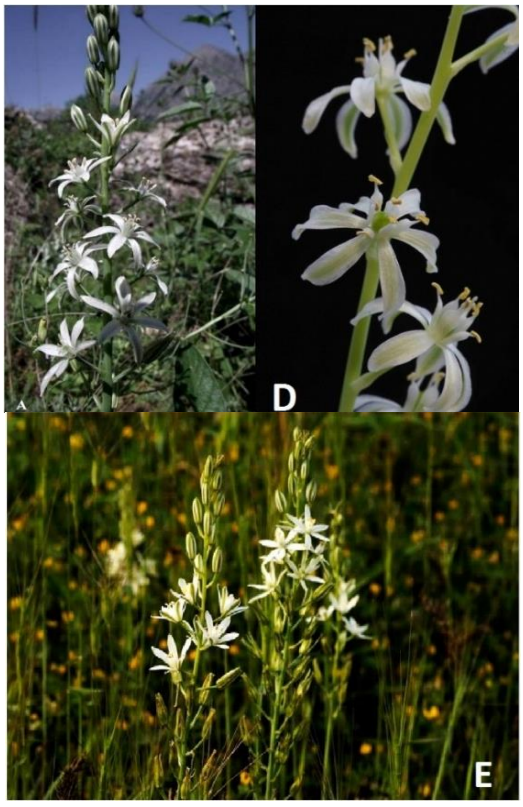

Figure 4: *Ornithogalum* species of the subgenus: *Beryllis* in Kahramanmaras;
D: *O. sorgerae*, E: *O. sphaerocarpum*

B. Subgenus: *Ornithogalum* Baker

Subgen. *Ornithogalum* is characterized by wide and short corymbose or pseudocorymbose raceme; pedicels usually erect-patent to reflexed at anthesis and in fruit; tepals white on the adaxial face bearing a central green band on the abaxial face; filaments linear or tapering contracted abruptly at their apexes; oblong, ovoid, or obovoid ovary; style long and filiform and stigma small trigonous; and seeds globose with reticulate testa (Moret *et al.* 1990). Thirteen taxa belonging to this subgenus have spread naturally in Kahramanmaras (Figure 5). These taxa are: *O. alpigenum* Stapf.; *O. balansae* Boiss.; *O. lanceolatum* Labill.; *O. montanum* Cirillo; *O. neurostegium* Boiss. et Blanche; *O. oligophyllum* E.D. Clarke; *O. orthophylum* Ten; *O. pedicellare* Boiss. & Kotschy; *O. platyphyllum* Boiss.; *O. sigmoideum* Freyn & Sint; *O. umbellatum* L.; *O. vasakii* Speta; *O. wiedemannii* Boiss. var. wiedemannii.

The Identification key of *Ornithogalum* species of the Subgenus *Ornithogalum* distributed in Kahramanmaraş

1. Leaves margine ciliate, lower surface pilose..... ***O. neurostegium***

1. Leaves margine and surfaces glabrous ……. 2

2. Leaves broadening above ground level; acute apex……. .3

3. Scape absent or to 2 cm longer; raceme± sessile between leaves; leaves (10-)15-20 mm broad at ground level.....***O. lanceolatum***

3. Scape evident; racem longer than leaves; leaves less than 15 mm…… 4

4. Leaves born stiffly erect and racem erect ……. ***O. platyphyllum***

4 Leaves horizontal or rarely arching.....***O. montanum***

2. Leaves broadening above ground level or equaly broad to upper part; tapering abruptly to subacute or blunt……5

5. Pedicels patent at fruit, thickening at base..... ***O. sigmoideum***

5. Pedicels erect or patent at fruit, rare patent, not , thickening……...6

6. Leaves 2-3, without a white line on upper surface; pedicels shorter than to as long as flowers at anthesis…… ***O. oligophyllum***

6. Leaves 4 or more, parallel-sided for most of their length, with a white line on upper surface; pedicels usually longer than flowers at anthesis……. . 7

