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# A contribution to the Flora of North-East Iran

THOMAS FREDERICK HEWER

## RÉSUMÉ

HEWER, T. F. (1981). Une contribution à la flore du nord-est de l'Iran. *Candollea* 32: 409-430. En anglais, résumé français.

Liste de quelque 300 espèces végétales récoltées dans une région sèche du N.-E. de l'Iran peu explorée jusqu'ici.

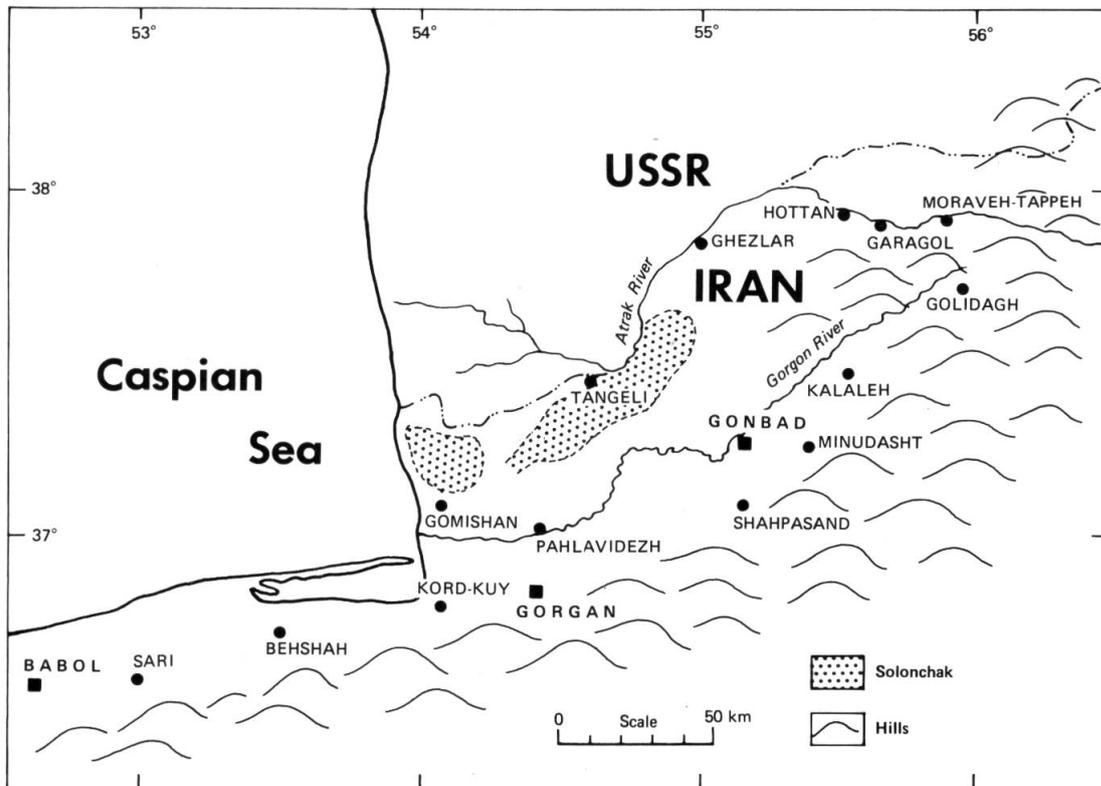
## ABSTRACT

HEWER, T. F. (1981). A contribution to the flora of North-East Iran. *Candollea* 32: 409-430. In English, French abstract.

A list of about 300 plant species from a botanically poorly explored and dry region of N.-E. Iran is established.

In the years 1976 and 1977 between the months of March and October I made a collection of plants in the area inhabited by Turkoman tribes in N.-E. Iran on behalf of the International Agency for Research on Cancer as part of their study of the high incidence of cancer of the oesophagus in this region. Since there had been no previous botanical survey it was necessary in particular to discover what weeds grew in the wheat fields, since their seeds might contaminate the bread and it was thought possible that plants eaten by sheep might affect their milk which was consumed as an important part of the Turkoman diet.

The area covered extends 180 km from the eastern shore of the Caspian Sea at 54°E. to a point 56°E., approximately 20 km East of Moravèh-Tappeh (Moravattapeh), limited on the North in part by the Russian frontier and then by the Atrak River (Rud-e Atrak). The southern limit is a line from Kord-Kuy in the West through Gorgan, Shahpasand, Gonbad (Gonbad-e Kavus;



Map of the area covered by the botanical survey.

Gonbad-e Qabus), Minudasht, Kalaleh to Golidagh, extending thence northwards to Moraveh-Tappeh. In addition a few excursions were made a few kilometers South of this line.

