

OXALIS IN THE BRITISH ISLES

By D. P. YOUNG

INTRODUCTION

The genus *Oxalis* contains nearly 800 species. They occur all over the world, but are mainly subtropical; the two chief strongholds of the genus are South America and South Africa. The only species native in these islands is the well-known wood-sorrel, *O. acetosella*. Many *Oxalis* species, however, have great colonising ability, and have spread far outside their native area, and quite a number have become more or less established in the British Isles. The majority of these introductions have been deliberate, by horticulturalists, and in many cases the spread of a species can be traced back to its origin in a garden.

My efforts to identify various alien *Oxalis* found in this country brought to light serious discrepancies in the naming of previously recorded specimens, which has led me to attempt a revision of the British list. At the same time, the recent spread of some species has been causing concern in horticultural circles, and a general account of the situation may be of interest to botanists.

OXALIS AS WEEDS AND NATURALISED PLANTS

Probably all the naturalised species in Britain have been introduced horticulturally (*O. stricta* may be an exception), and in general they are all plants of open habitats in light or acid soils. As a result, they are very largely confined to growing in garden beds, nurseries and market-gardens, and on walls, gravel paths, rubbish-heaps or seashores near such places. Only rarely do they occur amongst arable crops. *O. articulata* can grow amongst loose grass or brambles, and *O. corniculata*—especially the small creeping forms—is sometimes found in short turf, but none of the other species can (in this country) tolerate the competition of a closed plant community and so their spread is limited by the availability of disturbed ground for them to colonise. Most of the introduced species are native of warmer climates, and so they are not surprisingly commonest and most aggressive in the south-west of England and the Channel and Scilly Isles. Elsewhere they are more frequent near the coast. They also run riot in glasshouses.

The naturalised *Oxalis* fall into two groups, those that reproduce mainly by seed and those that do so mainly by bulbils. The first category includes principally *O. corniculata* and its allies. Although perennial, these can behave as annuals, ripening seed when the plants are only a few months old, and so producing at least one generation a year. Plants of this group are not serious weeds, although they may have a considerable nuisance-value. *O. corniculata* itself has a tough tap-root, which is sometimes difficult to dislodge, and fragile creeping stems which if broken will form separate new plants, but it can be eradicated by frequent cultivation. Forms of this species are common in greenhouses, and are often acquired with potted plants from nurserymen and so are spread to new localities.

It is the species that spread by bulbils that include those that have become a really serious menace. Three species are principally involved. *O. latifolia* is an increasing pest in nurseries and market-gardens in Devon and Cornwall, an established weed in potato fields in Jersey and also in a few nurseries and gardens elsewhere. *O. corymbosa* is a persistent weed in gardens in many parts of the country, especially in greenhouses; it is frequent around London. *O. pes-caprae* is a common weed in the bulbfields in the Scillies.

These three are all sufficiently large and rapid-growing to smother young plants around which they are spreading, and significantly exhaust the nutriment in the soil. Their bulbils are almost indestructible, and are produced in greater numbers if the plants are disturbed or decapitated. The bulbils are formed underground, where they are readily detached and spread around by digging. They are so small that it is quite impossible to comb them out of the soil. The result is that these plants have the property of growing and spreading the faster, the more that attempts are made to dig them out. Bulbils are spread from place to place in soil adhering to digging implements, boots, and transplanted roots, and probably are carried by birds. Peat used for top-dressing has often been blamed as a vehicle, and I have investigated two cases where it was definitely incriminated. Evidently the bulbils get into the peat when in store in nurserymen's yards, either off implements or by the agency of birds.

The problem is not only, or even principally, confined to Britain. *O. pes-caprae* has been an increasing pest in North Africa, and around the Mediterranean generally, since the beginning of the century; it is also a pest in Australia, where it covers great tracts of country. In both these places, in addition to monopolising the soil, it presents the additional nuisance of being poisonous to sheep and cattle. *O. latifolia* is now a well-known weed in many Mediterranean and subtropical countries, and *O. corymbosa* is one of the more serious weeds in Ceylon.

In this country the bulbous *Oxalis* have been established for upwards of forty years and have been troublesome weeds for a good part of that time, but only since the last war has infestation reached alarming proportions. It is difficult to gauge to what extent the increase is real, for many nurserymen in west Cornwall, for instance, claim to have had *O. latifolia* in their ground for years. Nevertheless there is no doubt that in some places this species is rapidly invading new ground, and is increasing in numbers where it is already established. The factor generally blamed is the advent of rotary cultivators, which distribute the soil—and the bulbils—far more effectively than hand digging or even ordinary ploughing. Many of the affected nurseries are in big old gardens which have been converted to the purpose, and *O. latifolia* and *O. corymbosa* seem to have been cultivated in them in their heyday and to have persisted ever since. Possibly another factor has been the revival of flower-growing after the war, which must have involved a great deal of restocking, affording opportunities for the carrying of bulbils to new sites. Furthermore, the plant faces relatively little competition in open cultivated ground, and so its increase is likely to be approximately logarithmic.

The failure of the bulbous *Oxalis* to respond to weed-killers has added to the concern that they are causing. Chemical applications have only the same effect as physical damage, that is stimulating the growth of bulbils which recommence growth as soon as favourable conditions return. Ducellier (1923) recognised that the only chance of killing the plants was to use a powerful herbicide (he recommended 10–20% sulphuric acid) at frequent intervals during the short time between the shrivelling of the old bulb and formation of new bulbils. Modern workers have aimed at killing the bulbils themselves, and fumigation with agents such as methyl bromide (originally developed against animal pests in the soil) has shown the most promise so far (Luckwill 1953, 626–627). Fumigation is very expensive and would be quite uneconomic for an individual grower to carry out except under glass where the ground is valuable. It seems, therefore, that even if control of *Oxalis* infestation by this means is successful, its application would require mutual or government financing. To what extent infestation must progress before it becomes in the public interest to do this remains to be seen. Some hopes have been expressed that a natural predator might be found, suitable for biological control. No active work seems to be being done on this rather tenuous line of attack. The nearest approach to such a

method has been the partly successful use of pigs or poultry to rout for the bulbils. It is possible to choke out the plants by grassing over the land for three years or more—until all dormant bulbs have died. But the owner of the ground usually depends for his livelihood on the regular cropping of the land with flowers or vegetables, and so here again the remedy is economically out of the question for an individual. Moreover, it is important to clear the whole of an infested tract, as otherwise a cleared patch will soon be reinfested from neighbouring *Oxalis* colonies.

It is often difficult to decide whether *Oxalis* in gardens are to be considered wild or not. The fact that a plant can maintain itself in a garden where it was planted, without further care from the gardener, is not sufficient to justify calling it feral. The real criterion is whether it can withstand efforts to exterminate it. As far as most bulbous species are concerned, the facts just given speak for themselves. In the case of the less unwelcome species, one cannot be so definite. The records given below are all considered to be feral, but some have been given the benefit of the doubt. Details of habitat have been included as far as possible to allow the reader to form his own conclusions. "In gardens" is intended to imply that the plants were at least not part of the cultivation scheme. Herbarium specimens have been accepted as feral unless the labels indicated that they were cultivated.

TAXONOMY

The genus is one of considerable difficulty, in the first instance because it includes many groups of closely related forms, which are variously regarded according to the state of knowledge of them as single polymorphic species or as groups of critically-defined species. The original range of variation of several species has unfortunately been obscured by the fact that selected strains have been collected and bred by horticulturalists, and have since returned to the feral state. Many of these reproduce only vegetatively, and apparently distinct and constant forms are only clones. This complexity has led to considerable difficulties with nomenclature, which will be appreciated by studying the account of the few species below. There are undoubtedly many more names than species, but progress in clearing up synonymy has been hampered by lack of knowledge of natural ranges of variation on one hand, and by inadequate descriptions and type-specimens on the other.

