A GUIDE TO THE TURKISH GENERA OF UMBELLIFERAE

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Umbelliferae are often badly and inadequately represented in herbaria. There are at least two reasons for this. The first is that many Umbelliferae are tall, coarse-growing plants that are not easy to press: they take a long time to dry, readily become mildewed, take up a lot of room in the press and rarely make attractive herbarium specimens. The second is that they have a rather undeserved reputation as being weedy, dull and difficult with artificial genera that can only be separated on technicalities. For both these reasons, collectors have often neglected the family.

In Turkey, where 90 genera are represented, it is only in recent years that the family has received proper attention from plant collectors, but the lack of a simple guide to the genera has for long been a major drawback and, unless the collector is a specialist in the group, the likelihood is that in the field the plant will only be labelled "Umbelliferae". Sometimes as a result of this, the collector tends to make inadequate field observations and collect insufficient material. As an attempt to provide a simple generic guide, useful both to the herbarium and field worker, and at the same time to stress the features to which the collector should pay special attention, the following system has been prepared.

Most of, if not all, the 90 Turkish genera[1] can be recognized on macroscopic characters. A selection of eight of these characters was made so that permutations of them were sufficient to distinguish the majority of the genera under review. Each of the characters was given an alphabetical symbol. An alphabetical formula was then prepared for each genus. These generic formulae were arranged in alphabetical order to give an index-guide to the family. The number of characters used was restricted to 8 as it was thought that more would make the system too cumbersome and thus defeat its object of concise simplicity.

By giving the more outstanding features of a genus in a simple formula, this system has several advantages over dichotomising keys. In the conventional type of key, absence of flower, fruit or leaf would make it very difficult to run down an unknown plant and with such inadequate material it might be necessary to have two separate keys. With this method it is often possible, even though one or two letters of the formula are missing, to identify the genus. By avoiding such standard Umbelliferae characters as the number and position of the oil canals, the guide is particularly useful, and easily handled, in the field. On the other hand, because it has been compiled from herbarium specimens and, where these were not available, from the literature, the system has no doubt both lacunae and defects. An Umbellophile armed with this guide, a Land Rover and an unlimited amount of petrol could spend a pleasant summer in Turkey making it foolproof.

[1] The genera recognized are based on the treatments by Drude and Wolff in the Pflanzenfamilien and Pflanzenreich respectively.

The characters selected, their symbols and possible sources of confusion are:

		Characters	*Sources of confusion*
1.	A	Flowers white, creamy-white, pink, red, pale blue or green.	Some white-flowered species dry bright yellow (*Daucus*, *Laserpitium*, *Echinophora*).
	B	Flowers distinctly yellow.	
2.	C	Basal or lower cauline leaves simple.	
	D	Basal or lower cauline leaves lobed or ternate.	
	E	Basal or lower cauline leaves 1× pinnate or pinnatisect.	Often transitions between 'E' and 'F'. In doubtful cases, both should be considered.
	F	Basal or lower cauline leaves 2× pinnate.	
3.	G	Fruit more than 3× as long as broad.	Borderline cases of which there are very few are classified as 'H'.
	H	Fruit less than 3× as long as broad.	
4.	I	Fruit hairy or with spines, bristles, scales or papillae.	
	J	Fruit glabrous, smooth or with wavy wings.	
5.	K	Each mericarp flat; thickness less than 1/3 of width.	Immature fruits of the strongly compressed group 'K' may appear to be 'L' (e.g. *Peucedanum*).
	L	Each mericarp not strongly compressed; thickness more than 1/3 of width.	
6.	M	Collar of fibrous petiole-remains present at base of stem.	Stem and petiole-remains that are not fibrous should be classified as 'N'.
	N	Collar of fibrous petiole-remains absent.	
7.	O	Bracts present.	
	P	Bracts absent.	
8.	Q	Bracteoles present.	The character of the presence or absence of bracts and bracteoles is best observed on flowering material because in many genera they fall off shortly after flowering time.
	R	Bracteoles absent.	
	S	Umbels simple.	

