

## The Genus *Phalaris* in Turkey

### Türkiyede *Phalaris* Cinsi

Asuman BAYTOP\*

As stated by Anderson (1) who recently studied the taxonomy and the distribution of the genus *Phalaris*, this genus is represented on the world by 15 species. As origin, some of them are native to America. Another group is native to lands bordering the Mediterranean Sea and one species is found throughout the northern hemisphere as an holarctic element. At present, because of man's activities and agronomical investigations, many of them have been introduced on all the continents and thus have gained a worldwide distribution (1).

In Turkey it occurs 8 species of *Phalaris*. Seven of them are mediterranean plants (*P. paradoxa*, *coerulescens*, *minor*, *aquatica*, *truncata*, *brachystachys*, *canariensis*) and are found in relatively dry places: fields, roadsides, grassy lands. The eighth (*P. arundinacea*) is an element belonging to the northamerican-eurosiberian flora and grows on wet places: edges of lakes, riversides.

Some of these species are important plants used as animal food. The most important of them is *P. canariensis* which is widely cultivated in Turkey for its grains used as a food for small cage birds. It is grown in the Aegean, Marmara, Central-North and South-East agricultural regions of Turkey and the grains, known as «kusyemi» are exported in a large scale (8).

Among the perennial species, *P. aquatica* is said to be a good forage grass in the young state and has been found much valuable for pasture in Australia and in North America (2). However, it has been noted that it may be injurious to animals in some respects. Thus, it is said that the poisoning of sheep which have

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grazed in a pasture containing a large percentage of *P. aquatica* was due to the alkaloids present in this grass (6). Another report of sheep poisoning with the same plant gives as reason the large amount of nitrates that it accumulates in some cases (7).

*P. crundinacca*, another perennial species, is praised as a good forage grass when young (3):

*P. minor* is also said to be an useful forage plant and is even cultivated in this purpose (4).

The present paper deals with the description of the genus *Phalaris* in Turkey, gives a key for the identification of the 8 species growing in this country, followed by the description of each species and the distribution according to the specimens that we have seen in the following herbaria: Herbarium of the Royal Botanic Garden at Edinburgh, Herbarium of the Royal Botanic Gardens at Kew Herbier du Conservatoire Botanique de Genève, Herbarium of the Faculty of Sciences at Ankara, Herbarium of the Faculty of Pharmacy at Istanbul and Herbarium of the Faculty of Sciences at Istanbul. The localities have been arranged according to the grid system introduced by P.H. Davis (5).

### *Phalaris* L.

Sp. Pl. 54 (1753), G. Pl. 29 (1754)

Annual or perennial grasses. Rhizomes, in perennial species, short or creeping, or the base of the culm swollen in the lowest internodes. Culms erect or geniculate at the base, terete, glabrous and smooth. Leaf-blades flat, glabrous, sheaths glabrous and smooth, the lower often minutely scabrid, the upper somewhat or clearly inflated or enclosing the base of the panicle, ligules membranous, ovate or oblong, often torn. Panicle dense, then ovate, oblong or more or less cylindrical, or somewhat loose, then lan- ceolate and lobed. Spikelets laterally compressed, pedicelled, 3-flo- wered, the lower two florets reduced to sterile lemmas (one or both of them may be obsolete), the single fertile floret bisexual, disarticulating above the glumes together with the two sterile lemmas adpressed at its base. Spikelets all alike, bisexual and fertile, or these spikelets accompanied by sterile ones. Fertile spi- kelets: glumes equal in size, 4-8 mm long, longer than the floret,

usually glabrous, 3-nerved, keeled, the keel winged or wingless, sterile lemmas reduced to 1 or 2 scales or obsolete, often hairy, fertile lemma 2.5-4 mm long, keeled, ovate-lanceolate in profile, coriaceous, shiny, glabrous or covered with adpressed silky hairs, obsoletely 5-nerved, palea linear in profile, of the same texture and about the same length as the lemma, hairy only on the upper part of the keel, obsoletely 2-nerved. Sterile spikelets: if present in the panicle, the glumes equal in size, but somewhat different from those of the fertile spikelets, or much deformed and hardened at the base of the inflorescence, lemma and palea membranous, linear-lanceolate in profile. Stamens 3. Anthers 1-3.5 mm long. Grain tightly enclosed by the lemma and palea, elliptical or oblong, somewhat flattened, brown, bearing at the top the rest of the style, with a narrow groove at the ventral keel, the groove dark coloured, reaching the middle or the top of the grain. Embryo  $1/2 - 1/3$  the length of the grain, hilum as a small, roundish spot at the base of the groove. Starch grains compound, with numerous components, oblong or rounded, 5 to 25  $\mu$  in diameter.

## Key to the species

1. Panicle with two kinds of spikelets: fertile and sterile. In the fertile spikelet: fertile lemma glabrous or sparsely hairy, sterile lemmas obsolete
  2. Annuals. Panicle with deformed and hardened sterile spikelets at its base. Upper leaf-sheath enclosing the base of the panicle  
*1. paradoxa*
  2. Perennials, culms bulbous at the base. Panicle without any different kind of sterile spikelets at its base. Upper leaf-sheath far from the base of the panicle  
*2. coerulescens*
1. Panicle with one kind of spikelets: fertile. Fertile lemma covered with adpressed silky hairs, sterile lemmas 1 or 2
3. Keel of the glumes winged. Panicle dense. Sterile lemmas 1 or 2
4. Sterile lemma 1. If a second is present, then this one very small
  5. Annuals. Wing of the glumes broad, with a clearly denticulate margin. Sterile lemma half the length of the fertile lemma. Anthers 1.5 mm long  
*3. minor*

grazed in a pasture containing a large percentage of *P. aquatica* was due to the alkaloids present in this grass (6). Another report of sheep poisoning with the same plant gives as reason the large amount of nitrates that it accumulates in some cases (7).