The genus has been monographed by Knuth (1930), but his account has been criticised on the grounds of excessive subdivision and separation of closely related taxa, and of the inclusion of the same species under two or more different names. As a source-book it is nevertheless invaluable. A treatment of the South African species on more satisfactory lines is given by Salter (1944), who studied the plants in the field for many years. Wiegand (1925) revised the *Corniculatae* group from the eastern United States, and his version has been adopted by Fernald (1950, 943-946) in the latest edition of Gray's *Manual of Botany*. A new investigation of the genus in South America, based on field observations, is badly needed. For the present, any piecemeal alterations in nomenclature are inadvisable unless based on very solid evidence.

The following account of the naturalised British species adopts the arrangement of Knuth's monograph, except that the section *Polyoxalis* (*O. tetraphylla*) is merged with *Ionoxalis*. The treatment of the *Corniculatae* is based mainly on Wiegand's revision. No attempt has been made to cite complete synonymies, for which reference should be made (with caution!) to the works already mentioned. The names adopted are those that seem most generally acceptable; although many of them are open to objection, a lengthy taxonomic investigation will be needed before the nomenclature can be properly settled. Species reported as British, but on inadequate evidence, are included in square brackets.

DESCRIPTION OF THE BRITISH SPECIES

All our species except *O. tetraphylla* have trifoliate leaves, and this is to be understood in the descriptions. Most of them flower all through the summer, and flowering times are only mentioned where they are more restricted.

The abbreviations used for herbaria are those of the *Index Herbariorum*, viz. : BM British Museum, CGE Cambridge University, K Kew, MANCH Manchester Museum, NMW Cardiff Museum, OXF Oxford University, SLBI South London Botanical Institute. Records with no date are recent, i.e. since 1950 and believed to be still extant; undated herbarium specimens are denoted by "n.d." Records marked ! have been seen by myself in situ. "Teste" before a collector's name implies that I have accepted the record without seeing a specimen.

Section LAXAE Reiche. No bulb. Stem short, erect, herbaceous. Inflorescence cymose. Flowers yellow.

O. VALDIVIENSIS Barnéoud, 1845, in Gay, *Fl. Chilena*, 1, 446.

Annual. Whole plant *glabrous* or almost so. Stem short (10 cm.) or almost absent. Leaves closely scattered up the stem; petioles long (4-14 cm.), sometimes minutely pilose, with a joint about 5 mm. from the base, below which they widen out into tapering sheaths. Peduncles much longer than the leaves (8-15 cm.), bearing flowers in long *forked cymes*. *Sepals obtuse*, 4 mm. *Petals* 12-16 mm. long, yellow with *reddish veins*. *Pedicels* reflexed in fruit, capsules *pointing downwards*. *Capsule short* (6 mm.), nearly spherical, scarcely longer than the calyx.

Native of Chile, on woodland margins. In cultivation, but not very commonly grown. Has occurred rarely in this country as a garden escape or relic of cultivation, often only casual.

- V.C. 5. S. SOMERSET : no locality or date, but apparently from the Ilminster region ca. 1921, *H. Downes* (BM); "Seems to be a casual . . . It was found far in the country, but I think it might have been introduced with corn refuse spread on the land."
8. S. WILTS. : apparently wild in a garden and adjacent waste land, Larkhill, 1941, R. C. L. Burges (hba. Burges, J. D. Grose).
23. OXFORD : maintains itself in a garden at Burford, *teste D. McClintock*.
29. CAMBR. : waste ground, Cambridge, 1882, N. & H. N. Dixon (SLBI).
36. HEREF. : casual, Underdown, Ledbury, 1901, S. H. Bickham (BM).

Only the Somerset specimen had previously been correctly determined, but the record has not been published heretofore. I have heard of other gardens where it "runs wild," but it is scarcely feral.

[Section ROSEAE Reiche. No bulb. Stem \pm erect, herbaceous. Corolla pink. S. America.

O. ROSEA Jacquin, 1794, 25.

Annual, 20-40 cm. tall. Stem simple or branched, juicy, *glabrous*, bearing small scattered leaves. Petioles short (3 cm.); leaflets *glabrous* or slightly pilose, *obcordate*, up to 10 mm. long. Inflorescence a few-flowered forked cyme; peduncles up to 10 cm. long, pedicels 0.5-1 cm., erect in flower, drooping in bud and in fruit. Petals about 5 mm. long, *retuse*, rose-pink with a whitish base. Capsule *globose*.

Native of Chile, in meadows. Long cultivated as a garden and greenhouse plant, but not often seen nowadays. Sometimes considered, quite incorrectly, to be synonymous with *O. floribunda* Lehm. (i.e. *O. articulata* Savigny), whence much confusion has arisen amongst gardeners and botanists who have used either name for both species. Occasionally maintains itself in gardens, but there are no authentic records for it occurring wild in this country. The record by Druce (1932) is based on a specimen of *O. articulata*.]

Section CORNICULATAE Reiche. No bulb. Stem weakly erect, procumbent, or creeping. Flowers yellow. Cosmopolitan, centred on America.

The plants of this critical section show a complex reticulation of characters, particularly the pubescence of various parts. The position is further complicated by a long-standing dispute over the nomenclature of the three chief species. The following table shows the names adopted by various authors for the three taxa, which may be represented by their *B.P.L.* (ed. 2) numbers.

<i>B.P.L.</i> number <i>B.P.L.</i> name	132/2 <i>corniculata</i> L.	132/3 <i>stricta</i> L.	132/4 <i>dillenii</i> Jacq.
Salisbury (1794)	<i>pusilla</i> <i>corniculata</i> L.	<i>ambigua</i>	
Jacquin (1794)	<i>repens</i> Thunb.	<i>stricta</i> L.	<i>dillenii</i>
Jordan (1854)		<i>europaea</i>	<i>navieri</i>
Small (1896)	<i>corniculata</i> L.	<i>cymosa</i>	<i>stricta</i> L.
Robinson (1906)	<i>repens</i> Thunb.	<i>corniculata</i> L.	<i>stricta</i> L.
Wilmott (1915)	<i>corniculata</i> L.	<i>stricta</i> L.	
Wiegand (1925)	<i>corniculata</i> L.	<i>europaea</i> Jord.	<i>stricta</i> L.
Eiten (1955)	<i>corniculata</i> L.	<i>stricta</i> L.	<i>dillenii</i> Jacq.

The views of Wiegand are adopted here as far as species are concerned. His treatment is a hierarchy of species, varieties, and forms; many of his infra-specific taxa are artificial, but may be useful for classification.

A list of distributed exsiccata from this group, with corrected determinations, is given in Appendix II.

O. CORNICULATA L., 1753, *Sp. Pl.*, 435.

Stems radiating from a fusiform tap-root, prostrate or procumbent, 10-30 cm. long; rooting freely at the nodes and occasionally buried, but specialised stolons lacking; usually pubescent. *Leaves alternate*; petioles with *oblong stipules* at the base (fig. 1A), with spreading pubescence; leaflets cuneate-obcordate, glabrous above, sparingly pubescent beneath. *Peduncles* slightly longer than the leaves, *pubescent*, bearing 1-7 flowers in an *umbel*. *Sepals* 2.5-5 mm., *acute*; petals bright yellow, 4-7 mm. *Capsule* angular-cylindrical, *hoary* with reversed adpressed pubescence and with some patent hairs.