The ideal specimen

Accurate naming of Umbelliferae is very much dependent on adequate material supplemented by good field notes. The ideal specimen/field-note would cover the following characters:

1. Flower colour—best noted in the field.
2. Leaves—notes on shape of basal leaves if too large to press, cauline leaves with or without sheathing petioles.
3. Mature fruit.
4. Base of stem to show presence or absence of fibrous petiole-remains.
5. Flowering umbels.
6. Life form—annual, biennial, perennial, or monocarpic.
7. Habitat—often characteristic for particular genera.
8. Habit, e.g. single-stemmed or clump-forming.
9. Underground parts—bulbous, rhizomatous, fusiform, tuberous or fibrous.

10. Stem—smooth, ridged, hollow, solid, latex when cut, height.
11. Smell—often very characteristic for genera but not an easy character to use because of the difficulties in definition.

Instructions for use of Guide

An unknown genus which had white flowers, simple leaves, a fruit less than 3 × as long as broad, a glabrous fruit that was not strongly compressed, was without fibrous petiole-remains and in which both bracts and bracteoles were present would therefore have the formula ACHJLNOQ. Tracing this formula in the alphabetically arranged index would show that the plant belonged to the genus *Falcaria*—and the supplementary note would show that it was a perennial species restricted to salt marshes. In many cases, as in this example, the formula itself is sufficient for identification, but where more than one genus has the same formula distinguishing features are added and arranged in such a fashion that the unsuitable candidates can rapidly be rejected. In such cases of several genera occurring under the same formula, perennial genera are always listed first, then the biennial and finally the annual genera. Unless in direct contrast to the preceding genus, each distinguishing feature mentioned relates only to its own genus and *does not occur* in any of the succeeding genera. For example, under the formula AEHJLNOQ are ten genera. Within the 6 perennial (♃) genera, *Echinophora*, which is listed first, has spiny leaves and in fruit has apparently simple umbels (due to the fusion of pedicels to form an enclosing sheath)—automatically none of the other perennial genera have these features. The second genus *Olymposciadium* differs from the remaining four in having non-fibrous petiole remains. The four genera of wet places—*Carum*, *Sium*, *Apium*, and *Berula*—are separated on characters of leaf and umbel type. The biennial (☉) and annual (○) genera are likewise distinguished on individually pertinent characters.

Under the formula AFHJLNOQ where 12 perennial genera are represented, the two most distinct genera are dealt with first, viz. the spiny *Echinophora* and the tuberous-rooted *Oenanthe*. The remaining 10 genera are divided into 2 groups: 1) low growing, more or less delicate perennials with linear leaves and 2) tall growing, clump-forming plants with broad leaf segments. After this, the genera are separated out in the usual manner.

The geographic distribution within Turkey is only given when it is of some guide to identification.

Alphabetical list of formulae

ACHIKNOQ	○	Umbels sometimes accrescent in fruit.	TORDYLIUM (Ainsworthia)
ACHILMOS	♃	Rigid, spiny, often blue-glaucous, herbs.	ERYNGIUM
ACHILNOS	♃	Rigid, spiny, often blue-glaucous, herbs.	ERYNGIUM
,,	○	Umbels in flower and fruit hidden by large ± prickly bracts.	ACTINOLEMA
ACHILNPR	○		PIMPINELLA
ACHJLNOQ	♃	Salt marsh plant.	FALCARIA
ACHJLNPR	☉ ♃	*Lazistan.*	SCALIGERIA (Albovia)
ACHJLNPS	○	Acaulous.	HOHENACKERIA
ADHIKNOQ	☉	Vittae shorter than the fruit, club-shaped.	HERACLEUM
,,	○	Vittae as long as the fruit, linear.	TORDYLIUM (Ainsworthia)