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The present paper deals with the description of the genus *Phalaris* in Turkey, gives a key for the identification of the 8 species growing in this country, followed by the description of each species and the distribution according to the specimens that we have seen in the following herbaria: Herbarium of the Royal Botanic Garden at Edinburgh, Herbarium of the Royal Botanic Gardens at Kew, Herbarium of the Conservatoire Botanique de Genève, Herbarium of the Faculty of Sciences at Ankara, Herbarium of the Faculty of Sciences at Istanbul and Herbarium of the Faculty of Pharmacy at Istanbul. The localities have been arranged according to the grid system introduced by P.H. Davis (5).

#### **Phalaris L.**

Sp. Pl. 54 (1753), G. Pl. 29 (1754)

Annual or perennial grasses. Rhizomes, in perennial species, short or creeping, or the base of the culm swollen in the lowest internodes. Culms erect or geniculate at the base, terete, glabrous and smooth. Leaf-blades flat, glabrous, sheaths glabrous and smooth, the lower often minutely scabrid, the upper somewhat or clearly inflated or enclosing the base of the panicle, ligules membranous, ovate or oblong, often torn. Panicle dense, then ovate, oblong or more or less cylindrical, or somewhat loose, then lanceolate and lobed. Spikelets laterally compressed, pedicelled, 3-flowered, the lower two florets reduced to sterile lemmas (one or both of them may be obsolete), the single fertile floret bisexual, disarticulating above the glumes together with the two sterile lemmas adpressed at its base. Spikelets all alike, bisexual and fertile, or these spikelets accompanied by sterile ones. Fertile spikelets: glumes equal in size, 4-8 mm long, longer than the floret,

usually glabrous, 3-nerved, keeled, the keel winged or wingless, sterile lemmas reduced to 1 or 2 scales or obsolete, often hairy, fertile lemma 2.5-4 mm long, keeled, ovate-lanceolate in profile, coriaceous, shiny, glabrous or covered with adpressed silky hairs, obsoletely 5-nerved, palea linear in profile, of the same texture and about the same length as the lemma, hairy only on the upper part of the keel, obsoletely 2-nerved. Sterile spikelets: if present in the panicle, the glumes equal in size, but somewhat different from those of the fertile spikelets, or much deformed and hardened at the base of the inflorescence, lemma and palea membranous, linear-lanceolate in profile. Stamens 3. Anthers 1-3.5 mm long. Grain tightly enclosed by the lemma and palea, elliptical or oblong, somewhat flattened, brown, bearing at the top the rest of the style, with a narrow groove at the ventral keel, the groove dark coloured, reaching the middle or the top of the grain. Embryo  $1/2 - 1/3$  the length of the grain, hilum as a small, roundish spot at the base of the groove. Starch grains compound, with numerous components, oblong or rounded, 5 to 25  $\mu$  in diameter.

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4. Sterile lemma 1. If a second is present, then this one very small
  5. Annuals. Wing of the glumes broad, with a clearly denticulate margin. Sterile lemma half the length of the fertile lemma. Anthers 1.5 mm long  
*3. minor*

5. Perennials, culms often bulbous at the base. Wing of the glumes narrow, with an entire or obsoletely denticulate margin. Sterile lemma one third the length of the fertile lemma. Anthers 3.5 mm long *4. aquatica*
4. Sterile lemmas 2 and equal in size
6. Sterile lemmas  $1/6 - 1/10$  the length of the fertile lemma. Annuals or perennials
7. Annuals. Upper leaf-sheath inflated. Panicle ovate or oblong. Glumes 6-8 mm long. Fertile lemma 4-5 mm long. Wing tapering gradually till the base of the glume *5. brachystachys*
7. Perennials. Upper leaf-sheath not inflated. Panicle oblong-cylindrical. Glumes 5-7 mm long. Fertile lemma 3-4 mm long. Wing on the upper  $1/2 - 2/3$  of the glume *6. truncata*
6. Sterile lemmas  $1/2$  the length of the fertile lemma. Annuals *7. canariensis*
3. Keel of the glumes wingless. Panicle somewhat loose and lobed. Sterile lemmas 2, half the length of the fertile lemma. Rhizomes creeping *8. arundinacea*
1. **P. paradoxa** L., Sp. Pl. 1665 (1763). Fig. 1.

Annual, tufted grasses. Culms erect or geniculate at the base, 20-100 cm tall. Leaf-blades 2-9 mm wide, minutely scabrid on both surfaces and on the margins. Sheaths glabrous, smooth, upper sheath inflated and enclosing the base of the panicle. Ligules 2-8 mm long, often torn. Panicle dense, oblong-cylindrical, tapering to narrow base, pale green, often purple tinged, 4-10 cm long, 1.5-2.5 cm wide. Panicle axis scabrid. Spikelets falling in groups of 6-7, all pedicelled, one of them with a bisexual floret and fertile, the others sterile. Fertile spikelets: pedicelled, glumes 7-8 mm long, attenuate at the top to a 2-3 mm long awnlike prolongation, 3-nerved, with 2-3 secondary nerves on each face, winged on the keel, wing as a toothlike projection of about 1 mm long on the middle of the keel, sterile lemmas obsolete, each represented by one or a few hairs, fertile lemma ovate-lanceolate in profile, 3 mm