Varieties.

This species is exceedingly variable, and the forms breed true from seed.

Var. *CORNICULATA* represents the typical or normal-sized plant: stems up to 50 cm. long, sometimes ascending; leaflets 8-23 mm. broad; inflorescence 2-7 flowered; capsules 12-25 × 3-4 mm.

(i) *Dwarf forms.*—There appear to be more than one of these, but taxonomy and nomenclature are both unsatisfactory, and I can only offer the following tentative arrangement:

Var. *REPENS* (Thunb.) Zuccarini, 1829-30, *Denkschr. Akad. Münch.* 1 abh., 230; *O. repens* Thunberg, 1781, *Oxalis*, 16. Stems filiform, prostrate, often creeping underground; leaflets 6-12 mm. broad; inflorescence 1-2-flowered, rarely more; capsules 12-16 × 3-4 mm. This is probably identical with var. *minor* Lange (1880, in Willkomm

& Lange, *Prod. Fl. Hispan.*, 3, 520) which name is often used but is antedated by var. *minor* Ecklon & Zeyher (1835, *Enum. Plant. Afr. Austr. Extratrop.*, 83), "foliis obcordato-cuneiformibus glauco-puberulis minoribus," which may not be the same thing. Apparently a native of S. Africa; often grown in gardens, especially as a purple-leaved form (see below). Probably not infrequent as a garden escape, but I hesitate to give any records owing to the difficulty of separating it from var. *corniculata* which has been dwarfed by conditions of growth. When grown side by side the two are nevertheless distinct.

Var. *MICROPHYLLA* Hooker f., 1864, *Handbook of the N.Z. Flora*, 38; *O. microphylla* A. Cunningham ex Hooker f. (*loc. cit. in syn.*), non Poiret, 1816, *Encycl. Méthod., Bot.*, suppl. 4, 248 (= *O. bifida* Thunb.). Plant forming a low compact mat of wiry creeping stems and tiny leaves; petioles 0.6-1.3 cm., filiform; leaflets rather deeply emarginate, 3-6 mm. broad; peduncles filiform, one-flowered; capsules short, 5-7 × 3 mm., abruptly narrowed at the top. Mountainous parts of New Zealand and Tasmania. Often grown in rockeries. A frequent garden escape which becomes established in gravel paths, between paving stones, and sometimes in lawns and other short turf. It can be distinguished with certainty by the short fat capsules, and in habit it is quite distinct. It probably merits the rank of a geographical subspecies. Recorded in Britain as follows:

- V.c. 2. E. CORNWALL : Newquay, 1913, C. C. Vigurs (K).
 6. N. SOMERSET : Bruton, 1937, F. K. Makins (K).
 11. S. HANTS : Beaulieu Abbey, 1926, R. Findlay (K).
 16. W. KENT : on gravel road verge, Tunbridge Wells, K. E. Bull!
 17. SURREY : foot of wall, Holmbury Hill, 1932, E. C. Wallace (hb. J. E. Lousley).
 21. MIDDX. : Ealing, 1949, L. M. P. Small (BM).
 33. E. GLOS. : in a lawn, Cheltenham; on a footpath, Gretton, N. Saunders (hb. Young).
 35. MON. : garden weed, Newport, 1955, K. F. Adams (NMW).
 36. HEREF. : Ledbury, 1917, S. H. Bickham (K).
 38. WARWICK : near river below the castle, Warwick, B. T. Ward.
 44. CARM. : roads and footways, Achddu [? Fachddu], 1944, J. A. Webb (NMW).
 58. CHESHIRE : gravel road verge, Prenton, Birkenhead, E. P. A. Jones! (hb. Young).
 62. N.E. YORK : Thornton-le-Dale, 1915, E. C. Horrell (OXF).
 74. WIGTOWN : garden weeds, Newton Stewart and Logan, R. C. L. Howitt (hb. Young).
 H38. DOWN : Singer's nurseries, Newcastle, teste D. McClintock.
 H39. ANTRIM : garden weed, Rathmore, Greenisland, *idem*.
 S. CHANNEL IS. : old walls, St. Peter Port, Guernsey, 1928, R. M. Hall (BM).

(ii) *Anthocyanin varieties*.—Various forms with the vegetative parts suffused with purple are grown in gardens. The nomenclature is unsatisfactory; the arrangement given by Knuth (1930, 149-150) is incorrect.

Var. *ATROPURPUREA* Van Houtte ex Planchon, 1857, *Fl. des Serres*, 2(2), 47 & t. 1205, "foliis atropurpureis." This is apparently the same as var. *purpurea* Parlatores (1872, *Fl. Italiana*, 5, 271), "caule foliisque purpureis," and var. *rubra* Nicholson (1886, *Ill. Dict. of Gardening*, 2, 540), "dark purple leaflets," and Planchon (*loc. cit.*) cites *O. tropaeoloides* Schlachter (ined.) as synonymous. Identical with var. *corniculata* except that all parts normally green are heavily suffused with purple. The coloration tends to fade on drying, so that pressed specimens turn ± green. A frequent garden escape or relic of cultivation; records not worth listing in full, but a few will be found in Appendix I.

Besides the above, a purple-suffused form of var. *repens* exists. Unless one of the above names is applicable, there seems to be no separate name for it. It is frequent as a garden weed. Var. *variegata* Goiran (1896, *Bull. Soc. Bot. Ital.*, 97), "foliis \pm variegatis," is a form completely suffused with purple but with the leaves flaked with achlorophyllose patches, resulting in a harlequin pattern of brownish-purple and bright rose (see plate in *Fl. des Serres*, 19, t. 1968 (1873)). I have not seen true *variegata* in this country.

Numerous other varieties have been described, notably var. *villosa* Hohenacker with hairy leaves and stems, but none occurs in this country.

Distribution

The aggregate *O. corniculata* is cosmopolitan, but is probably not indigenous over much of its range. It does appear to belong to the Old World. It is chiefly grown in gardens as the varieties mentioned above. Different strains vary in hardiness, but some will stand the hardest winter even if top growth is killed, and all can overwinter as seeds. On the continent it is a frequent weed of disturbed ground, dry roadsides, etc. In this country it is most frequent as a garden weed, and the earliest record of its spontaneous appearance was no less than 370 years ago (Raven 1953, 14). The varieties are usually more or less obvious escapes or relics of cultivation, but are none the less very persistent, and are spread with pot plants and the like from nurseries. The plant is most frequent in the south-west, and is very common in the Channel Isles. It is known from vice-counties 1-3, 5, 6, 8-17, 20-28, 30-36, 38, 40, 41, 43, 44, 46-49, 51, 54-64, 68-70, 72, 74, 77, 83, 85, 86, 88, 91, 93, H21, H38, H39, and the Channel Isles. The list given in the *Comital Flora* is very incomplete, and that just given contains many vice-counties not included in the *C.F.* or subsequent publications. These are technically new county records and are enumerated in Appendix I.

