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Checklist of Grasses in Istanbul

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INTRODUCTION

The conservation of grass diversity is an extremely important issue for improving the agricultural production and enhancing the food security. Among all plants of the earth grasses are some of the mostly used plants by human beings. They are also essential components of the natural steppe ecosystems, as well as agricultural systems, and are, therefore, vital in maintaining the sustainability of ecosystem. Grass family Poaceae Dumortier is the fifth largest plant family on earth and it is the second largest plant family in Turkey. It consists of approximately 9700 grass species belonging to 700 genera, of which about 738 species and 135 genera occur in Turkey.

Istanbul is one of the most populous cities of Eurasia and is the world's 4th largest city proper and 20th largest urban area as well as Turkey's cultural and financial centre. The city is located in the NW part of Turkey (41° 01.2' N, 28° 58.2' E) and it extends both on European (Thrace) and Asian (Anatolia) sides of the Bosphorus. It is the only metropolis in the world that is situated on two continents. Its neighbours are the Black Sea in the north, Marmara Sea in the south, Kocaeli City in the east, and Tekirdağ City in the west **(Figure 1)**. Istanbul has approximately 5100 km2 of land area and 13, 854, 740 population.

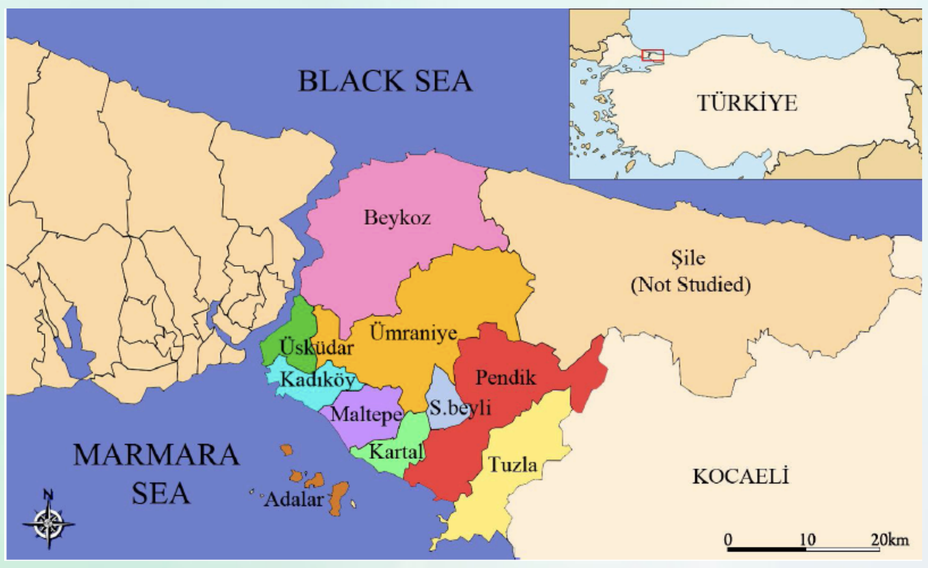

Figure 1. Districts studied in Istanbul during 2005-2007
(Beykoz, Üsküdar, Kadıköy, Kartal,Ümraniye, Maltepe, Tuzla, Pendik, Adalar and Sultanbeyli)

The wide varieties of ecological features in Istanbul have resulted in more Pteridophyta and Angiospermae (2500 species) than those in England (250,000 km2 land area, 1850 plant species) and Netherlands (50,000 km2 land area, 1600 species). Many botanists due to its varied climatic and geographic conditions have studied Istanbul's rich flora. (Özhatay and Keskin 2007) Many floristic studies in urban and rural areas have been done in Turkey.

Grass family Poaceae Dumortier is the fifth largest plant family on earth and it is the second largest plant family in Turkey. It consists of approximately 9700 grass species belonging to 700 genera, of which about 738 species and 135 genera occur in Turkey. The main focus in this research is on grasses found in Istanbul. By this checklist, we provide information on currently known grass species and their distribution in Istanbul.

The list has been prepared by closer examination and consultation with the Flora of Turkey (Davis, 1985) and other relevant floristic studies carried out in Istanbul and environs, such as those in Aznavour 1899, 1911, 1913; Auchlic 1943; Baytop 1962, 1966; Eliçin, 1983; Yüzbaşıoğlu 2004; Altundağ 2005; Sezer 2006; Özhatay et al. 2010; Genç & Özen 2008, Özhatay & Keskin 2007 and Altay et al., 2010.

Additionally many herbarium specimens housed in various national herbaria (abbreviations from http://sciweb.nybg.og/science2/ Index Herbariorum.asp: ISTE, ISTF, and ISTO, VANF) and international herbaria (B, BM, E, G, K, LE, MO, and W) were also examined in order to determine the recorded Poaceae taxa in Istanbul. The corresponding author also carried out intensive field studies in Istanbul between the years 2006 and 2011 and collected many herbarium specimens of the family Poaceae. The plant name authors are given according to Brummit and Powell (1992). The synonyms and Turkish common names of the species are also given on the basis of Cabi and Doğan (2012).