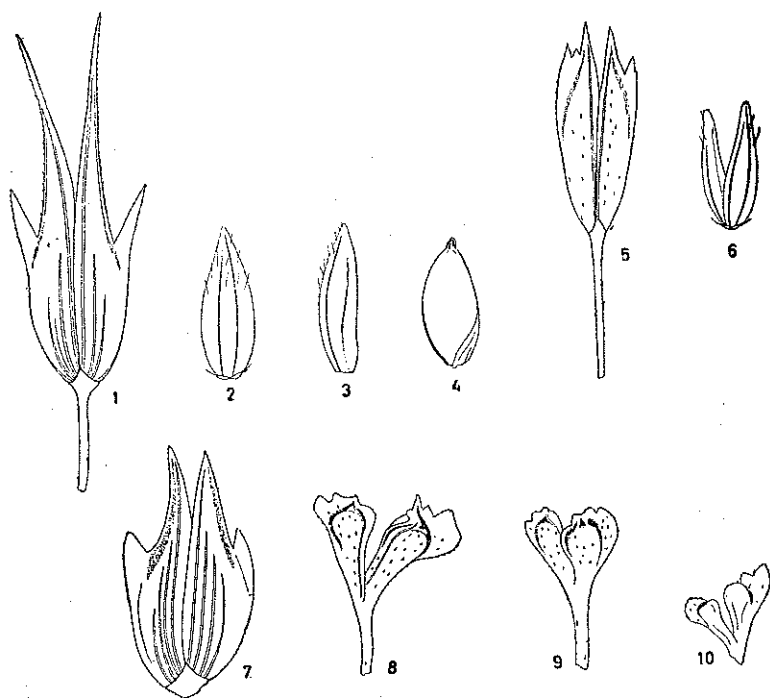


Fig. 1. *Phalaris paradoxa*. 1-4 normal fertile spikelet: 1 glumes, 2 lemma, 3 palea, 4 grain. 5-6 normal sterile spikelet: 5 glumes, 6 lemma and palea, 7 basal fertile spikelet. 8, 9, 10 basal sterile spikelets. (x 7).

long, coriaceous, shiny, glabrous or with some silky hairs towards the top, palea as long as the lemma. Sterile spikelets: pedicelled, glumes 4-6 mm long, acute, 3-nerved, winged on the keel, wing irregularly denticulate, sterile lemmas each represented by one or a few hairs, lemma and palea membranous, 2 mm long. Anthers 1-1.8 mm long. Grain oblong, 2.5 mm long; 1 mm wide, the rest of the style erect, embryo  $\frac{1}{3}$  the length of the grain, the groove about  $\frac{1}{2}$  the length of the grain.

The spikelets found at the base of the panicle are quite different from those described above. They are gathered in the same way in clusters of 7 and have a fertile spikelet which are surrounded by sterile ones. But all are reduced in size and are

indurated; the fertile spikelet ise sessile (instead of pedicelled), 5 mm long, with the glumes shortly tapering at the top and the sterile spikelets are reduced to 1-2 mm glumes with crestlike wings.

The number of the hardened spikelets at the base the inflorescence is very variable. They are rarely absent. They occupy a short or longer distance in the panicle, or even the greater part of it.

A 2 (E) Istanbul: Yeşilköy, Tohum Islah Enstitüsü, v. 1947, *M. Heilbronn!* Aymama, Kâğıthane, *Azn!* Sarıyer, Belgrat forest, near Topuzlu bent, 3.vi.1959, *F. Yaltırık*, ISTO 1502! A 2 (A) Istanbul: Dudullu, Fenerbahçe, Maltepe, *Azn!* Maltepe, 24.v.1959, *A. Baytop*, ISTE 5372! Maltepe, 20.vi.1960, *A. Baytop*, ISTE 5945! and 5945a! Orhantepe, 20.vi.1960, *A. Baytop*, ISTE 5925! Tuzla İçmeleri, 27.v.1961, *A. Baytop*, ISTE 6665! Karamürsel to Yalova, 10 km before Yalova, fieldside, 12.vi.1966, *A. Baytop*, ISTE 9842! A 2 Kocaeli: Gebze, v.1954, *M. Heilbronn!* A 2 Bursa: Karacabey, Hara, 11.vi.1938, *Krause* 5262! A 3 Zonguldak: Devrek, 20.vi.1935, *S. Fehmi!* B 1 Izmir: Bornova, experimental fields of Agronomi Kürsüsü, *N. Zeybek*, ISTE 10643! Bornova, near Necip pınar, 15.v.1963, grassy land, *C. Regel*, ISTE 12388! Bostanlı - Karşıyaka, seaside, iv.1966, *M. Aydar*, ISTE 12349! Sabuncu gorge, Izmir - Manisa road, 14.v.1966, *A. Baytop* 10065! B 1 Balıkesir: Edremit, grassy land, 22.v.1963, *C. Regel*, ISTE 12327! C 1 Muğla: Milas to Bodrum, 12 km from Milas, 5 km from road junction to Güllük, 20 m., *Poterium macchie*, 22.v.1962, *Davis* 35008. C 3 Antalya: Bahçeli evler, 21.iv.1959, *Hennipman et al.* 535! C 5 Adana: Ceyhan to Yumurtalık, near sea level, roadside, 9.v.1965, *Coode and Jones*, 713! C 5 İçel: Mersin, among the ruins of Elaensa Sebaste, 22.iv.1964, *Townsend* 640422/34! C 6 Gaziantep: Gaziantep to Besni, Cintepe, 750 m, 10.v.1935, *Balls*, 2239! Nisip - Birecik, ca 5 km from the Euphrates, 400 m, edge of fields, on marly soil, 14.v.1957, *Davis* 27962! C 6 Hatay: Antalya, 16.v.1962, *A. Baytop*, ISTE 7026! C 7 Urfa: ca halfway between Viranşehir and Ceylanpınar, 500 m, fallow hillock, 2.v.1966, *Davis* 42357! C 8 Diyarbakır: Şilbe, 10.vi.1958, *Brown* 468! C 9 Mardin: Cizre to Hessana, at S. foot of Cudi dağ, 500 - 700 m, 10.v.1966, *Davis* 42765!

It is a mediterranean plant found mainly in Outer Anatolia. It grows in waste places, uncultivated lands, roadsides. April-July. It is reported from European Turkey.

*P. paradoxa* is very close to *P. cocrulascens* because of the following common characters. In both of them, the spikelets fall in groups of 7, in which one of them has a bisexual floret, the others being sterile; the fertile lemma is glabrous or nearly so, and the sterile lemmas found at its base are reduced to one or a few hairs. But it can be easily recognized as follows. It is an annual



plant; the fertile spikelet is pedicelled and have the glumes attenuate at the top to an awnlike prolongation and winged on the keel with a toothlike projection; the spikelets found at the base of the panicle are indurated, the fertile one being sessile and the others much reduced.