The level of the Caspian Sea is 28.5 m below sea level. Eastwards from the Caspian shore the altitude is 20 m or more below sea level rising gradually up the Atrak River to sea level near Tangeli, and 180 m at Moraveh-Tappeh. There is a very gradual upward slope of the featureless and almost treeless steppe country from the Atrak River South to Gorgan and Gonbad; beyond this to the East are rounded loess hills reaching 1400 m altitude. The country around and immediately South of Gorgan and Gonbad is irrigated, partly from wells, and extensively cultivated.

The northern slopes of the Alborz (Elburz) mountains South of the line between Gorgan and Gonbad are heavily wooded. The hills to the East of the region, around Golidagh, were originally wooded but now forest is almost confined to the steep valleys that cannot easily be cultivated.

In the salt marshes near the Caspian Sea, and in places farther East alongside the Atrak River, the soil is solonchak, alkaline and saline with low humus content. Adjacent areas from which salt has been leached out are solonetz; an analysis from one such area, made by Dr. Leonard Curtis, showed a silt loam with free calcium carbonate 10.2%; salt content, measured with a conductivity meter, 0.1-0.5 miliohms/cm, classified as "camborthid".

In the hilly area around Golidagh the soil varied from alkaline with low humus to neutral pH with good humus content.

The rainfall around the Atrak River is 300-400 mm per annum; in the plain of the Gorgan River around Gonbad it is 350-400 mm; in the lower plain of the Gorgan River around Pahlavidezh 300-500 mm and in the hills of Golidagh it is 400-800 mm. Most of the precipitation around Gorgan and Gonbad falls as rain while in the hills much of it in the winter falls as snow.

The extremes of temperature within the area are not great. In the plains of northern Gorgan and Gonbad there are only a few days in the year when the mean maximum temperature is over 45°C. The first frost comes usually in November and the last in March. In the higher altitudes around Golidagh it comes earlier and lasts longer, until some time in April.

In the northern half of the region, up to the Russian frontier, there are some wide wadis in which wheat and barley are cultivated early in the year when the ground is still damp from rain and occasional snow. In places, especially alongside the Atrak River, cotton is grown. In the southern half of the region, around Gorgan and Gonbad, as a result of irrigation, there is extensive cultivation of wheat and barley; millet and rye are also grown. There are fields of chick pea (*Cicer arietinum*), water-melon (*Citrullus vulgaris*), sunflower (*Helianthus annuus*), maize (*Zea mays*) and a few melons (*Cucumis melo*).

In the botanical survey of indigenous plants some four hundred species were collected and identified. Specimens of the collection and copies of the field notes are deposited in the Herbarium of the Royal Botanic Gardens, Kew, England (K) and duplicates of the specimens are also in the Herbarium of the Ariamehr Botanical Garden (TARI), Tehran, Iran.

The numbers after the plant names (H3501-4077) are those of the field notes and specimens. These are followed by letters (a-e) indicating the altitude at which they were noted, some being widespread.

a = from below sea level to 50 m, including some salt marsh;

b = 50-200 m above sea level;

c = 200-500 m;

d = 500-1000 m;

e = 1000-1500 m;

\* indicates that the species was recorded but not collected.

The following is an alphabetical list of the recorded plants, arranged after their families, genera and species.