O. STRICTA L., 1753, *Sp. Pl.*, 435, sec. Small (1896). *O. dillenii* Jacquin (1794); *O. navieri* Jordan (1854).

Root fibrous. Stem often branched from the base, strigose, rather fleshy; erect or decumbent, occasionally rooting but *without specialised stolons*. Leaves *subopposite or in groups or fascicles*; stipules narrow, oblong, adnate to the petiole (fig. 1B); petioles strigose; leaflets obcordate, 10-18 mm. broad, glabrous on both sides or sometimes with a few hairs beneath. Peduncles longer than the leaves, strigose; *inflorescence* (1-2-3(-4) flowered,

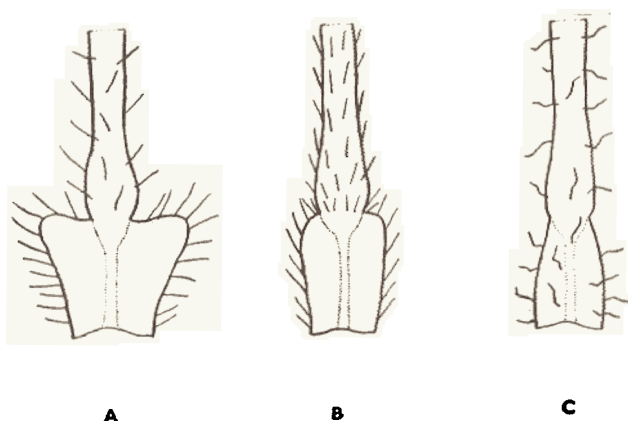


Fig. 1. Leaf-bases of (A) *Oxalis corniculata*, (B) *O. stricta*, (C) *O. europaea*. $\times 8$.

umbellate, not cymose; pedicels 8-25 mm. long, deflexed in fruit, strigose. Petals 7-11 mm. long, soft yellow. Capsules cylindrical, 15-25 × 3 mm., abruptly short-pointed. The plant occurring here appears to come under var. *piletocarpa* Wiegand (1925), which has the capsule finely and densely adpressed-puberulent but not viscid. According to Wiegand, in the type it is finely puberulent with additional long viscid hairs. Flowers from August onward.

Canada and U.S.; rarely cultivated or adventive in Europe. Wiegand says, "When and how widely this species was introduced into Europe is not known . . . It was evidently growing in the Eltham garden at the time of Dillenius, but seems not to have spread as did *O. europaea*." It occurs here and there in France (Chevalier, 1940, 675); I have seen it in the Jardin des Plantes in Paris, mixed with *O. europaea*. Although frost-hardy to some extent, it seldom survives the winter and behaves as an annual.

Only British station, v.c. 13, W. Sussex; in arable fields on sandy soil near Pulborough, 1951, *O. Buckle*; has persisted since. How or whence it was introduced here is not known. It appears in greatest quantity amongst root-crops, or in stubble after the corn is cut; the agrestal habitat is noteworthy. An earlier record from Cemmaes, v.c. 47 (Druce, 1920), on the strength of which the plant already appears in the *B.P.L.*, is incorrect; the specimen (OXF) is *O. europaea*.

O. EUROPAEA Jordan, 1854. *O. stricta* mult. auct. (incl. *B.P.L.* ed. 2, *Fl. British Is.*, and *Student's Flora*).

Short-lived perennial or annual. Root fibrous. Stem usually erect, 5-40 cm. tall, glabrous or hirsute with septate hairs; emitting underground stolons from the base, and also sometimes horizontal, but not rooting, branches above ground. Leaves mostly subopposite, fascicled, or whorled; stipules none, or no more than a narrow wing to the enlarged basal joint of the petiole (fig. 1C); petioles (and peduncles) glabrous or strigose; leaflets obcordate, 12-30 mm. broad, typically glabrous. Peduncles about as long as petioles; inflorescence of 2-5 flowers, often cymose; pedicels 8-10 mm. long, not reflexed in fruit. Petals 5-10 mm. long, yellow. Capsule cylindrical, shorter than in the last two species (8-12 × 2.5-3.5 mm.), gradually acuminate, glabrous or with only scattered hairs. Flowers from July onward.

Varieties.

(i) *Indumentum variation*.—The plant varies a good deal in the hairiness of various parts, and different combinations of characters are possible. Wiegand (1925, 135) gives an arrangement which may be summarised as follows:

		Upper surface of leaves glabrous	Upper surface of leaves hairy
		var. <i>europaea</i>	var. <i>bushii</i>
Hairs on pedicels adpressed, not viscid	Stem glabrous or with adpressed hairs	f. <i>europaea</i>	f. <i>subglabrata</i> Wiegand
	Stem villous	f. <i>pilosella</i> Wiegand	f. <i>bushii</i>
Hairs on pedicels spreading, viscid	Stem nearly or quite glabrous	f. <i>cymosa</i> (Small) Wiegand	
	Stem villous	f. <i>villicaulis</i> Wiegand	f. <i>vestita</i> Wiegand

Var. *BUSHII* (Small) Wiegand, 1925, 135; *O. bushii* Small, 1898, 611, with leaves covered with adpressed hairs, is a distinct enough plant. It is quite rare in this country and has not indeed been collected since last century. Records: v.c. 1, W. Cornwall; near Penzance, 1839, J. Ralfs (MANCH); 1872, Mrs. Lomax (BM, etc.), and many intermediate dates but none subsequently. 41, Glam.; "Glamorgan," 1850, J. W. Rimmington (MANCH)—a rather dubious record.

As to the various forms proposed by Wiegand, the variation in stem and pedicel indumentum is so wide and apparently inconstant—depending amongst other things on the state of development of the plant—that I refrain from quoting any British records under the separate names. Nothing appears to be known of the genetics of the various characters, and although his names may be useful for classifying herbarium specimens, their scientific basis is doubtful.

(ii) *Anthocyanin variety*.

Var. *rufa*, (Small) comb. nov. *Oxalis rufa* Small, 1901, in Britton, *Manual Fl. N.W. States and Canada*, 577; *O. stricta* var. *rufa* Farwell, 1918, *Rep. Mich. Acad. Sci.*, 20, 183. Leaves and to a lesser extent stems etc., suffused with reddish-purple. The colour, which disappears in old leaves and also very largely on drying, is pinker and less intense than in the parallel variety of *O. corniculata*. Occurs not infrequently as a naturalised weed, but I have not seen it outside gardens. Records too numerous to give in detail; some are given in the Appendices.

A prostrate form, var. *lejeunei* (Rouy) Chevalier (1940, 675), has been described. I have seen no material and am inclined to doubt whether it is distinct.

DISTRIBUTION

Despite Jordan's name, *O. europaea* is almost certainly only native in N. America and possibly Japan and Manchuria, but it is naturalised almost ubiquitously. In Britain it is chiefly a garden weed, but it has occasionally been recorded in arable crops including corn. Like *O. corniculata* it tends to behave as an annual. It is common on the light soils of west Surrey, and in the adjoining parts of Middlesex and west Sussex; elsewhere it has occurred in localities scattered rather evenly over the whole country except the north of Scotland. It is not particularly common in the south-west, and is only doubtfully recorded from the Channel Isles. This distribution, which may be contrasted with that of *O. corniculata*, is an expression of the plant's preference for a cool temperature climate. Recorded for v.c. 1-14, 16-18, 21-26, 28, 29, 33, 37, 38, 41, 44, 47-49, 52-59, 68, 70, 74, 80, 83, 87, 93, 94, H22, H38, H39, and Donegal. Here again the C.F. is very incomplete and the above lists contain many technically new county records which are substantiated in Appendix I.

Section *CARNOSAE* Reiche. Perennials with thick stems, tuber-like but not bulbous at the base, bearing leaves at the growing tip. Xerophytes from Chile.