7. Perianth segments 10(-12) mm.....…. ***O. alpigenum***

7. Perianth segments 12-21 mm……. 8

8. Capsule prominently winged……. 9

9. Raceme dense; leaves 6-10..... ***.O. vasakii***

9. Raceme lax, rarely dense; leaves 2-4 …… 10

10. Scape 5-10 cm, 2-9 flowered, tepals oblong-linear, 5-14 mm, styles 2.5-3 mm..... ***O. balansae***

10. Scape 0.5-16 cm, 1-10 flowered…..…… ***O. wiedemannii***

8. Capsule not winged……11

11. Bulbs with bulbils or not; pedicels stout at fruit, 0.5-9 cm…… ***O. umbellatum***

11. Bulbs without bulbils; pedicels thin at fruit, 0,7-3.5 cm……..12

12. Ovary 3-5 mm, ovoid, styles 2-3 mm..... ***O. orthophyllum***

12. Ovary 3 – 3.1 mm, obovoid, styles 2 – 2.1 mm…… ***O. pedicellare***

O. alpigenum, O. balansae, O. lanceolatum, O.montanum, O. neurostegium, O. oligophyllum, O. platyphyllum, O. pedicellare, O. orthophylum species are shown in Figure 6. Figure 7 shows *O. umbellatum, O. vasakii, O. wiedemannii., O. sigmoideum* species.

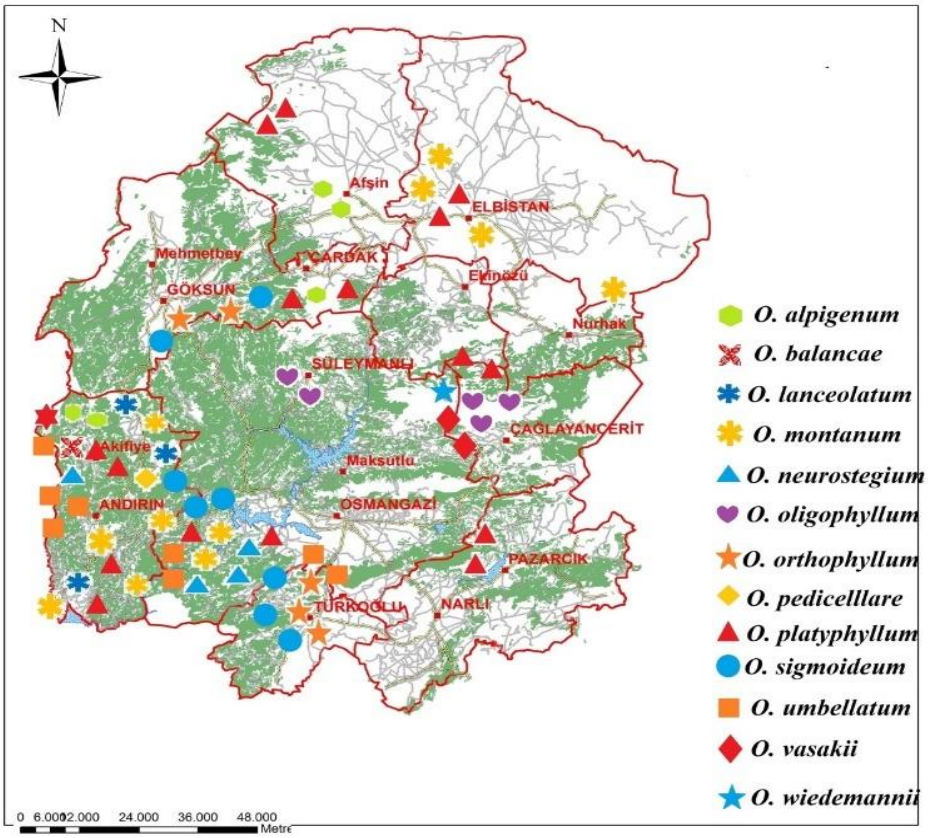

Figure 5: *Ornithogalum* species of the subgen. *Ornithogalum* distributed in Kahramanmaras.