2. *P. coerulescens* Desf., Fl. Atlant. 1, 56 (1798). Fig. 2.

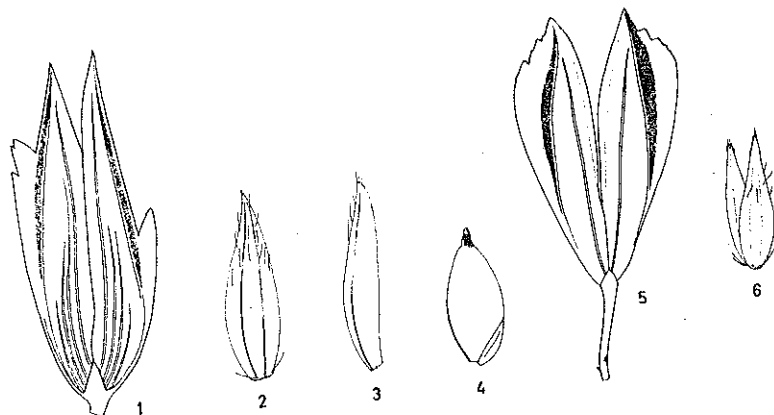


Fig. 2. *Phalaris coerulescens*. 1-4 fertile spikelet: 1 glumes, 2 lemma, 3 palea, 4 grain. 5-6 sterile spikelet: 5 glumes, 6 lemma and palea. (x7).

Perennial, tufted grasses. Culms erect or geniculate at the base, 20-150 cm tall, bulbous at 1 or 2 superposed lower internodes. Leafblades 1-4 mm wide, often convolute in the lower leaves, minutely scabrid on both surfaces and on the margins. Sheaths glabrous and smooth, upper sheath slightly inflated, lower sheath scabrid. Ligules 2-4 mm long, often torn. Panicle dense, oblong or cylindrical, pale green or purplish, 2-7 mm long, 7-20 mm wide. Panicle axis scabrid. Spikelets falling in groups of 6-9 (often 7), one of them sessile, with a bisexual floret and fertile, the surrounding spikelets pedicelled, male and sterile. In groups of more than 7 spikelets, there are often 2 fertile spikelets. Fertile spikelets: sessile, glumes 7-8 mm long, lanceolate in profile, acute, glabrous or adpressed hairy, 3-nerved, with 2-3 secondary nerves on each face, winged on the keel, wing toothlike, with entire or

denticulate margins, asymmetric on the two glumes, sterile lemmas obsolete, each represented by one or a few hairs, fertile lemma lanceolate in profile, 3.5-4 mm long, coriaceous, shiny, glabrous or with a few adpressed hairs towards the top, palea as long as the lemma. Sterile spikelets: pedicelled, 6-7 mm long, glumes obovate-oblancoolate in profile, glabrous or adpressed hairy, 3-nerved, keel winged, wing oblique and denticulate at the top, sterile lemmas represented by one or a few hairs, lemma and palea membranous, 2.5 mm long. Anthers 3 mm long. Grain oblong, 2.5 mm long, 1 mm wide, the rest of the style erect, embryo  $1/3$  the length of the grain, the groove about  $1/2$  the length of the grain.

A 2 (E) Istanbul: Kanarya, Soğuksu, 31.v.1964, A. Baytop, ISTE 7668! Halkalı, 11.vi.1958, M. Heilbronn and B. Tözün! Yeşilköy, Tohum Islah Enstitüsü, v.1947, M. Heilbronn! Halkalı - Kalfaköy, Kasapçayırı - Yukarıkavak, Azn! A 2 (A) Istanbul: Maltepe, 1.vi.1960, A. Baytop, ISTE 5880 (with villous glumes)! Orhantepe, 20.vi.1960, A. Baytop, ISTE 5924! Bostancı, Heybeliada, Büyükkada, Azn! Büyükkada, H. Birand! Karamürsel to Yalova, 10 km before Yalova, fieldside, 12.vi.1966, A. Baytop, ISTE 9841! A 2 Bursa: near the lake Apolyont, Bursa to Karacabey, 37 km before Karacabey, 12.vi.1966, A. Baytop, ISTE 9856! B 1 Çanakkale: Erikli, Kaz dağı, dry meadows, 11.vi.1964, C. Regel, ISTE 12389!

It is a mediterranean plant collected in Turkey from Marmara region and European Turkey. It is found in fields and meadows. May-July.

*P. coerulescens*, together with *P. paradoxa*, constitute a group which can be put apart from the other species of *Phalaris* by their common characters given under *P. paradoxa*. The characteristic features that serve to separate it from *P. paradoxa* are as follows. It is perennial, the culm has at its base one or two swollen internodes. The central fertile spikelet of the fascicle is sessile, with acute (not as an awnlike prolongation) glumes and asymmetrical wings on both glumes. There are no indurated and reduced spikelets at the base of the panicle.

### 3. *P. minor* Retz, Fasc. Obs. Bot. 8 (1783). Fig. 3.

Annual, tufted grasses. Culms erect or geniculated at the base, 20-80 cm tall. Leaf-blades 3-9 mm wide, smooth on both surfaces, minutely scabrid on the margins. Sheaths glabrous, upper sheath slightly or not inflated. Ligules 4-6 mm long, often torn. Panicle

dense, oblong or more or less cylindrical, pale green, 1.5-5.5 cm long, 1-1.5 mm wide. Panicle axis scabrid. Spikelets shortly pedicelled, all alike. Glumes 5 mm long, lanceolate in profile, 3-nerved, winged on the keel, wings irregularly erose-denticulate. Sterile lemma only 1 and 1 mm long, adpressed hairy. Fertile lemma 3 mm long, ovate-lanceolate in profile, coriaceous, shiny, adpressed hairy. Palea a little shorter than lemma, linear in profile. Anthers 1.5-1.8 mm long. Grain 2 mm long, ovate, the rest of the style erect and acuminate, embryo  $1/3$  the length of the grain, the groove  $1/3-1/2$  the length of the grain.