O. CARNOSA Molina, 1810, *Sagg. Storia Nat. Chile*, 2nd ed., 288.

A succulent with fleshy stems, 1-2 cm. in diameter, at first subterranean but becoming aerial by gradual lengthening, eventually attaining 20 cm. long, branched, pitted with the scars of old leaf-bases. Whole plant glabrous. Leaves and flowers borne at the tips of the stems. Leaflets fleshy, up to 2 cm. broad, obcordate, smooth and somewhat glaucous above, entirely covered below with glistening transparent papillae which give the surface a crystalline appearance. Peduncles somewhat longer than the leaves, bearing 1-3 (-5) flowers in an umbel. Three outside sepals cordate-deltoid with prominent auricles, two

larger than the others and clasping the unopened corolla in bud, the third folded back about its midrib; two inner sepals much smaller, linear. *Petals* ca. 15 mm. long, *bright yellow*. Capsule short, oblong, 7 mm. long, about equalling the sepals; setting good seed in this country.

Native of Chile, mainly on coastal rocks. Grown as a greenhouse plant; very frost-sensitive so will not pass the winter out of doors except in frost-free localities. A member of a critical group, but apparently the only species cultivated. Very difficult to make into satisfactory pressed specimens; if dried in the ordinary way, the plant breaks at every joint and falls to a heap of fragments.

Naturalised on walls and banks on St. Mary's and Tresco, Scilly Isles, probably planted (see discussion in *Proc. Bot. Soc. Brit. Is.*, **1**, 578 (1955)). Known there for some 20 years, but the earliest specimen that I have seen was collected by R.C.L. Burges in 1950 (hb. Burges).

Section ARTICULATAE R. Knuth. Perennials with thick woody rootstock bearing leaves at the growing point.

O. ARTICULATA Savigny, 1798, in Lamarck, *Encycl. Méthod., Bot.*, **4**, 686. *O. lasiopetala* Zuccarini, 1825, 25; *O. floribunda* Lehmann, 1826, *Ind. Sem. Hort. Hamburg*, 17.

Rhizome thick, fleshy or almost woody, ascending or horizontal, up to 2 cm. diameter, covered with the scars or scaly remains of old leaf-bases, and with a wiry basal root; in old plants becoming branched, often with constrictions which divide it into spherical or oblong segments; very like the rhizomes of *Iris germanica* but smaller. Leaves and flowers borne at the ends of the rhizomes, so that the plant forms compact bunches. Petioles 10-25 cm. long, \pm pubescent; *leaflets* obcordate, \pm pubescent, 1-4 cm. broad, with sparse but prominent elongated orange calli all over both sides, although concentrated on the underneath margin (fig. 2a). Peduncles slightly longer than the petioles. Flowers many, in an umbel; sepals with an orange callus at the tip, pubescent; petals 10-15 mm. long, usually bright deep rose colour, rarely white or pale pink. Capsules cylindrical-ovate, short (10 mm.), not plentifully formed.

It is difficult to say what is the correct name for this well-known garden plant. It is commonly known as *O. floribunda*, which is equated by Urban (1884) and Knuth (1930, 210) to *O. articulata* var. *hirsuta* Progel (1877, 488); but I think the latter name should be restricted to heavily tomentose forms. Chevalier (1940, 692) considers that the common plant is *O. lasiopetala* and that it is not the same as *O. floribunda*. Knuth (1930, 196, 208) separates *O. lasiopetala* from *O. articulata* by lack of subfoliar tubercles in the former, evidently relying on Zuccarini's omission to mention them. However, the isotype ("Brasilia. Sellow legit," ex herb. Berlin) of *O. lasiopetala* at Kew has tubercled leaves, so this distinction will not hold water. Chittenden (1951, 1458-1460) considers that the garden *O. floribunda* is partly *O. rubra* St.-Hilaire (1825, *Fl. Bras. Mer.*, **1**, 124), but I know of nothing to support this view. *O. floribunda* has also been equated to *O. martiana* (see below), and confused with *O. rosea* following a misnamed plate in the *Botanical Register* (**13**, t. 1123 (1827)). Pending a reinvestigation of the taxonomic position, it seems best to keep to the oldest name, with the reservation that it may have to be understood in an aggregate sense to cover the group of plants from which the cultivated plant has been derived.

Native of E. temperate South America; occasionally naturalised in other temperate countries. A favourite garden plant, and nowadays by far the commonest pink *Oxalis* in cultivation. It is hardy, but flourishes best in warmer areas.

Found \pm naturalised in waste ground, roadsides, and seashores, always near houses and only becoming well established near the coast (on account of the milder climate); frequent in the south-west. Rarely becomes a weed, and unlike other species is often found amongst other vegetation such as grass or brambles.

- V.c. 1. W. CORNWALL : Gulval, 1952, M. L. Bolitho (hb. J. E. Lousley); roadside, Lizard, B. D. Miles; frequent in the Scillies!, sometimes a bulbfield weed, teste R. C. L. Howitt.
 2. E. CORNWALL : waste-ground, Newquay, 1931, G. C. Druce (OXF); meadow, Polzeath, 1935, J. D. Grose (hb. Grose).
 3. S. DEVON : Dartmouth, 1930, F. M. Day (OXF).
 11. S. HANTS. : Milford, 1935, I. W. Wyatt (K).
 13. W. SUSSEX : seashore, amongst grass and brambles, Kingston!
 16. W. KENT : old gravel-pit, Hayes, 1912, W. H. Griffin (OXF, SLBI).
 44. CARM. : Llanstephan, 1920, D. Hamer (OXF).
 45. PEMB. : hedges, Newgale Hill, 1947, J. A. Webb (NMW).
 48. MERION. : on shingle between Barmouth and Llanaber, 1926, C. E. Salmon (K).
 55. (RUTLAND) : old stone heaps far from houses, Ketton; also at Ryhall, R. C. L. Howitt.
 H1. KERRY : sandhills near houses, Derrynane, 1937, R. C. L. Burges (hba. Burges and J. E. Lousley).
 H20. WICKLOW : sandhills, Brittas Bay, 1937, *idem* (*ibid*).
 H21. DUBLIN : amongst brambles, Hill of Howth!
 S. CHANNEL IS. : frequent, D. McClintock (BM).

Section OXALIS. Perennials, with a herbaceous horizontal creeping rhizome, often scaly. Leaves trifoliate; flowers solitary. A widespread group of closely-related species.

O. ACETOSELLA L., 1753, *Sp. Pl.*, 433.

The common wood-sorrel, and too well-known to need description. The flower-colour varies, and forms have been distinguished as vars. *alba* Peterm. (= type, i.e. should be called var. *acetosella*), *rosea* Peterm., *subpurpurascens* DC., *purpurascens* Mart., *lilacina* Lange, *violacea* Westf., and *caerulea* DC.

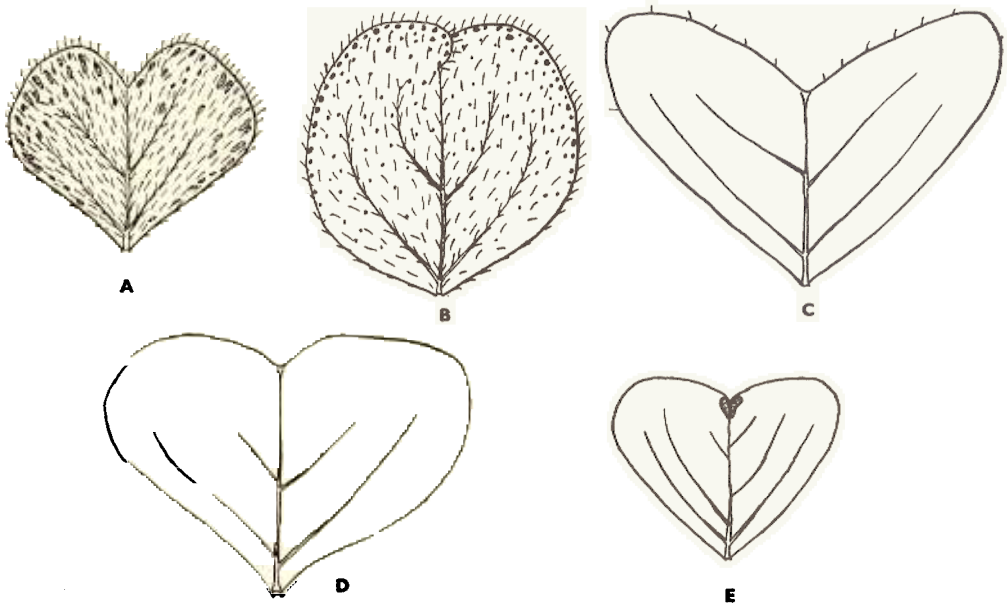


Fig. 2. Underside of single leaflets of (A) *Oxalis articulata*, (B) *O. corymbosa*, (C) *O. latifolia* ("typical" form), (D) *O. latifolia* from Cornwall, (E) *O. violacea*. Natural size.