#### *Aceraceae*

***Acer cappadocicum*** Gleditsch (e) \*

***Acer trautvetteri*** Medwed. (e) \*

***Acer velutinum*** Boiss. (e) \*

*Amaryllidaceae*

**Ixiolirion tataricum** (Pall.) *Herbert* 3853. (c, e)

*Araceae*

**Arum conophalloides** Ky. 3969. (d)

*Aspidiaceae*

**Polystichum aculeatum** Roth 3972. (d)

*Berberidaceae*

**Berberis vulgaris** L. 3996. (d)

*Boraginaceae*

**Anchusa azurea** Mill. 3845. (e)

**Arnebia decumbens** Vent. 4002 (d)

**Arnebia grandiflora** (Trautv.) M. Pop. 3634, 3712, 3783A. (d)

**Echium amoenum** Fisch. & C. A. Mey. 3844. (e)

**Heliotropium europaeum** L. 3913. (b)

**Heliotropium** sp. 3750. (c)

**Heterocaryum subsessile** Vatke 3721. (c)

**Heterocaryum** sp. 3545. (b)

**Lappula myosotis** Moench 3833. (c)

**Nonea lutea** (Desr.) DC. in Lam. & DC. 3681 (b)

**Onosma dichroanthum** Boiss. 3841. (e)

*Campanulaceae*

**Campanula rapunculus** L. subsp. **lambertiana** (DC.) Rech. f. 3816, 3881, 3952. (c, d)

*Capparidaceae*

**Capparis spinosa** L. 3804, 3976A, 3995B. (c, d)

*Caprifoliaceae*

**Lonicera floribunda** Boiss. & Bh. 3649. (c)

*Carpinaceae*

**Carpinus betulus** L. 3629, 3860. (d, e)

*Caryophyllaceae*

**Dianthus crinitus** Smith 3941. (e)

**Gypsophila bicolor** (Freyn. & Sint.) Grossh. 4007. (d)

**Herniaria hirsuta** L. 3723, 3774. (c)

**Holosteum umbellatum** L. 3578, 3615. (b, c, d)

**Kohlrauschia prolifera** (L.) Kunth 4020. (d)

**Lepyrodiclis holosteoides** (C. A. M.) Freyn 3958. (d)

**Lychnis coronaria** (L.) Desv. 4022. (d)

**Silene alba** Muhl. ex Rohrb. 3870. (e)

**Spergularia diandra** (Guss.) Boiss. 3754. (a, b, c)

**Vaccaria pyramidata** Medik. 3791, 3792, 4008. (c, d)

**Velezia rigida** L. 3931. (c)

*Chenopodiaceae*

**Atriplex hortensis** L. subsp. **desertorum** Aellen 4057. (b)

**Chenopodium murale** L. 3770. (c)

**Chenopodium vulvaria** L. 3746. (c)

**Halocnemum strobilaceum** (Pall.) M. Bieb. 4050. (a, b)

**Petrosimonia brachiata** (Pall.) Bunge 4042. (a)

**Salicornia herbacea** L. 3895, 3897. (a)

- Salicornia prostrata** Pall. 4049. (a)  
**Salsola aurantiaca** Bunge 4059. (b)  
**Salsola baryosma** (R. & S.) Dandy 4067, 4075. (c)  
**Salsola crassa** M. Bieb. 4064, 4068. (c, d)  
**Salsola aff. crassa** 4055, 4060, 4061, 4065. (b, c, d)  
**Salsola glauca** M. Bieb. 3995. (d)  
**Salsola nitraria** Pall. 4048, 4054, 4056, 4058, 4061A, 4069. (a, b, c)  
**Salsola pestifera** A. Nelson 4077. (d)  
**Spinacia turkestanica** Iljin 3534, 3551, 3567, 3717. (b, c)  
**Suaeda microphylla** Pall. 4040, 4041. (a)  
**Suaeda setigera** Moq. 4047. (a)

*Compositae*

- Achillea albicaulis** Meyer 3992. (d)  
**Achillea micrantha** M. B. 3955. (d)  
**Achillea nobilis** L. 3951. (e)  
**Achillea wilhelmsii** C. Koch 3787. (c)  
**Acroptilon repens** (L.) DC. 3956, 4014. (d)  
**Amberboa amberboi** (L.) Tzvel. 3736, 3763. (b, c)  
**Anthemis altissima** L. 3706, 3905. (b, c)  
**Artemisia annua** L. 4031. (a, b)  
**Artemisia austriaca** Jacq. 4074. (c)  
**Artemisia herba-alba** Asso 3995A. (c, d)  
**Aster** sp. 3999. (d)  
**Calendula arvensis** L. 3534, 3625. (b, c)  
**Calycocorsus tuberosum** (Fisch. & Mey. ex DC.) Rauschert. 3688. (c)  
**Carduus bekkeranus** Tamamschian 3687. (b)  
**Carduus pycnocephalus** L. 3693, 3786. (c)  
**Carduus uncinatus** M. B. 3917. (b)  
**Carthamus oxyacantha** M. B. 3786A, 3926. (c)

- Centaurea calcitrapa** L. 3924. (d)  
**Centaurea trichocephala** M. B. 3937. (d)  
**Centaurea virgata** Lam. 3994. (d)  
**Chrysanthemum parthenium** L. 3966. (d)  
**Cichorium intybus** L. 3943. (c)  
**Cirsium arvense** (L.) Scop. 3920. (d)  
**Coryza bonariense** (L.) Cronq. 4033. (a)  
**Cousinia** sp. 3930, 4011. (c, d)  
**Cousinia tenella** Fisch. & Mey. 3707. (c)  
**Cousinia turkmenorum** Bornm. 3703. (c)  
**Crepis marschallii** (C. A. Mey.) F. Schultz. 3874. (e)  
**Crepis micrantha** Czer. 3670. (a, b)  
**Crepis sancta** (L.) Babc. 3633. (b, c, d)  
**Cymbolaena griffithii** (A. Gray) Wagenitz 3710, 3820. (b, c)  
**Echinops** sp. 4012. (d)  
**Epilasia hemilasia** (Bge.) C. B. cl. 3569, 3709. (b, c)  
**Filago pyramidata** L. 3716, 3818, 3893. (c)  
**Heteropappus altaicus** (Willd.) Novopokrov 4024. (d)  
**Inula graveolens** (L.) Desf. 4034, 4072. (a, b, c)  
**Inula oculus-christi** L. 4016. (d)  
**Inula squarrosa** L. 3933. (d)  
**Karelinia caspia** (Pall.) Less. 4052. (a)  
**Koelpinia linearis** Pall. 3568, 3708. (b, c)  
**Lactuca serriola** L. 4026. (c)  
**Matricaria aurea** (L.) Boiss. 3671. (a)  
**Matricaria lasiocarpa** Boiss. 3761. (b, c)  
**Pallenis spinosa** (L.) Cass. 3910. (b)  
**Pulicaria dysenteria** (L.) Bern. 4036. (a)  
**Rhagadiolus papposus** (Boiss. & Buhse) O. Ktze. 3718, 3722, 3739. (c)  
**Senecio vernalis** Waldst. & Kit. 3531. (a, b)  
**Silybum marianum** L. 3677. (b)