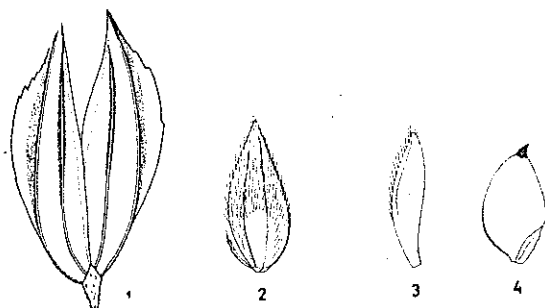


Fig. 3. *Phalaris minor*. 1 glumes, 2 fertile lemma with a sterile lemma at the base, 3 palea, 4 grain. (x7).

A 2 (E) Istanbul: Yedikule, *Azn!* A 2 (A) Istanbul: Suadiye, 12.vi.1963, *A. Baytop*, ISTE 7392! Maltepe, 1.vi.1961, *A. Baytop*, ISTE 5880a! Tuzla Içmeleri, 27.v.1961, *A. Baytop*, ISTE 6666! Alemdağ, Kızıltoprak - Kuşdili, Maltepe, *Azn!* A 2 Kocaeli: near Dil, on the side of the railway line, 19.v.1959, *A. Baytop*, ISTE 5349! A 2 Bursa, 1940, *Mete!* B 1 Izmir: Gümüldür, grassy land, 14.v.1963, *C. Regel*, ISTE 12313! C 4 İçel: Silifke, gardens, 22.iv.1953, *M. Başarman!* C 5 Adana: Adana to Karataş, 5 miles S. of Adana, near sea level, roadside ditch, 1.v.1965, *Coode and Jones* 238!

It is a mediterranean plant collected from West and South Anatolia where it grows in gardens, fields, roadsides. April-July. It is reported from European Turkey.

*P. minor* is an annual species. It can be recognized by its glumes with clearly erose-denticulate margins, by the single sterile lemma which is about  $1/3$  the length of the fertile lemma.

4. *P. aquatica* L., Amoen. Acad. 4,264 (1755). Syn. *P. tuberosa* L., Mant. Pl. 2, 557 (1771), *P. nodosa* Murr., Syst. Veg. ed. 13, 88 (1774) (1). Fig. 4.

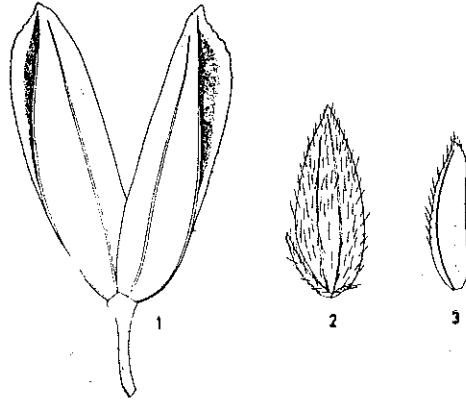


Fig. 4. *Phalaris aquatica*. 1 glumes, 2 fertile lemma with the sterile lemmas at the base, 3 palea. (x7).

Perennial, tufted grasses. Rhizomes short. Culms erect or geniculate at the base, 50-120 cm tall, often bulbous at the base. Leaf-blades 3-8 mm wide, smooth on both surfaces and minutely scabrid on the margins, or minutely scabrid on both surfaces of the upper leaves. Sheaths glabrous and smooth, lower sheath minutely scabrid. Ligules 3-7 mm long, often torn. Panicle dense, cylindrical, pale green, 6-8 cm long, 1-1.5 cm wide. Panicle axis scabrid. Spikelets pedicelled, all alike. Glumes 6-7 mm long, semi-oblong in profile, glabrous, 3-nerved, keel winged, wing on the upper  $1/2-1/3$  of the glume, with the upper margins oblique, entire or slightly erose. Sterile lemmas 2, the upper 1.5 mm long, the lower smaller than 0.5 mm, both hairy. Fertile lemma 4 mm long, ovate-lanceolate in profile, coriaceous, shiny and adpressed-silky hairy. Palea somewhat shorter than the lemma. Anthers 3-3.5 mm long.

A 2 (E) Istanbul: Halkalı, Orman Başmüdürlüğü Çayır Tohumu Üretim Fidanlığı, (the seeds are introduced from U.S.A.), 21.vi.1960, N. Gülgin, İSTE 8451a! A 2 (A) Istanbul: Orhantepe, 20.vi.1960, A. Baytop, İSTE 5941! Pen-

dik - Kartal, *Azn!* C 3 Antalya: Kirkgöz, 31.v.1936, *Tengwall*, 692! Antalya, 26.vi.1958, *Truman* 255! C 8 Mardin: Mardin to Nuseybin, ca 15 km from Mardin, 600 - 650 m, fallow fields, 22.v.1957, *Davis* 28456!

It is a mediterranean grass, collected in Istanbul and in South Anatolia. It is found rather on wet soil, in uncultivated fields. May-July. There is no records from the European Turkey, except one where the plant has been grown experimentally from the seeds coming from U.S.A.

The principal features that identify *P. aquatica* are that it is a perennial species, has cylindrical panicles and possesses only one well developed sterile lemma in the spikelet, the second being very short.

5. *P. brachystachys* Link, Neues Journ. Bot. Schrader 1 (3), 134 (1806). Fig. 5.