Throughout Europe and northern Asia. Represented in America by the closely-allied *O. montana* Raf. and *O. oregana* Nutt.

Section IONOXALIS (Small) R. Knuth. Plant stemless; leaves and flowers springing from a bulb formed by the bases of the petioles enlarged into scales. N. and S. America.

Another difficult group; the entire plant including bulb is essential for identification. The species in cultivation, and hence those that have become naturalised outside their native area, propagate themselves to a great extent vegetatively. They thus form clones derived from a few selected forms, and it is impossible to draw any taxonomic conclusions by studying them.

O. CORYMBOSA DC., 1824, *Prod.*, 1, 696. *O. martiana* Zuccarini, 1825, 20.

Leaves and flowers springing from an underground bulb (fig. 3A) with ovate scales, pale brown outside and whitish inside; when mature the bulb develops into a *large mass of bulbils* (3-6 mm.) all sessile in the axils of the old scales, which wither and leave only the heart of the original bulb unchanged. One or two roots from the base of the bulb often swell into juicy white translucent tubers up to 5 cm. long and 1 cm. thick at the top. Petioles weak, thin and tortuous below ground, sparsely hairy, 5-15 cm. long; *leaflets* (fig. 2b) large, 2.5-5.5 cm. wide, roundish, *with a deep narrow indentation* at the apex between rounded, close or even overlapping lobes; sparsely hairy beneath and near the margin above, and *with tiny reddish calli* on the margin and microscopic reddish tubercles (hardly visible to the naked eye) scattered over the lower surface. Peduncles up to 30 cm. long, bearing flowers in a *contracted cyme*. Sepals acute, with two orange calli at the tip. Petals purplish rose, 15-20 mm. long. I have never seen the fruit, nor a description of it. The plant spreads by the bulbils which are copiously produced in autumn.

De Candolle's name antedates the better-known *martiana* by a few months. It is threatened by two earlier names, *O. debilis* Kunth (see below) and *O. macrophylla* Kunth, 1821, in Humboldt, Bonpland, and Kunth, *Nov. Gen. et. Spec.*, 5, 184, but there is some doubt as to whether they are conspecific. The equation of *O. martiana* Zucc. to *O. floribunda* Lehm. in the *B.P.L.* (ed. 2), copying Progel (1877, 486), is quite erroneous.

Superficially resembles *O. articulata*, from which it can be distinguished by the laxer habit, characteristic cluster of bulbils, and different calli underneath the leaves. It is more difficult to separate from the following species, the descriptions of which should be consulted.

Native of most of South America; naturalised in many subtropical countries and a troublesome weed in some. Formerly cultivated as a garden plant, but quite superseded by *O. articulata* which is much more floriferous and much less dangerous.

Rather frequently naturalised in old gardens, where it is usually a relic of cultivation. Unlike *O. articulata* it cannot compete in closed associations and is only seen in open tilled ground, paths, etc. Occasionally in market gardens and nurseries, usually where an old garden has been turned to such use; sometimes distributed with nurseryman's plants and peat. Common in suburban gardens west and south of London, probably emanating from various parks and botanical gardens, some of which have since been built over; occasional in other parts of the country, but in Cornwall and Devon less common than *O. latifolia*.

- V.c. 1. W. CORNWALL: nursery, Penzance!
 8. S. WILTS.: Cathedral Close, Salisbury, R. C. L. Howitt.
 11. S. HANTS.: Southampton University botanic garden! garden, Chandler's Ford!
 14. E. SUSSEX: cottage gardens, Mayfield! and Battle!

16. W. KENT : Greenwich Park! (evidently the plant recorded, as *O. floribunda*, by Grinling, Ingram, and Polkinghorne (1909)); in market-garden and glasshouses, Oakley House, Keston, R. Woodall!; spreading from the gardens of Fairhill House, Shipbourne, and now over a half-mile radius, R. Bush!
17. SURREY : frequent in the London suburbs from Kew to Croydon!; Kew Gardens!, established for many years; garden weed, East Molesey, A. M. Thompson!; spontaneous in a greenhouse, Horley, F. M. Gurteen!; garden, Limpsfield!
18. S. ESSEX : rubbish tip, Barking!, evidently from garden refuse.
20. HERTS. : pest in garden, Bishop's Stortford, D. McClintock.
21. MIDDX. : weed in kitchen garden, Osterley Park, 1900, A. Lloydell (OXF) ; now common around Twickenham ; Syon House, Hampton Court, and Chelsea Physic Gardens!; introduced with peat, Shepperton, P. W. Norman.
37. WORCS. : garden, Birlingham rectory, Pershore, D. McClintock.
54. N. Lincs. : Holton-le-Moor, D. McClintock.
56. NOTTS : market garden, Farndon, R. C. L. Howitt.
- S. CHANNEL IS. : field, St. Ouen, Jersey, F. le Sueur.

Probably much commoner than the above records indicate.

O. debilis Kunth, 1821, in Humboldt, Bonpland, and Kunth, *Nov. Gen. et Spec.*, 5, 236. A plant traditionally known as this grows as a weed in Kew gardens, with *O. corymbosa*. There is a specimen (K) from there dated 1879. It differs from *O. corymbosa* by its smaller (2-3 mm.) bulbils, and in the salmon-pink or brick-red flowers, as compared with the mauve shade of the latter species. The Kew plant is a clone differing from the usual form of *O. corymbosa* (itself no doubt a single clone), but whether it is specifically distinct or is correctly referable to *O. debilis* is doubtful to say the least.

[*O. VIOLACEA* L., 1753, *Sp. Pl.*, 434. Bulb roundish, of lanceolate scales, brown outside; at the base emitting fibrous roots, and occasionally a white tuberous root. *Entire plant glabrous*. *Leaflets* (fig. 2e) obdeltoid, with a narrow and rather shallow sinus with rounded sides; *with a pair of brown calli underneath at each sinus*, at the end of the midrib, but nowhere else. Inflorescence a simple few-flowered umbel. Sepals rather obtuse, each with a pair of short orange-brown calli at the tip. Petals purplish-rose, 14-20 mm. long. Capsule globose-ovoid, 4-5 mm. long.

United States, in woods and prairies. This side of the Atlantic the plant is much confused with other pink-flowered species. Included in the *B.P.L.* (ed. 2), but I have seen no material to support this; in particular, all material in hb. Druce (OXF) determined as *O. violacea* is either *O. corymbosa* or *O. articulata*. There is no evidence that it has ever occurred in Britain as a wild plant, and it should be removed from the British list. Chevalier (1940, 682) was likewise of the opinion that French records for it were erroneous].