**Sonchus oleraceus** L. 3782 (c)

**Taraxacum** cf. **T. nevsikii** Yuzep. 3537, 3573. (b)

**Taraxacum** sp. 3514, 3631, 3760. (b, c, d)

**Tragopogon buphthalmoides** (DC.) Boiss. 3814, 3829. (c)

**Tripleurospermum parviflorum** (Willd.) Pobed. 3548, 3570. (b)

#### *Convolvulaceae*

**Convolvulus arvensis** L. 3758. (b)

**Convolvulus askabadensis** Bornm. & Sint. 3823. (c)

**Convolvulus cantabrica** L. 3866. (e)

**Convolvulus dorycnium** L. 3789, 3927, 3998. (c, d)

**Cressa cretica** L. 4051. (a)

#### *Cruciferae*

**Alyssum desertorum** Stapf. 3553. (b)

**Alyssum meniocoides** Boiss. 3516, 3552. (b)

**Arabidopsis pumila** (Steph.) Busch. 3535. (b)

**Arabis** sp. 3864. (e)

**Capsella bursa-pastoris** (L.) Medic. 3508, 3611. (b, c)

**Cardaria draba** (L.) Desv. 3572, 3678, 3766. (b, c)

**Erophila verna** (L.) Chevall. 3608. (c)

**Eruca sativa** Miller 3696. (c)

**Euclidium syriacum** (L.) R. Br. 3749. (c)

**Lepidium latifolium** L. 3919. (d)

**Leptaleum filifolium** (Willd.) DC. 3504, 3558. (b)

**Malcolmia africana** (L.) R. Br. 3538, 3550, 3756. (b, c)

**Malcolmia turkestanica** Litw. 3699. (c)

**Rapistrum rugosum** (L.) All. 3907. (b)

**Sinapis arvensis** L. 3673, 3762. (b, c, d, e)

**Thlaspi perfoliatum** L. 3607. (d)

**Torularia torulosa** (Desf.) O. E. Schulz 3697. (c)

*Cyperaceae*

**Carex divulsa** Stokes 3872. (e)

**Carex stenophylla** Wahlenb. 3515, 3561. (b)

**Cyperus laevigatus** L. var. **distachyos** (All.) Coss. & Durieu 3715. (c)

**Cyperus** sp. 3903. (b)

*Dioscoreaceae*

**Tamus communis** L. 4028. (c)

*Dipsacaceae*

**Dipsacus strigens** Willd. 4023. (d)

**Pterocephalus plumosus** (L.) Coult. 3822A. (c)

**Scabiosa columbaria** L. 3987. (d)

**Scabiosa palaestina** L. 3822. (c)

**Scabiosa palaestina** L. var. **latiloba** Boiss. 3809. (c)

**Scabiosa palaestina** L. var. **persica** Boiss. 3828A. (c)

*Ebenaceae*

**Diospyros lotus** L. 3964. (d, e)

*Elaeagnaceae*

**Elaeagnus angustifolia** L. 4062. (b)

*Equisetaceae*

**Equisetum telmateia** Ehrh. 3959. (d)

*Euphorbiaceae*

**Euphorbia bungei** Boiss. 3944. (d)

**Euphorbia chamaesyce** L. 3914. (b)

**Euphorbia coeladenia** Boiss. 3646, 3842. (d, e)

**Euphorbia granulata** Forssk. 4066. (c)

**Euphorbia helioscopia** L. 3560, 3610. (b, c)

**Euphorbia myrsinites** L. 4073A. (c)

**Euphorbia rigida** M. B. 3828. (c)

*Fagaceae*

**Quercus castaneifolia** C. A. Mey. 3861, 3863, 3869. (d, e)

**Quercus iberica** Bieb. (e) \*

*Frankeniaceae*

**Frankenia hirsuta** L. 3894. (b)

**Frankenia pulverentula** L. 3899. (b)

*Fumariaceae*

**Fumaria parviflora** Lam. 3533, 3555, 3643, 3748. (b, c, d)

*Geraniaceae*

**Erodium ciconium** (L.) L'Hér. 3546. (b)

**Erodium cicutarium** (L.) L'Hér. ex Aiton 3506, 3511, 3562. (b, c, d, e)

**Erodium malacoides** (L.) L'Hér. ex Aiton 3728. (c)

**Erodium oxyrinchum** M. B. 3504. (b, c)

**Geranium molle** L. 3684, 3977. (b, c)

*Gramineae*