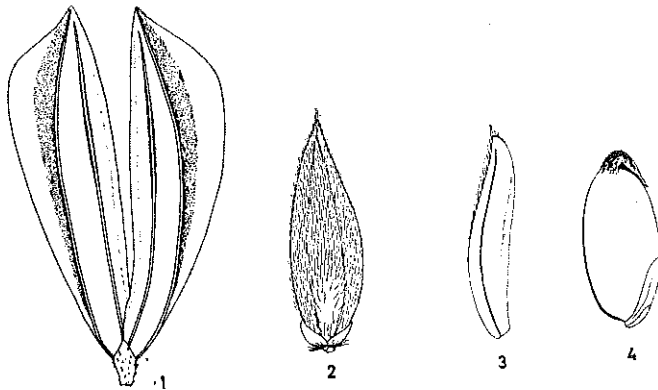


Fig. 5. *Phalaris brachystachys*. 1 glumes, 2 fertile lemma with the sterile lemmas at the base, 3 palea, 4 grain. ( $\times 7$ ).

Annual, tufted grasses. Culms erect or geniculate at the base, 20-70 cm tall. Leaf-blades 2-5 mm wide, minutely scabrid on both surfaces and on the margins. Sheaths glabrous, the upper inflated, the lowers minutely scabrid. Ligule 2-4 mm long, often torn. Panicle dense, ovate or oblong, pale green, sometimes purplish, 1.5-

3 cm long, 1-1.5 cm wide. Panicle axis scabrid. Spikelets short pedicelled, all alike. Glumes 6-8 mm long, semi-obovate in profile, glabrous, 3-nerved, keel winged, wing broad and oblique at the upper part, becoming gradually narrower as reaching the base of the glume, margins entire. Sterile lemmas 2, equal, about 0.5 mm long, ovate-lanceolate, somewhat fleshy, brownish, glabrous, with a row of hairs at its base. Fertile lemma 4.5-5 mm long, lanceolate in profile, coriaceous, shiny, adpressed hairy, Palea as long as the lemma. Anthers 3-3.5 mm long. Grain 3.5 long, 1.5 mm wide, elliptic, the rest of the style recurved, embryo nearly as half as the grain, groove as long as the grain.

A 1 Kırklareli: Lüleburgaz, vi.1954, *H. İşmen!* A 1 Tekirdağ: 14 km E. of Tekirdağ, 13.v.1968, *T. Gözler*, ISTE 12672! A 2 (E) Istanbul: Yeşilköy, Tohum Islah Enstitüsü, v. 1947, *M. Heilbronn!* Uskumruköy, Şişli, Hamidiyeköy Zincirlikuyu, Gümüşsu - Maslak, Yeşilköy - Florya, *Azn!* Rumelihisar, *Post!* A 2 Kocaeli: Tuzla, 27.v.1961, *A. and T. Baytop*, ISTE 6692! Gebze, v.1954, *M. Heilbronn!* Tuzla, vii.1945, *A. Heilbronn* and *M. Başarman!* A 2 Bursa: near Gemlik, 8.vii.1960, *A. Baytop*, ISTE 6077! Kurtulköy, on the way from Bursa to Gemlik, 12.vi.1966, *A. Baytop*, ISTE 9851! near the lake Apolyont, on the way from Bursa to Karacabey, 37 km before Karacabey, 12.vi.1966, *A. Baytop*, ISTE 9856a! B 1 Çanakkale: Çanakkale to Ezine, 20 km before Ezine, roadside, 19.v.1967, *N. and M. Tanker*, ISTE 11045! B 1 İzmir: Torbalı, vi.1946, *A. Attilâ!* inter segetes Smyrnae, v.1827, *Fleischer!* C 5 Içel: S. W. of Tarsus, Eucalyptus wood, 15.v.1959, *Hennipmann et al.* 1170! C 6 Gaziantep: Oğuzeli, cornfields, 29.v.1958, *M. Heilbronn* 280!

It is a mediterranean plant, found mainly in West and South Anatolia where it grows in uncultivated land, edges of fields, roadsides. May-July. It is reported from European Turkey.

*P. brachystachys*, as *P. truncata*, are recognized with the two small swollen sterile lemmas present at the base of the fertile floret. This character puts them together, separating them from the remain of the *Phalaris* species. The main characters that differentiate *P. brachystachys* from *P. truncata* are as follows. *P. brachystachys* is annual, the upper sheath on the culm is inflated. The panicle is ovate or nearly oblong. The glumes are 6-8 mm long, the wing is broad and oblique on the upper margin and attenuated till the base of the glume. The fertile lemma is 4.5-5 mm long. The rest of the style is recurved.

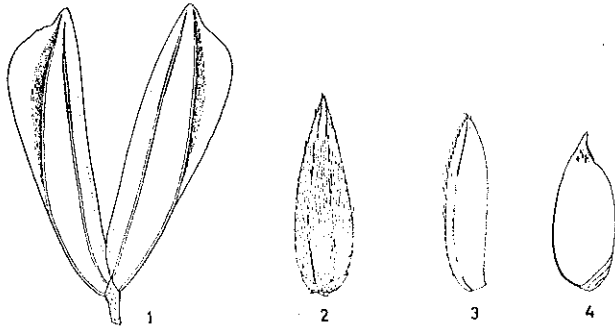
6. *P. truncata* Guss., Suppl. Fl. Sic. Prodr. 18 (1832). Fig. 6.

Fig. 6. *Phalaris truncata*. 1 glumes, 2 fertile lemma with the sterile lemmas at the base, 3 palea, 4 grain. (x7).

Perennial, tufted grasses, with sterile shoots. Culms erect or geniculate at the base, 50-100 cm tall. Leaf-blades 1-3 mm wide, often convolute in the upper leaves of the culms and in the leaves of the shoots, minutely scabrid on both surfaces and on the margins. Sheaths glabrous, not clearly inflated, lower sheaths and the sheaths on the sterile shoots minutely scabrid. Ligules 2-4 mm long, often torn. Panicle dense, oblong-cylindrical, pale green, sometimes purplish, 2.5-5 cm long, 8-16 mm wide. Panicle axis scabrid. Spikelets shortly pedicelled, all alike. Glumes 5-6 mm long, semi-obtriangular in profile, glabrous, 3-nerved, keel winged, wing on the upper 1/2-2/3 of the glume, broad and oblique-truncate on the upper part, with entire margins. Sterile lemmas 2, equal, about 0.5 mm long, ovate-lanceolate, somewhat fleshy, brownish, glabrous, with a row of hairs at its base. Fertile lemma 3.5-4 mm long, lanceolate in profile, coriaceous, shiny, adpressed hairy. Palea nearly as long as lemma. Anthers 3-3.5 mm long. Grain 3 mm long, oblong, the rest of the style erect, embryo 1/3-1/4 the length of the grain, groove as long as the grain.