ADHILMOS	♃	Bracts showy. *N. Anatolia*—Euxine element.	ASTRANTIA
,,	♃	Rigid, spiny, often blue-glaucous herbs.	ERYNGIUM
ADHILNOQ	♃	Woods. *N. Anatolia*—Euxine element.	SANICULA
ADHJKNPR	♃	Scree plant. *Pisidia.*	PEUCEDANUM
ADHJLNOQ	☉	Cartilaginous leaf margins.	FALCARIA
ADHJLNOR	☉		APIUM
ADHJLNPR	☉	*Lazistan.*	SCALIGERIA (Albovia)
AEGILNPQ	☉	Swollen nodes.	PHYSOCAULIS
AEGJLNOQ	☉	Cartilaginous leaf margins.	FALCARIA
AEHIKNOQ	☉ ♃	Calyx 5-toothed. Stylopodium large.	HERACLEUM
,,	☉ ☉	Calyx teeth absent. Stylopodium small.	TRIGONOSCIADIUM
,,	☉	Calyx teeth present. Fruit sometimes purple-spotted.	TORDYLIUM
AEHILMOQ	♃		SESELI
AEHILMOS	♃	Rigid, spiny, often blue-glaucous, herbs.	ERYNGIUM
AEHILNOQ	♃	Leaves spiny. Apparently a simple umbel in fruit due to fusion of pedicels to form an enclosing sheath.	ECHINOPHORA
,,	♃	Fruit curved, large. Umbels sometimes male-flowered only.	LECOKIA
,,	☉ ♃	Fruit straight.	PIMPINELLA
,,	☉	Rays of umbel irregularly divergent. Hairs simple, not glandular. Bracts entire.	CAUCALIS
,,	☉	Rays of umbel not divergent. Hairs stellate at tip, glandular. Bracts entire.	LISAEA
,,	☉	Rays of umbel accrescent in fruit. Bracts clearly divided.	DAUCUS
AEHILNOS	☉	Delicate.	LAGOECIA
,,	☉ ☉ ♃	Rigid, spiny, often blue-glaucous herbs.	ERYNGIUM
AEHILNPQ	☉		TORILIS
AEHJKNOQ	☉ ♃	Fruit margins not wrinkled.	HERACLEUM
,,	☉	Fruit margins thickened and regularly wrinkled.	TORDYLIUM
AEHJKNOR	♃	*Caria & Cilician Taurus.*	GLAUCOSCIADIUM
AEHJKNPQ	♃		PEUCEDANUM
AEHJKNPR	♃	Scree plant. *Pisidia.*	PEUCEDANUM
AEHJLNOQ	♃	Leaves spiny. Apparently a simple umbel in fruit due to fusion of pedicels to form an enclosing sheath.	ECHINOPHORA
,,	♃	Petiole bases persistent but not fibrous.	OLYMPOSCIADIUM
,,	♃	Wet places or not. Leaf segments very narrow.	CARUM
,,	♃	Wet places. Umbels terminal.	SIUM
,,	♃	Wet places. Umbels leaf-opposed. Leaves bright green, shiny.	APIUM
,,	♃	Wet places. Umbels leaf-opposed. Leaves blue-green, dull.	BERULA
,,	☉	Tall ± leafless stems.	SISON
,,	☉	Large, rigid, spiny bracts and bracteoles. *Maraş.*	EXOACANTHA
,,	☉	Each mericarp spherical. Calyx teeth obsolete.	BIFORA
,,	☉	Each mericarp hemispherical. Calyx teeth long, persisting.	CORIANDRUM
AEHJLNOR	☉	Damp places.	APIUM
,,	☉	Dry places. Each mericarp spherical.	BIFORA
AEHJLNPQ	☉	Each mericarp spherical. Calyx teeth obsolete.	BIFORA
,,	☉	Each mericarp hemispherical. Calyx teeth long, persisting.	CORIANDRUM
AEHJLNPR	♃	Hairy. Petals pink or red. *Lazistan.*	PIMPINELLA
,,	♃	Glabrous. Large coarse leaves. *Lazistan.*	AEGOPODIUM
,,	♃	Glabrous. Fine leaves.	CARUM
AFGILNOQ	☉ ♃	Beak of fruit not longer than the fertile portion.	ANTHRISCUS
,,	☉	Beak of fruit much longer than the fertile portion.	SCANDIX