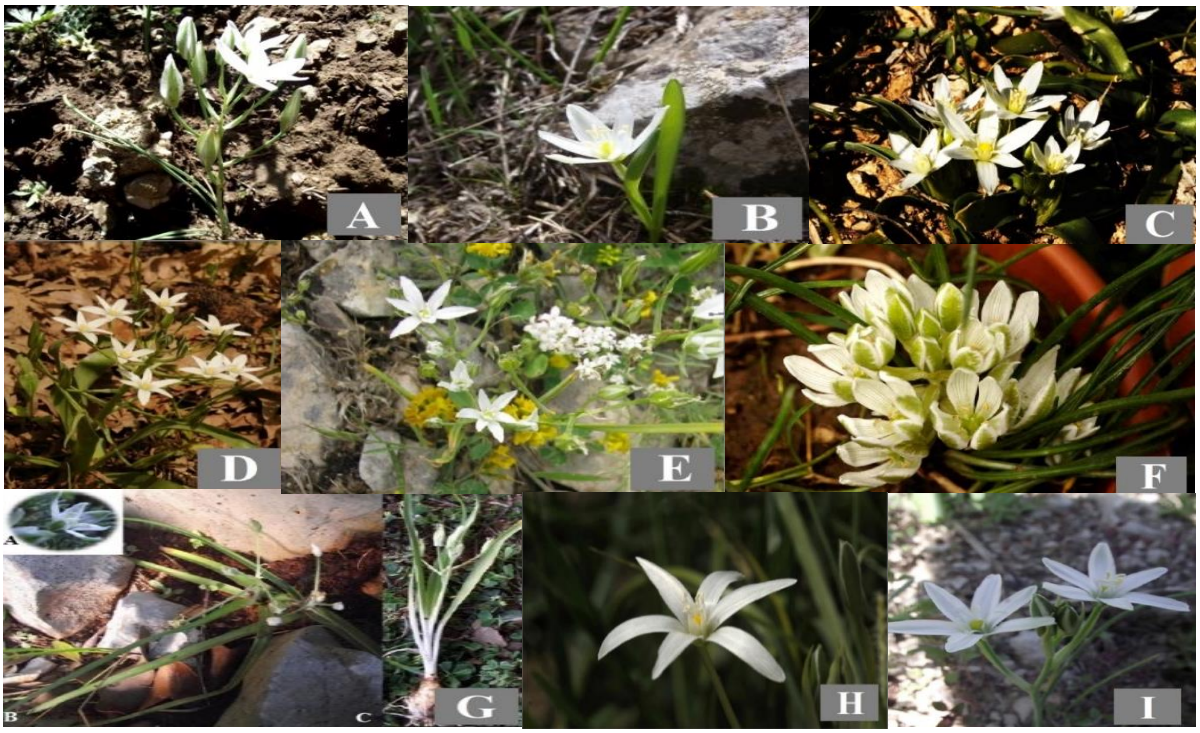

Figure 6: Photos of *Ornithogalum* species of subgen. *Ornithogalum* in Kahramanmaras.
A: *O. alpigenum*, B: *O. balansae*, C: *O. lanceolatum*, D: *O.montanum*, E: *O. neurostegium*, F: *O. oligophyllum*, G: *O. platyphyllum*, H*: O. pedicellare*, I: *O. orthophylum.*

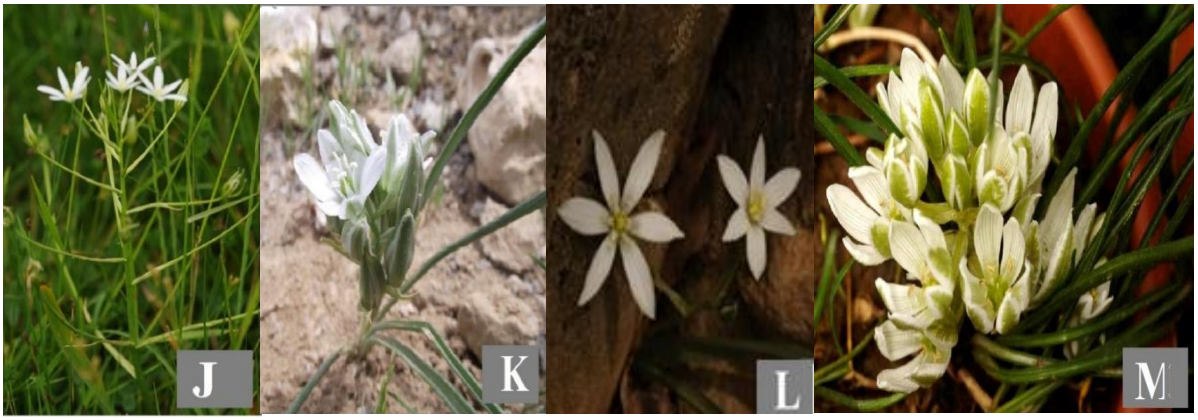

Figure 7: *Ornithogalum* species of subgen. *Ornithogalum* in Kahramanmaras,
J: *O. umbellatum*, K: *O. vasakii*, L: *O. wiedemannii*., M: *O. sigmoideum*

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