**Aegilops biuncialis** Vis. 3815. (c)

**Aegilops tauschii** Coss. 3734. (c)

**Aeluropus lagopoides** (L.) Trin. ex. Thev. 3900, 4037. (a, b)

**Aeluropus littoralis** (Gouan) Parl. 3896. (b)

- Arundo donax** L. 4078. (a, b, c) \*
- Avena fatua** L. (b, c, d, e) \*
- Avena ludoviciana** Dur. 3733. (c)
- Bromus briziformis** Fisch. & C. A. Mey. 3867. (e)
- Bromus danthoniae** Trin. 3806. (c)
- Bromus tectorum** L. 3725. (c)
- Calamagrostis epigeios** (L.) Roth 3965. (d)
- Eremopyrum bonaepartis** (Spreng.) Nevski 3794. (c)
- Hordeum bulbosum** L. 3856. (e)
- Hordeum glaucum** Steud. 3559A, 3632, 3668, 3702. (a, b, c)
- Hordeum spontaneum** G. Koch 3825. (c)
- Lolium temulentum** L. 3705, 3745, 3767, 3906. (b, c, d)
- Lophochloa pleiodes** (Vill.) Reichb. 3726. (c)
- Pennisetum orientale** L. C. Rich. 3826. (c)
- Phalaris minor** Retz. 3666, 3685, 3908. (a, b)
- Phleum bertolonii** DC. 4019. (d)
- Phleum paniculatum** Huds. 3850, 4021. (c, d, e)
- Poa annua** L. 3679. (b)
- Poa bactriana** Roshev. 3843. (e)
- Poa bulbosa** L. var. **vivipara** Koel. 3542, 3619. (b, c)
- Polypogon monspeliensis** (L.) Desf. 3714, 3889. (a, b, c)
- Secale cereale** (Zhuk.) Roshev. (c, d) \*
- Setaria viridis** (L.) Beauv. (d) \*
- Sorghum halepense** (L.) Pers. 3984. (d)
- Sphenopus divaricatus** (Guan) Reichb. 3669. (a)
- Stipa pulcherrima** C. Koch 3877. (e)

*Guttiferae*

- Hypericum perforatum** L. 3935, 3973. (c, d)

*Hamamelidaceae*

**Parrotia persica** (DC.) C. A. Mey. 3653, 3689. (b, c, d)

*Iridaceae*

**Iris fosterana** Aitch. & Baker 3585, 3589, 3614. (c, d)

**Iris junio** sp. 3595, 3642. (c)

**Iris kopetdagensis** (Vved.) Mathew & Wendelbo 3641. (d)

**Iris reticulata** M. B. 3583. (e)

*Juglandaceae*

**Juglans regia** L. (d) \*

**Pterocarya fraxinifolia** Spach (c) \*

*Juncaceae*

**Juncus acutus** L. 4053. (a)

*Labiatae*

**Eremostachys** sp. 3731A, 3800. (c)

**Hymenocrater** sp. 3602. (c)

**Lallemantia royleana** (Wall.) Benth. 3544, 3571, 3704, 3719. (b, c)

**Lamium amplexicaule** L. 3612. (c)

**Marrubium vulgare** L. 3780. (c)

**Mentha longifolia** (L.) Huds. 3985. (d)

**Perowskia abrotanoides** Karel. 3993, 4076. (c, d)

**Phlomis** cf. **cancellata** Bge. 3731B. (c)

**Phlomis herba-venti** L. 3939. (d)

**Prunella vulgaris** L. 3962. (d)

**Salvia nemorosa** L. 3779. (c)

**Salvia virgata** Jacq. var. **cano-velutina** Rech. f. 3925. (c)

- Salvia viridis** L. 3817, 3909. (b, c)  
**Scutellaria tournefortii** Benth. 3967. (d)  
**Stachys trinervis** Aitch. & Hemsl. 3601. (c)  
**Stachys turcomanica** Trautv. 3729, 3807. (c)  
**Teucrium chamaedrys** L. 3916. (b)  
**Teucrium hyrcanium** L. 3981. (d)  
**Teucrium polium** L. 3915, 4013. (b, d)  
**Ziziphora tenuior** L. 3704B. (c)