AFGILNPQ	☉	(*cont.*) Beak of fruit much longer than the fertile portion.	SCANDIX
,,	☉	Swollen nodes. Fruit without a beak.	PHYSOCAULIS
AFGJLNOQ	♃	Calyx teeth prominent and persisting.	GRAMMOSCIADIUM
,,	♃	Calyx scarcely toothed.	CHAEROPHYLLUM
AFGJLNPQ	♃	Root globose. Fruit not beaked. *W. Turkey.*	BIASOLETTIA
,,	♃	Root fusiform. Fruit beaked.	ANTHRISCUS
,,	☉ ♃	Bracts sometimes showy. Fruit not beaked.	CHAEROPHYLLUM
AFHIKMOQ	♃	Flowers drying bright yellow. Fruit with prominent wings on secondary ribs.	LASERPITIUM
,,	♃	Fruit without wings on secondary ribs.	ZOZIMIA
AFHIKNOQ	☉	Fruit margins thickened and regularly wrinkled.	ORMOSCIADIUM
,,	☉	Fruit margins not thickened or wrinkled.	CYMBOCARPUM
AFHIKNPR	♃	Red petals.	PASTINACA
AFHILMOQ	♃	Robust plants.	SESELI
AFHILMPQ	♃	Robust plants.	SESELI
AFHILNOQ	♃	Leaves spiny or very finely divided. Apparently a simple umbel in fruit due to fusion of pedicels to form an enclosing sheath.	ECHINOPHORA
,,	♃	Fruit curved. Umbels sometimes male-flowered only.	LECOKIA
,,	♃	Umbellules globose. Leaf texture ± firm.	SESELI
,,	♃	Umbellules not globose. Leaf texture ± firm.	CNIDIUM
,,	☉ ♃	Leaf texture soft.	PIMPINELLA
,,	☉ ☉	Maritime or not. Bracts divided. Umbels accrescent in fruit and many rayed.	DAUCUS
,,	☉	Maritime. or not and ± glabrous with large outer petals.	ORLAYA
,,	☉	Robust. Petioles broadly winged. Umbels many-rayed.	ASTRODAUCUS
,,	☉	Calyx teeth small, persistent. Fruit with slender spines, often drying blue-green.	TORILIS
,,	☉	Calyx teeth conspicuous, herbaceous. Fruit with stout spines.	CAUCALIS
AFHILNPQ	♃		SESELI
,,	☉	Robust. Petioles broadly winged. Umbels many-rayed.	ASTRODAUCUS
,,	☉	Fruit shortly beaked, hairy.	ANTHRISCUS
,,	☉	Fruit spiny. Leaf segments ± broad.	TORILIS
,,	☉	Fruit spiny. Leaf segments linear.	TURGENIOPSIS
AFHJKNOQ	♃	Leaf segments linear. *Kurdistan.*	DIPLOTAENIA
,,	♃	± dwarf. Bracts and bracteoles large and showy. *Lazistan.*	LASERPITIUM
,,	♃	Fruits with two broad marginal wings and three dorsal ridges.	ANGELICA
,,	♃	Fruit without dorsal ridges. Outer petals sometimes spreading.	HERACLEUM
,,	☉	Bracts much divided. Outer petals showy. Centre of umbel with black sterile flowers. Wings of fruit papery.	ARTEDIA
,,	☉	Outer petals showy. Fruit margins thickened, ± spongy.	TORDYLIUM
,,	☉	Fruit with deep furrows and prominent transverse ridges.	CAPNOPHYLLUM
,,	☉	Fruit without deep furrows and prominent transverse ridges.	CYMBOCARPUM
AFHJKNOR	♃	*Caria & Cilician Taurus.*	GLAUCOSCIADIUM
AFHJLMOQ	♃	Leaf segments linear.	TRINIA
,,	♃	Leaves like *Aquilegia vulgaris.*	SILER
AFHJLMPR	♃		TRINIA
AFHJLNOQ	♃	Leaves spiny or very finely divided. Apparently a simple umbel in fruit due to fusion of pedicels to form an enclosing sheath.	ECHINOPHORA
,,	♃	Marsh plant with prominent tuberous roots.	OENANTHE