A 1 Kırklareli: Yenibedir to Büyükkarıştıran, 13.vi.1968, A. Baytop ISTE 13347! A 2 (E) Istanbul: Halkalı, Kalfaköy, Halkalı - Safraköy, Bakırköy - Yeşilköy, Florya - Şenlikköy, Küçükçekmece - Bakırköy, Aşn! Büyükçekmece to Silivri, 7.vi.1959, A. Baytop, ISTE 5400! Haznedar, 31.v.1968, N. Baylav and G. Ertem, ISTE 13435! A 2 (A) Istanbul: Üsküdar - Beylerbeyi, Bostancı - Erenköy, Kızıltoprak, Aşn! Orhantepe, 20.vi.1960, A. Baytop, ISTE 5923! Cevizli, near the sea, 21.vii.1963, A. Baytop, ISTE 7430! Karamürsel to Yalova, 10 km before Yalova, edge of a field, 12.vi.1966, A. Baytop, ISTE 9843!

It is a mediterranean grass collected from both sides of the Bosphorus, the Marmara Sea region and the European Turkey. It is found in fields and roadsides.

*P. truncata* is close to *P. brachystachys*, due to the fact that both possess two small, fleshy and glabrous sterile lemmas at the base of the fertile floret. Yet it can be separated from it by the following characters. *P. truncata* is perennial, the upper sheath on the culm is not clearly inflated. The panicle is oblong-cylindrical. The glumes are 5-6 mm long, the wing is more truncate than oblique on the upper margin and occupies the upper 1/2-1/3 part of the keel. The fertile lemma is 3.5-4 mm long. The rest of the style is erect.

7. *P. canariensis* L., Sp. Pl. 54 (1753). Fig. 7.

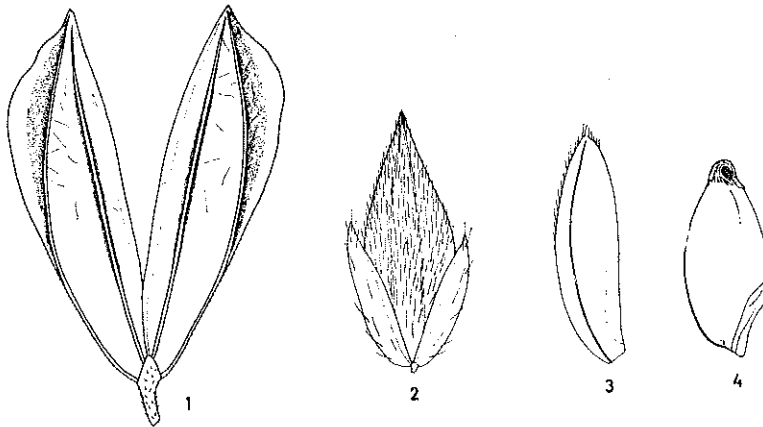


Fig. 7. *Phalaris canariensis*. 1 glumes, 2 fertile lemma with the sterile lemmas at the base, 3 palea, 4 grain. ( $\times 7$ ).

Annual tufted grasses. Culms erect or geniculate at the base, 30-60 cm tall. Leaf-blades 3-8 mm wide, minutely scabrid on both surfaces and on the margins. Sheaths glabrous and smooth, the upper inflated, the lowers minutely scabrid. Ligule 3-5 mm long, often torn. Panicle dense, ovate or oblong, pale green, 2-3 cm long, 1-1.5 cm wide. Panicle axis scabrid. Spikelets shortly pedicelled, all alike. Glumes 7-8 mm long, semi-ovate in profile, glabrous or scarcely hairy, 3-nerved, keel winged, wing narrow in the lower



part, broader upward, oblique on the upper part, margins entire. Sterile lemmas 2, equal, 3-3.5 mm long, lanceolate, adpressed hairy. Fertile lemma 5-6 mm long, ovate-lanceolate in profile, coriaceous, shiny, adpressed hairy. Palea somewhat shorter than lemma. Anther 3 mm long. Grain 4 mm long, 1.5 mm wide, the rest of the style recurved, embryo half as long as the grain, groove as long as the grain.

A 2 (E) Istanbul: Yeşilköy, Taşkılla, Baltalimanı, İstinye, Tarabya - Yeniköy, Büyükdere, *Azn!* Büyükdere, *Post!* A 2 (A) Istanbul: Üsküdar, Büyükdere, *Azn!* Burgaz adası, 16.vi.1961, *A. Baytop*, ISTE 6727! B 1 Manisa: Akhisar, 6.vi.1962, *H. Bağda*, ISTE 1082! B 4 Ankara: Yenisehir, vineyards, 5.vii.1932, *Kotte!* near Çankaya, 10.vi.1935, *Krause* 4821! C 5 Adana: Adana to Karatas, 5 miles S. of Adana, near sea level, 1.v.1965, *Coode and Jones*, 255!

This mediterranean plant has been collected mainly from West and South Anatolia where it is wild in roadsides, fields and vineyards. It is cultivated in Turkey for its grains used as food for cage birds. May-July. It is reported from European Turkey.

*P. canariensis* can be recognized as follows. It is annual. The panicle is ovate or oblong. The glumes are 7-8 mm long, the wing margins are entire. There are 2 sterile lemmas at the base of the fertile floret, which are the same size and are half the length of the fertile lemma.

8. *P. arundinacea* L., Sp. Pl. 55 (1753). Fig. 8.