*Leguminosae*

- Alhagi camelorum** Fisch. 4063. (c)  
**Alhagi graecorum** Boiss. 3788, 3918, 4010. (b, c, d)  
**Alhagi maurorum** Medic. (non Boiss.) 4043. (a)  
**Astragalus asterias** Stev. ex Ledeb. 3773A. (c)  
**Astragalus campylorhynchus** Fisch. & Mey. 3698. (c)  
**Astragalus hamosus** L. 3773B. (c)  
**Astragalus** sp. 3757. (b, c)  
**Colutea armena** Boiss. & Hult. 3871, 3979. (e)  
**Colutea komarovii** Takhtad. 3613. (c)  
**Coronilla varia** L. 3891. (c)  
**Glycyrrhiza glabra** L. var. **glandulifera** (W. & K.) Reg. & Herd. 4015. (d)  
**Glycyrrhiza triphylla** Fisch. & Mey. 4000. (d)  
**Hippocrepis unisiliquosa** L. subsp. **bisiliqua** (Forsk.) Bornm. 3827. (d)  
**Lathyrus aphaca** L. 3676. (b)  
**Lathyrus** sp. 3635. (d)  
**Lotus halophilus** Boiss. & Reut. 3892. (e)  
**Medicago polymorpha** L. 3667A, 3772. (a, b, c)  
**Medicago rigidula** (L.) All. 3636B. (d)  
**Medicago sativa** L. 3777, 3940, 3983. (c, d, e)  
**Melilotus indica** (L.) All. 3667B. (b)

- Onobrychis radiata** M. Bieb. 3876. (e)  
**Onobrychis viciifolia** Scop. 3848. (e)  
**Prosopis farcta** (Banks & Sol.) MacBride 3784, 3923, 3980. (b, c)  
**Trifolium fragiferum** L. 3865. (e)  
**Trigonella monantha** C. A. Mey. 3577, 3636A, 3648, 3771. (b, c, d)  
**Vicia monantha** Retz. 3622A. (d)  
**Vicia sativa** L. var. **angustifolia** L. 3622B. (c)  
**Vicia narbonensis** L. 3852. (e)  
**Vicia** sp. 3988. (d)  
**Vicia tenuifolia** Roth. 3873. (e)

*Leonticaceae*

- Bongardia chrysogonum** (L.) Griseb. 3586. (c)

*Liliaceae*

- Allium christophii** Trautv. 3793, 3837, 3855A. (c, d, e)  
**Allium paradoxum** (M. B.) G. Don 3628. (d)  
**Allium rubellum** M. Bieb. 3664, 3686, 3738, 3781. (a, b, c, d, e)  
**Allium scabriscapum** Boiss. & Ky. 3805. (c)  
**Asparagus verticillatus** L. 3883, 3952. (d, e)  
**Fritillaria gibbosa** Boiss. 3592. (c, d, e)  
**Fritillaria kotschyana** Herb. subsp. **grandiflora** (Grossh.) Rix 3660. (e)  
**Gagea commutata** C. Koch 3507. (b)  
**Gagea lutea** (L.) Ker-Gawl. 3659. (e)  
**Gagea pseudoreticulata** Vved. 3605A. (d)  
**Gagea reticulata** (Pall.) Schult. 3559. (b)  
**Gagea reticulata** (Pall.) A. & H. Schultes subsp. **rigida** (Boiss. & Sprun.)  
Pasch. 3532, 3541. (b)  
**Gagea stipitata** Merckl 3502, 3510, 3517, 3547, 3557, 3565, 3588. (b, c)  
**Hyacinthus litwinowii** Czerniak 3566. (e)

- Merendera persica** Boiss. 3730. (c)  
**Merendera trigyna** (Adams) Stapf 3584. (e)  
**Muscari neglectum** Guss. 3519, 3556. (b)  
**Ornithogalum sintenisii** Freyn 3591, 3605B. (d)  
**Scilla gorganensis** Meikle 3658. (e)  
**Scilla** sp. 3599, 3654. (d, e)  
**Tulipa micheliana** Hogg 3501, 3576, 3616, 3617. (b, c)  
**Tulipa montana** Lindley 3600. (c)  
**Tulipa systola** Stapf<sup>1</sup> 3581, 3582, 3590, 3603, 3639, 3651, 3796, 3840, 3878, 3942, 3978. (b, c, d, e)

*Linaceae*

- Linum corymbulosum** Reichenb. 3831, 3948. (c, d)

*Malvaceae*

- Althaea flavovirens** (Boiss. & Buhse) Iljin 3954. (d)  
**Althaea hirsuta** L. 3775, 3819. (c)  
**Hibiscus trionum** L. 4018. (d)  
**Malva aegyptia** L. 3711, 3724. (c)  
**Malva nicaeensis** All. 3682. (b)

*Moraceae*

- Ficus carica** L. 3645A. (d)

*Oleaceae*

- Jasminum fruticans** L. 3640. (d)

*Onagraceae*

- Epilobium hirsutum** L. 3960. (d)

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<sup>1</sup>Nomenclature in process of revision at Kew and Wageningen.