AFHJLNOQ	♃	(*cont.*) Low growing, delicate or little-branched with linear leaf segments.	
,,		Bracts much divided, leaf-like. Root globose. *Lydia.*	STEFANOFFIA
,,		Root fusiform. *Izmir.*	HELLENOCARUM
,,		Very finely divided, *Meum*-like leaf. *Armenia.*	FURNROHRIA
,,		Root globose.	BUNIUM
,,		Root fusiform.	CARUM
,,	♃	Tall, robust, clump-forming or much branched with broad leaf segments.	
,,		Each mericarp sub-globular. Stylopodium conical.	PHYSOSPERMUM
,,		Mericarps not sub-globular. Stylopodium conspicuous, flat. *N.E. Turkey.*	PLEUROSPERMUM
,,		Leaf firm-textured, segments ± obtuse. Pine forests.	CNIDIUM
,,		Leaf ± soft-textured, segments ± acute. Wet places. Rays many—up to 30.	LIGUSTICUM
,,		Rays up to 15.	PIMPINELLA
,,	⊙	Stems purple-spotted.	CONIUM
,,	⊙	Leaves mostly basal.	SCALIGERIA
,,	⊙	Long bracts deeply divided, reflexed. Umbel many-rayed, accrescent in fruit.	AMMI
,,	⊙	Each mericarp spherical.	BIFORA
AFHJLNOR	⊙		BIFORA
AFHJLNPQ	♃	Marsh plants with prominent tuberous roots.	OENANTHE
,,	♃	Root globose.	BUNIUM
,,	⊙	Stylopodium conical. Fruit c. 2 mm. *W. & S.W. Turkey.*	SCALIGERIA
,,	⊙	Each mericarp spherical. Fruit c. 4 mm. Calyx teeth obsolete.	BIFORA
,,	⊙	Each mericarp hemispherical. Calyx teeth long, persisting.	CORIANDRUM
,,	⊙	Leaf segments narrow, linear. Pedicels sometimes thickened in fruit. *W. Turkey.*	MICROSCIADIUM
,,	⊙	Leaf segments narrow, linear. *Armenia.*	SZOWITSIA
,,	⊙	Leaf segments long, sharply and acutely serrate. Umbels regular with long rays. Shallow water or marsh plant.	CICUTA
,,	⊙	Umbels irregular with short rays. Cultivated ground.	AETHUSA
AFHJLNPR	♃	Large coarse leaves. Stoloniferous. *Lazistan.*	AEGOPODIUM
,,	♃	Leaves ± finely divided. Root fusiform.	CARUM
BCHILNOQ	⊙	Fruits white.	BUPLEURUM
BCHILNPR	♃	*Cappadocia.*	PIMPINELLA
BCHJKNPR	♃	Scree plant. *Pisidia.*	PEUCEDANUM
BCHJLNOQ	⊙ ♃	Some with 1-3-flowered umbellules and only 1-rayed umbels.	BUPLEURUM
BCHJLNPQ	⊙	Leaves often amplexicaul or connate.	BUPLEURUM
BCHJLNPR	♃	Leaves all basal, prickly.	PIMPINELLA (Reutera)
,,	⊙	Leaves often amplexicaul or connate.	SMYRNIUM
BDHJKMOQ	♃		PEUCEDANUM
BDHJKNPR	♃	Scree plant. *Pisidia.*	PEUCEDANUM
BEGJLNOQ	♃	*Samos & Amanus.*	KUNDMANNIA
BEHIKNOQ	♃	Fruit with broad white often spongy margins. Stems sometimes purple-spotted.	MALABAILA
,,	⊙ ♃	Fruit with narrow margins.	PASTINACA
BEHJKMOQ	♃		JOHRENIA
BEHJKMPQ	♃		PEUCEDANUM
BEHJKNOQ	♃	Fruit with broad white, often spongy margins. Stems sometimes purple-spotted.	MALABAILA
,,	♃	Fruit with narrow margins.	PASTINACA
BEHJKNPR	♃	Scree plant. *Pisidia.*	PEUCEDANUM
,,	⊙ ♃		PASTINACA