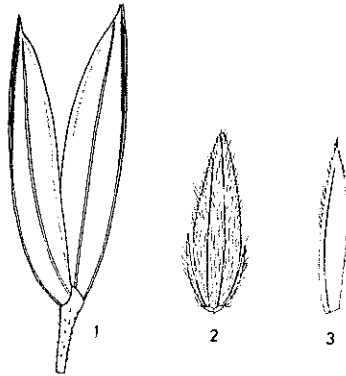


Fig. 8. *Phalaris arundinacea*. 1 glumes, 2 fertile lemma with the sterile lemmas at the base, 3 palea. (x 7).

Perennial, tufted grasses. Rhizomes creeping. Culms erect or geniculate at the base, 60-150 cm tall. Leaf-blades 5-18 mm wide, glabrous, smooth or minutely scabrid on both surfaces and on the margins. Sheaths glabrous, smooth. Ligule 4-8 mm long, often torn. Panicle loose, lobed, lanceolate-cylindrical, green or purplish, 12-18 cm long, 1.5-2.5 cm wide, branched, branches spreading during anthesis, then contracted, lower branches without any spikelets at their base. Panicle axis smooth, branches and pedicels scabrid. Spikelets pedicelled, all alike. Glumes 4-6 mm long, lanceolate in profile, glabrous, 3-nerved, keel wingless. Sterile lemma 2, equal in size, 1.5-2 long, with silky hairs. Fertile lemmas 3.5-4 mm long, lanceolate in profile, coriaceous, shiny, adpressed hairy. Palea as long as lemma. Anthers 2.5-3.5 mm long.

A 1 Edirne: Bülbüladası, on the bank of river Meriç, 40 m, 19.v.1961, *A. Baytop*, ISTE 6613! A 9 Kars: Yalnızçam dağları, above Yalnızçam, 2100 m, by stream, 19.viii.1957, *Davis* 32481! B 3 Konya: Akşehir, vi.1942, *M. Barşarman*! B 3 Kütahya: Eskişehir to Kütahya, 23 km from Kütahya, 800-900 m, banks of river Porsuk, 22.vi.1962, *Davis* 36085! B 4 Ankara: Ankara, 26.xii.1942! Kızılcahamam, 5.vi.1968, *T. Baytop*, ISTE 13052! B 9 Van: 5 km N. of Şatak, river bank, 25.vii.1954, *Davis* 23264! B 10 Kars: 8-12 km E. of Iğdır, D.Ü.Ç., 800 m, Phragmites marsh, 29.v.1966, *Davis* 43845! B 10 Ağrı: Suluçam (Musun), S. end of Balık G., 2300 m, edge of lake, 23.vii.1966, *Davis* 47283! Pont de Muratpaşa et berges du lac de Balukgöl, 8-15.v.1911, *M. Haradjian* 4205! C 3 Isparta: Gelendost, near Eğridir, wet meadows, 20.v.1966, *C. Regel*, ISTE 12390! C 3 Antalya: 25 km N-NW of Antalya, lake 5 km NW of Döşemealtı, floating in 2.5 m deep cold water, 20.iv.1959, *Hennipman et al.* 507! C 10 Hakkâri: Cilo dag, in gorge between Cilo yayla and Diz deresi, 2700 m, by shady torrent, 10.viii.1954, *Davis* 24278! Sat dağı, between Yüksekova and Varegöz, meadow near stream, 2050 m, 30.vi.1966, *Davis* 45749! 12 km from Yüksekova, 2000 m, riverside scree, 4.ix.1967, *Duncan and Tait* 162! Yüksekova, 1950 m, plains, 7.ix.1967, *Duncan and Tait* 213!

This species found almost throughout the Northern Hemisphere and also, as an introduction in the Southern Hemisphere (1), is widespread in Anatolia, and is collected mainly from Central and East parts, from nearly sea level to 2700 m. It grows on the edges of streams and lakes. It is reported from European Turkey.

*P. arundinacea* is a perennial rhizomate species, occurring in wet places, on river banks, on lake edges. It can be recognized with its panicle loose and lobed, its wingless glumes and its two sterile lemmas equal in size and about 1/3 the length of the fertile floret.

## SUMMARY

In Turkey, it occurs 8 species of *Phalaris*. One of them, *P. arundinacea*, which is native throughout the Northern Hemisphere, is also present in Turkey, mainly in Central and East Anatolia. The others, *P. paradoxa*, *coerulescens*, *minor*, *aquatica*, *brachystachys*, *truncata*, *canariensis*, are of mediterranean origin and are found mainly in West and South Turkey. *P. canariensis* is cultivated in this country for its grains used as food for cage birds.

All these species are present in European Turkey, except one, *P. aquatica*, which is not yet collected in wild state, but is found cultivated in an agricultural station from seeds introduced from North America.

## ACKNOWLEDGEMENTS

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## ÖZET

Türkiyede 8 *Phalaris* türünün yetiştiği tespit edildi. Bunlardan biri, Kuzey Yarıküre boyunca yetişen *P. arundinacea*, Türkiyede oldukça yaygındır ve başlıca Orta ve Doğu Anadoludan toplanmıştır. Diğer türler, *P. paradoxa*, *coerulescens*, *minor*, *aquatica*, *brachystachys*, *truncata*, *canariensis*, menşe itibarıyla, Akdeniz havzası bitkileridir ve Türkiyenin başlıca Batı ve Güney kısımlarında yetişir. *P. canariensis* bitkisinin Türkiyede ekimi yapılır. Taneleri «kuşyemi» adı altında satılır ve ihraç maddelerimizdendir.

Bu 8 *Phalaris* türüne Trakyada da tesadüf edilmiştir. Ancak biri, *P. aquatica*, İstanbulun Asya yakasından toplanmış olmakla beraber, Trakya bölgesinde henüz yabancı olarak bulunmamış, fakat bir ziraat merkezinde, Kuzey Amerikadan getirilmiş tohumlardan yetiştirilmiş olarak görülmüştür.

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