*Orchidaceae*

**Dactylorhiza romana** (Seb. & Mauri) Sóo 3662. (e)

*Orobanchaceae*

**Orobanche cernua** Löfl. 3832. (c)

**Orobanche lutea** Baumg. 3875. (e)

**Orobanche nana** Noë 3768. (b)

**Orobanche ramosa** L. subsp. **mutelii** (F. W. Schultz) Coutinho 3701. (c)

*Oxalidaceae*

**Oxalis corniculata** L. 3680, 3976. (b)

*Paeoniaceae*

**Paeonia wittmanniana** Hartwiss ex Lindley 3661. (e)

*Papaveraceae*

**Glaucium cf. oxylum** Boiss. & Buhse 3834. (d)

**Hypocoum pendulum** L. 3540, 3575A, 3623, 3700, 3776. (b, c)

**Papaver pavoninum** Fisch. & C. A. Mey. 3691, 3785, 3880. (c, d)

**Roemeria refracta** DC. 3630, 3692, 3753, 3836, 3854. (c, d, e)

*Plantaginaceae*

**Plantago coronopus** L. 3665. (a)

**Plantago indica** L. 3886. (a)

**Plantago lanceolata** L. 3847. (e)

**Plantago loeflingii** L. 3741. (c)

*Plumbaginaceae*

- Limonium reniforme** (Girard) Lincz. 4046. (a)  
**Psylliostachys spicata** (Willd.) Nevski 3801. (c)  
**Psylliostachys suworowii** (Regel) Roshk. 3694, 3795. (c)

*Polygonaceae*

- Atraphaxis spinosa** L. 3810 (c)  
**Atraphaxis** cf. **tournefortii** Jaub. & Sp. 3824. (c)  
**Polygonum aviculare** L. 3743, 3765. (b, c)  
**Polygonum bellardii** All. 3904. (b)  
**Polygonum lapathifolium** L. 4032. (a)  
**Polygonum patulum** M. B. 3764, 4038. (a, b, c)  
**Rumex conglomeratus** Murr 3963. (b)  
**Rumex** cf. **patientia** L. 3652. (d)  
**Rumex tuberosus** L. 3882. (d)

*Primulaceae*

- Anagallis arvensis** L. 3674, 3695, 3821. (b)  
**Androsace maxima** L. 3554. (b)  
**Cyclamen coum** Miller subsp. **caucasicum** (K. Koch) O. Schwarz 3960. (c)

*Ranunculaceae*

- Adonis aestivalis** L. 3549, 3563, 3624, 3778. (b, c, d, e)  
**Anemone biflora** DC. 3518, 3596. (c)  
**Ceratocephala falcata** (L.) pers. 3503, 3512, 3536, 3797. (b)  
**Consolida halophila** (Hutch.) Munz 3735, 3901. (b, c)  
**Consolida orientalis** (J. Gay) Schröd. 3720, 3751. (c)  
**Consolida persica** Boiss. 3928. (c)  
**Consolida regalis** S. F. Gray 4035. (a)