RESULTS AND DISCUSSION

The main focus of this research is types of grasses (which are also referred as the Poaceae family) that are specifically found in Istanbul. Much of the information in these publications is derived from Turkey. Our aim with this research is to provide information from local sources, some of which might give no valid information. Hence, only information specific to İstanbul has been included in this research, which is derived from notes of İstanbul specimens. It has been covered in numerous publications in Turkey as well as Istanbul, for example, those by Baytop (1966), Auchlic (1943), Aznavour (1899, 1911, 1913). **Table 1** shows comparison of Baytop (1966) with our data.

	Baytop (1966)	This Checklist
Genera	83	89
Species	215	258

Table 1. Comparison of selected treatments of Istanbul Grasses

The list also includes current scientific names including new nomenclatural novelties, synonyms, and common names of the taxa as well as indication of their distribution in Istanbul. The threat categories are also given for each species. A dichotomous example of key to the Istanbul grass genera follows the checklist.

Examples of Checklist of Istanbul Grass a Key To The Genera

1. Culms woody (bamboo), perennial; flowering irregularly (not every year)..... *Phyllostachys*
1. Culms herbaceous, annual (somewhat woody in Arundo); flowering yearly or more frequently..... 2
2. Second glumes with 5 rows of hooked spines on abaxial surface ..... *Tragus*
2. Second glumes without hooked spines on abaxial surface..... 3
3. Spikelets with unisexual florets only; staminate and pistillate spikelets conspicuously different..... Group A
3. Spikelets at least some with one or more perfect florets; if unisexual, then staminate and pistillate spikelets not conspicuously different..... 4
4. Florets 1 per spikelet 5
4. Florets 2 or more per spikelet on at least some spikelets 7
5. Inflorescence a spike or spicate raceme or raceme ..... Group B
5. Inflorescence a panicle, some panicles spicate (depauperate specimens may be reduced to a raceme, e.g some Bromus and Vulpia)..... 6
6. Panicles open, contracted, or with racemose branches, but without spicate primary unilateral branches... Group C
6. Panicles with spicate primary unilateral branches..... Group D
7. Reduced florets below perfect florets (both above and below in Phragmites)..... 8
7. Reduced florets above perfect floret or all florets perfect 12
8. Reduced florets both above and below fertile florets ..... *Phragmites*
8. Reduced florets below fertile floret, or both florets reduced/staminate..... 9
9. Glumes both absent; spikelets appear to have 1 floret..... 10
9. Glumes at least one present; spikelets have 2–3 florets..... 11
10. Plants perennial, native; upper florets less than 6 mm long..... *Leersia*
10. Plants annual, introduced (cultivated); upper florets 7–12 mm long..... *Oryza*
11. Spikelets paired (except at rame or inflorescence or spicate raceme apex where spikelets are in 3's), one sessile or subsessile and perfect, one pedicellate and sterile (Saccharum both spikelets perfect)..... Group E
11. Spikelets not paired or paired; when paired spikelets both perfect; upper floret dissimilar from lower floret or florets; first glume usually reduced or absent (except in Phalaris and some Panicum species... ... ... Group F
12. Inflorescence a spike or spicate raceme or raceme..... Group G
12. Inflorescence a panicle (depauperate specimens may be reduced to a raceme)..... 13
13. Panicles of spicate primary unilateral branches..... Group H
13. Panicles of open, contracted, or rames but without spicate primary unilateral branches..... Group I

*A relatively large group consists of Irano-Turanian species. The Irano-Turanian element in the province comprises **21 (28.7%)** species. Mediterranean species also constitute about **8.9% (13 species)**. **11 species** are Euro-Siberian and they are found in wet places. As the members of this family are cosmopolitan, only 2 species are endemic to Turkey.

Bromus sipyleus BOISS. ENDANGERED	Endemic	Sipil kılcanı	Perennial
Alopecurus gerardii VILL. ENDANGERED	Endemic	Köse tilkikuyruğu	Annual

CONCLUSIONS

By this checklist, we provide information on currently known grass species and their distribution in Istanbul. Approximately 258 species representing 89 genera have been recorded in Istanbul, which constitutes nearly one third of the grasses found in Turkey. The number of recorded grass species in Istanbul represents 30 % of the total flora of Istanbul. The results of this study are also compared with the former publications on the basis of new nomenclatural novelties carried out in the family.

49% of Poaceae members present in İstanbul province belong to 10 genera (*Bromus* L., *Elymus* L., *Aegilops* L., *Hordeum* L., *Triticum* L., *Phalaris*, *Alopecurus* L.,*Phleum* L., *Festuca* L.,*Lolium* L.).

*The main reasons for this are that these genera comprise many species of mainly Irano-Turanian elements and that Istanbul province is in transitional belt between 2 phytogeographical regions, namely the Irano-Turanian and the Mediterranean.