BEHJLNOQ	☉ ♃	Plant yellowish-green.	SMYRNIOPSIS
BEHJLNPR	♃	Leaves all basal, prickly.	PIMPINELLA
			(Reutera)
BFGJKNOQ	♃	Leaves with cartilaginous margins.	PRANGOS
			(Colladonia)
BFGJLNOQ	♃	*Samos & Amanus.*	KUNDMANNIA
BFHIKMOQ	♃	Flowers white but drying bright yellow.	LASERPITIUM
BFHIKNOQ	♃	Wings of fruit papery margined. *Istanbul.*	ELAEOSELINUM
,,	♃	Fruit with broad, white, often spongy margins.	MALABAILA
BFHILNOQ	♃	Much-branched. Umbels apparently simple.	ECHINOPHORA
,,	♃	Leaf segments linear.	HIPPOMARATHRUM
BFHJKMOQ	♃	Bracts and bracteoles often showy.	FERULAGO
,,	♃	Leaf segments sometimes linear.	PEUCEDANUM
BFHJKMPQ	♃		PEUCEDANUM
BFHJKNOQ	♃	Leaf margins cartilaginous. Hairs shaggy, stellate at apex.	OPOPANAX
,,	♃	Leaf margins cartilaginous, ± glabrous.	PRANGOS
,,	♃	Margins of fruit spongy, white.	JOHRENIA
,,	♃	3 dorsal ribs of fruit winged. Bracts and bracteoles very conspicuous.	LOPHOSCIADIUM
,,	♃	3 dorsal ribs of fruit never winged. Flowers of central umbel female.	FERULAGO
,,	♃	All flowers hermaphrodite.	PEUCEDANUM
BFHJKNPQ	♃	Margins of fruit often spongy-white.	JOHRENIA
,,	♃	Umbels with irregular rays.	PEUCEDANUM
,,	♃	Leaf segments small or sometimes linear.	FERULA
,,	♃	Leaf segments large, broad.	XANTHOGALUM
BFHJKNPR	♃	Fruit very large, wings papery. Leaves glaucous. *Istanbul.*	THAPSIA
,,	♃	Leaf segments small or sometimes linear.	FERULA
,,	♃	Leaf segments large, broad.	XANTHOGALUM
BFHJLMOQ	♃	High alpine. *Kurdistan.*	TRACHYDIUM
,,	♃	Fruit winged.	PRANGOS
,,	♃	Leaf segments broad. *Samos.*	KUNDMANNIA
,,	♃	Leaf segments narrow.	SESELI
BFHJLNOQ	♃	High alpine. Plant completely prostrate. *N.E. Turkey.*	CHAMAESCIADIUM
,,	♃	Maritime plant with fleshy leaves.	CRITHMUM
,,	♃	Scree plant. Basal remains of stems and petioles many but not fibrous.	POLYLOPHIUM
,,	♃	Fruit large and completely smooth. *Mesopotamia.*	CACHRYS
,,	♃	Root globose. *Lydia.*	MURETIA
,,	♃	Leaf segments linear and long.	HIPPOMARATHRUM
,,	♃	Mericarps incurved from base to apex.	SMYRNIUM
,,	♃	Mericarps ± straight. *Mesopotamia and Kurdistan.*	SMYRNIOPSIS
,,	☉		PETROSELINUM
BFHJLNOS	♃	High alpine. Plant completely prostrate. *N.E. Turkey.*	CHAMAESCIADIUM
BFHJLNPR	♃	Tall, glaucous.	FOENICULUM
,,	☉	Upper leaves amplexicaul or connate.	SMYRNIUM
,,	☉		ANETHUM