O. LATIFOLIA Kunth, 1882, *Nov. Gen. et Spec.*, 237, t. 467.

Habit of *O. corymbosa*. Bulb (fig. 3b) 1-2 cm. in diameter, consisting of lanceolate scales, the outer ones brown and papery; often with a white translucent conical tuberised root. *Bulbils borne on short horizontal underground stolons* (up to 2 cm. long) *from the base of the bulb*. Petioles 10-30 cm., with a few hairs; *leaflets* (fig. 2c) usually broader than long, 10-25 × 20-45 mm., *obdeltoid with a wide shallow indentation with straight sides* meeting at an obtuse angle, *glabrous* except for a few cilia at the edge, often purplish beneath, but *without any calli*. Peduncles 15-20 cm., ± pubescent; flowers in an *umbel*. Sepals lanceolate, pointed, with two brownish-orange calli at the tip. Petals pink, 8-13 mm. Fruit apparently unknown; the plant spreads vegetatively.

The above description is of what may be called the typical form, which occurs on the continent, in the Channel Isles, and as an occasional garden or nursery weed in various parts of England. It has leaflets with rather long pointed lobes, the whole leaflet having a

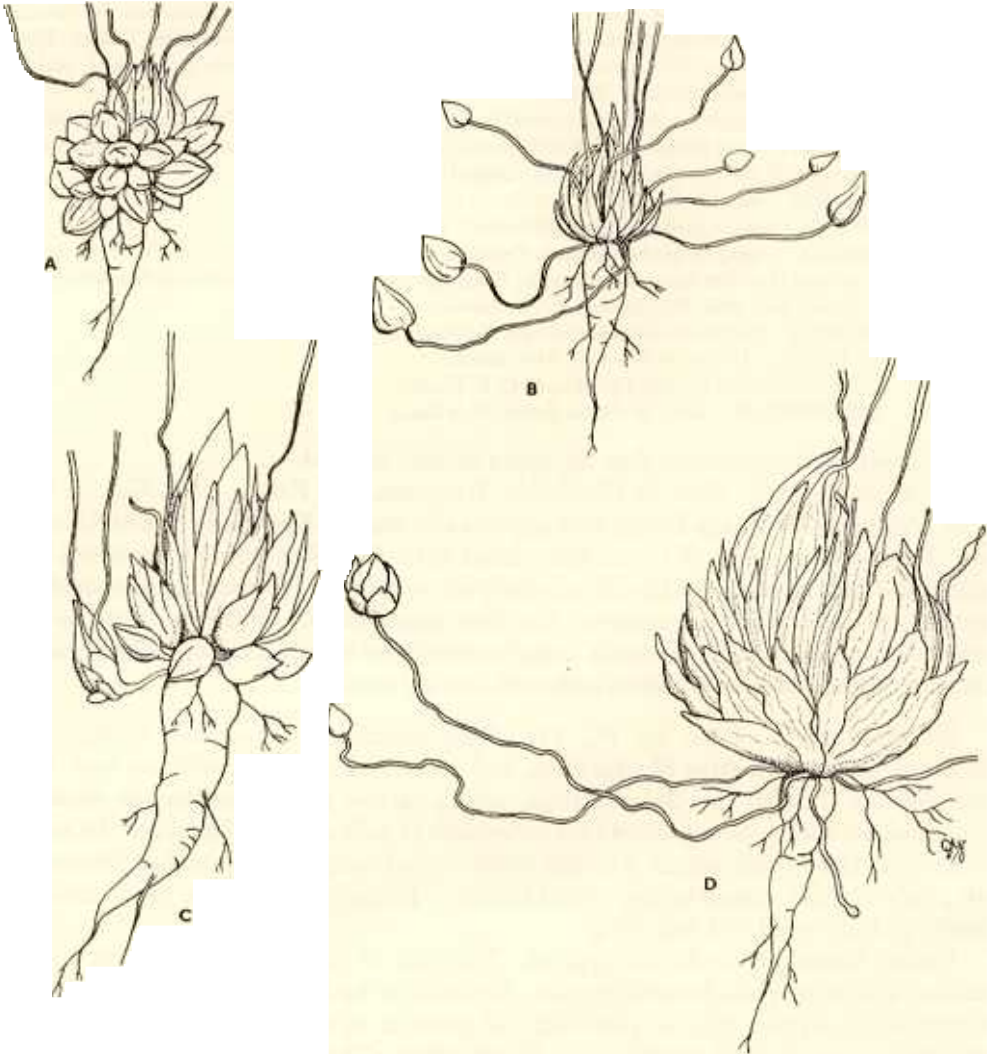


Fig. 3. Bulbs of (A) *Oxalis corymbosa*, (B) *O. latifolia* ("typical" form), (C) *O. latifolia* from Cornwall, (D) *O. tetraphylla*. Natural size. All four are shown with tuberised root, but this is not always developed.

somewhat fish-tailed shape, and comparatively few bulbils on distinct horizontal stolons. The other form, which is now so common in Devon and Cornwall, has *leaflets* (fig. 2D) with a narrower sinus with curved sides, rarely purple underneath, paler flowers, and numerous bulbils which are on short weak erect stalks or almost sessile (fig. 3C). Doubtless these are two different clones; I cannot fit any other specific name to the second form. The last is easily confused with *O. corymbosa*, from which it is distinguished by the wider sinus to the leaflets, which are without any tubercles or dots at the edge and virtually hairless.

Central and equatorial South America, West Indies, etc., in meadows and hillsides. Naturalised as a weed of cultivation in many parts of the world: Mediterranean region, Ceylon, S. Africa. At one time cultivated in gardens in this country. Now a troublesome weed in cultivated ground in market-gardens, glasshouses, and old gardens; uncommon, except in the south-west and in Jersey.

- V.c. 1. W. CORNWALL : weed in cultivated ground, Penzance, 1921, *E. Thurston* (K) ; now in almost every market-garden in the district; in many places around Helston, Camborne, and Falmouth.
2. E. CORNWALL : allotments, Bude, 1943, *D. Stamp* (K); reportedly a pest around Bodmin and Saltash, but I have seen no specimens.
3. S. DEVON : Newton Abbot, *M. L. Bolitho*; Kenn, *A. E. Ellis*; fields, Dawlish, *H. Gilbert-Carter* ; reportedly common in this area.

The above are all the form with rounded leaflets and subsessile bulbils. The following are all the " typical " form:

11. S. HANTS : garden weed, Winchester, *D. McClintock*.
58. CHESHIRE : pest in a nursery near Birkenhead, *E. P. A. Jones*.
64. MID-W. YORK : Harewood, 1954, *V. Scott* (BM).
- S. CHANNEL ISLES (Jersey) : field, Bellozane Valley, 1926, *Louis-Arsène* (B.E.C. Distribution); fields, St. Ouen, *F. le Sueur*; gardens, St. Helier and Trinity, *idem*; frequent in potato fields, teste *O. Buckle*.

O. TETRAPHYLLA Cavanilles, 1794, *Icones*, 3, 19.

Bulb up to 4 cm. in diameter, of narrow lanceolate striated scales, the outer brown and dry (fig. 3D), often with a white tuberised root at the base; bulbils few, on long flexuous stolons several cm. long. Leaves few, on pubescent petioles; *leaflets four*, obdeltoid with rounded lobes and a shallow indentation at the apex, 20-25 × 30-40 mm., *with thin silky pubescence*, sometimes with a purple band across the centre. Peduncles 15-35 cm., strongly pubescent, carrying the flowers in an umbel. Sepals lanceolate, obtuse, with two reddish calli at the tip of each. Petals 20 mm. long, bright rose red. Fruit apparently unknown.