**Ranunculus cicutarius** Schlecht. 3637. (d)

**Ranunculus dolosus** Fisch. & Mey. 3971. (d)

**Ranunculus kochii** Ledeb. 3587. (e)

**Ranunculus oxyspermus** Willd. 3579. (b)

**Ranunculus scleratus** L. 3713. (c)

**Thalictrum minus** L. 3857, 3936. (d, e)

*Rhamnaceae*

**Paliurus spina-christi** Mill. 3812, 3995C. (c, d)

*Rosaceae*

**Cerasus microcarpa** (C. A. Mey.) Boiss. 3604, 3650. (c, d)

**Cerasus pseudoprostrata** Pojark. 3598. (c, d)

**Crataegus melanocarpa** M. B. 3859. (e)

**Hulthemia persica** (Mich.) Bornm. 3991. (d)

**Mespilus germanica** L. (d) \*

**Potentilla hirta** L. 3839, 3949. (d)

**Potentilla recta** L. 3946. (d)

**Potentilla reptans** L. 3683, 3921 (b, c, d)

**Prunus divaricata** Ledeb. 3627. (d)

**Pyrus boissieriana** Buhse 3862. (e)

**Rosa canica** L. var. **dumetorum** Desr. 3884. (e)

**Rubus fruticosus** L. 3990A. (d)

**Sorbus terminalis** Crantz. (e) \*

*Rubiaceae*

**Asperula arvensis** L. 3855. (e)

**Asperula** sp. 3838. (d)

**Callipeltis cucullaria** (L.) Stev. 3732. (c)

**Crucianella suaveolens** C. A. Meyer 3934, 3938. (d)

**Galium** sp. 3922. (d)

**Galium tricornutum** Dandy 3620, 3835. (c, d)

**Galium verum** L. 3947. (d)

*Rutaceae*

**Haplophyllum acutifolium** (DC.) G. Don 3846, 4003. (d, e)

*Salicaceae*

**Populus alba** L. (b, c) \*

**Populus caspia** Bornm. (b, c) \*

**Populus euphratica** Oliv. 3727. (c)

**Salix aegyptiaca** L. 3858. (e)

**Salix excelsa** S. G. Gmel. 3593. (b)

*Scrophulariaceae*

**Kickxia elatine** (L.) Dumort. 4039. (a)

**Parentucellia latifolia** (L.) Carn. 3645. (d)

**Parentucellia viscosa** (L.) Carn. 3945. (d)

**Verbascum** sp. 3879, 3957, 4027. (c, d)

**Veronica anagallis-aquatica** L. 3675. (b)

**Veronica polita** Fr. 3539, 3747. (b, c)

*Solanaceae*

**Hyoscyamus aureus** L. 3609. (c, d)

**Hyoscyamus reticulatus** L. (e) \*

**Lycium depressum** Stocks 4071. (c)

**Solanum dulcamara** L. 3961. (d)

*Tamaricaceae*

- Tamarix gallica** L. 4070. (b, c)  
**Tamarix ramosissima** Ledeb. 3887, 3890. (a)  
**Tamarix tetragyna** Ehrenb. 3663. (a)

*Thelypteridaceae*

- Thelypteris palustris** Schott. 3970. (d)

*Thymelaeaceae*

- Diarthron vesiculosum** (Kar. & Kir.) C. A. Meyer 3744. (c)

*Ulmaceae*

- Zelkova crenata** (Desf.) Spach. (e) \*

*Umbelliferae*

- Ammi majus** L. 3902. (b)  
**Bifora testiculata** 3990. (d)  
**Bunium persicum** (Boiss.) B. Fedtsch. 3769. (b, c)  
**Bupleurum lancifolium** Hornem. 3830. (c)  
**Caucalis platycarpus** L. 3849, 3851, 3912. (b, c, d, e)  
**Conium maculatum** L. 3982. (d)  
**Daucus littoralis** Sm. 3885. (a)  
**Eremodaucus lehmannii** Bunge 3740, 3752. (c)  
**Eryngium bungei** Boiss. 3811. (c)  
**Eryngium coeruleum** M. B. 3911, 3932. (b, c)  
**Falcaria vulgaris** Bernh. 4004. (d)  
**Johrenia platypoda** Aitch. & Hemsl. 3813. (c)  
**Lecokia cretica** (Lam.) DC. 3604A, 3626. (b, c, d)  
**Pimpinella peregrina** L. 3929. (c)

**Sambucus ebulus** L. 3975. (b, c, d)

**Scandix pecten-veneris** L. 3621. (c)

**Torilis stocksiana** (Boiss.) Drude 3783. (c)

**Turgenia latifolia** (L.) Hoffm. 3802. (c)

*Urticaceae*

**Parietaria officinalis** L. 3968. (d)

*Valerianaceae*

**Valerianella leiocarpa** (Koch) O. Kuntze 3737. (c)

*Verbenaceae*

**Phyla nodiflora** (L.) Greene 3888. (a)

**Verbena officinalis** L. 3986. (d)

*Violaceae*

**Viola odorata** L. 3606. (d)

*Vitidaceae*

**Vitis vinifera** L. 4006. (d)

*Zygophyllaceae*

**Peganum harmala** L. (b) \*

**Tribulus terrestris** L. 3950. (d)

**Zygophyllum atriplicoides** Fisch. & Meyer 3597. (c)

**Zygophyllum fabago** L. 4001. (d)

It may be of interest to record the names of the plants that were the first to flower after retreat of the snow in March. On March 4th, 1976, in the neighbourhood of Ghezlar the most numerous plants actually in flower were *Gagea stipitata* and *Ceratocephala falcata*, with a number of small *Cruciferae*; *Erodium cicutarium* was ubiquitous and present in flower from March to May; *Anemone biflora* was in flower in March.

In view of the observed contamination of grain for milling by a great many seeds other than wheat attention was specially given to the weeds occurring in wheat fields. Their incidence depended more upon the efficiency of cultivation than upon the quality of the soil. The most frequent contaminants were *Sinapis arvensis* and other *Cruciferae*, and *Avena fatua*. In the poorly cultivated fields a high proportion of the listed annual and perennial plants were present as weeds and the seeds of those that ripened at the same time as the wheat were represented in the samples of grain examined in the small village flour mills.

I am indebted to the International Agency for Research on Cancer for the opportunity to make this survey and to the Director of the Royal Botanic Gardens, Kew, England, for the identification by members of his staff of most of the collection.