Mexico, on the high plateaux. Naturalised here and there: Simla (India), Java. Occasionally cultivated, but confused with *O. deppei*.

Only in Jersey; introduced in fields in quantity, La Haule, 1926, *Louis-Arsène* (B.E.C. Distribution); still there, also at St. Ouen and Faldouet (Gorey), and in an orchard at St. Aubin, *F. le Sueur*.

The related *O. deppei* Loddiges differs from *O. tetraphylla* in having sessile bulbils, leaves which are scarcely indented at the apex, and larger and more deeply-coloured flowers. Mexico; a well-known garden and greenhouse plant. It does not appear to have become naturalised so far.

Section CERNUAE R. Knuth. Plant with an underground and/or aerial stem from a bulb with inner nutritive scales covered with outer integumental ones.

Inflorescence an umbel. S. Africa.

O. PES-CAPRAE L., 1753, *Sp. Pl.*, 434. *O. cernua* Thunberg, 1781, *Oxalis*, 14. "Bermuda Buttercup."

Bulb ovoid, pointed, 2-4 × 1 cm., with a brown tunic, much like a daffodil bulb, *deeply buried* up to 25 cm. below ground; with a white contractile tuberised root, and emitting a thin *ascending annual underground stem* which bears large (5-10 mm.) bulbils along its length and also in a bunch at soil level. Leaves many, springing from the enlarged top of the stem at soil level; petioles lengthening during development up to 20 cm. long; leaflets obcordate, up to 20 × 30 mm., sparsely hairy below. Peduncles 10-30 cm. long, bearing flowers in umbels. *Flowers large, bright yellow*; sepals lanceolate, 5-7 mm.; petals 20-25 mm. long; flowers trimorphic, but perhaps only one form in this country. Capsule short, not formed in this country. Flowers March-June.

The bulb is annual; each year it shrivels and food reserves pass into the tuberised root, and a new bulb and bulbils are formed later. A lengthy description of the plant's

life-cycle is given by Ducellier (1923). The bulbils are hard and extremely tenacious of life.

Salter (1939) has pointed out that Linnaeus' name is correctly applied to this species and so has priority over the better known epithet *cernua*.

South Africa; said to prefer moist or shady places in its native habitat. Widely naturalised as a weed of disturbed or arid soils, e.g. all around the Mediterranean (a pest in date-groves), Macaronesia, Bermuda, Australia (a pest on sheep and cattle ranges), Uruguay. An account of the plant's spread up to 1910 has been given by Henslow (1910), who asserted that in the northern hemisphere only short-styled plants occurred, and that in consequence it was seed-sterile and spread vegetatively. However, Ducellier, writing in 1923, definitely mentions that in N. Africa the plant sets seed, and so either the barrier (never very strong) to cross-fertilisation between plants of the same style length has been broken down, or else mid- or long-styled plants have been introduced since Henslow's time. The point merits further investigation.

Cultivated as a greenhouse flower in this country; not frost-hardy. A frequent weed in bulbfields in the Scilly Isles, allegedly originating from Tresco Gardens; occasionally in Devon and the Channel Isles.

V.c. 1. W. CORNWALL: (Scillies); St. Mary's, in many places; St. Agnes, St. Martin's, Tresco, J. E. Lousley. Cf. Lousley (1955).

3. S. DEVON: Teignmouth, n.d., H. M. Tozer (OXF). Again reported recently, but I have not been able to get confirmation.

S. CHANNEL IS.: naturalised on a wall at St. Peter's, Guernsey (Marquand 1901, 72); Belcroute Bay, Jersey, 1926, C. Burdo (hb. F. le Sueur); Herm, F. le Sueur.

[*O. SEMILOBA* Sonder, 1860, *Fl. Cap.*, 1, 350. Bulb? Aerial stem often present, pubescent. Leaves from the top of the stem; petioles 6-7 cm. long; leaflets obdeltoid, deeply lobed, pubescent beneath, 15 × 12 mm. Peduncles about as long as leaves, carrying umbels of 5-15 flowers. Sepals ovate, obtuse, with two brownish calli. Petals 10 mm., retuse, purple. S. Africa, probably as far north as Tanganyika. Apparently not in cultivation, but closely allied to the popular *O. bowiei* Herbert. Reported by Pearsall (1933) as an alien at Polzeath; the specimens (hb. J. D. Grose) are *O. articulata*.]

Section TRIPARTITAE R. Knuth. As *Cernuae*, but inflorescence single-flowered; leaved trifoliate, petioled. (Sect. *Oppositae* Salter, defined slightly differently).

O. INCARNATA L., 1753, *Sp. Pl.*, 433

Bulb up to 2 cm. long, with a brown tunic, of the size and appearance of a hazel-nut kernel; emitting an *annual stem* that is white and flexuous below ground and *stiff, erect*, and *branching* above ground, 10-20 cm. tall; bearing sessile *bulbils*, 5-10 cm. long, *in the axils*. Whole plant almost glabrous. Leaves opposite, becoming crowded towards the ends of the branches; petioles 2-6 cm.; leaflets delicate, pale green, obcordate, rather deeply lobed, 5-15 × 8-20 mm. Peduncles from the axils, slender, 3-7 cm. long, with a joint with two tiny bracts near the middle. Flowers trumpet-shaped; sepals, oblong, acute; petals 12-20 mm. long, pale lilac with darker veins, overlapping. The species does not appear to set seed in this country, but multiplies by the aerial bulbils which drop off when mature.

South Africa, in shady places. Much grown in cottage gardens, and often running wild. In Devon and Cornwall it is frequently naturalised in stone walls and hedgebanks; elsewhere it is found as a relic of cultivation, and being less of a nuisance than other bulbous species it is difficult to decide at what point it is to be considered feral. It is a pretty species, sometimes confused by the tyro with *O. acetosella*, from which it is easily distinguished by its erect stems. The following list of records is probably very incomplete.

- V.c. 1. W. CORNWALL : frequent, also in the Scillies.
 3. S. DEVON : Sidbury, 1936, J. W. Wyatt (K); spontaneous in garden, Axminster, M. L. Bolitho.
 4. N. DEVON : Weare Gifford, H. W. Phillips.
 9. DORSET : in gardens, Swanage, 1933!
 14. E. SUSSEX : site of old cottage, Bishopstone!
 21. MIDDX. : garden, "comes up every year," Hammersmith, 1912, J. Murison (K).
 56. NOTTS. : garden weeds, Farndon and Lowdham, R. C. L. Howitt.
 74. WIGTOWN : weed in Logan gardens, R. C. L. Howitt.
 S. CHANNEL IS. : Guernsey, several places, 1926, Louis-Arsène (OXF); Jersey, D. McClintock;
 Herm, F. le Sueur.

ARTIFICIAL KEY TO SPECIES OF OXALIS WILD IN THE BRITISH ISLES

This key should be used with caution, since other alien species, not included, may be found in the future. It is offered as an aid to tracking down identifications, but they should be checked against the descriptions and if possible against authentic specimens.

- A. Flowers yellow.
 B. Plant succulent; stem a thick rhizome; 3 sepals cordate *carcosa*
 BB. Plant not succulent; stem slender or invisible; sepals not cordate.
 C. No aerial stem; bulbils present at base of plant and on underground stem. *pes-caprae*
 CC. Aerial stem present; no bulbils.
 D. Stem short, unbranched; flowers in long cymes; capsule not more than twice as long as broad. *valdiviensis*
 DD. Stems long, branched; flowers in few-flowered umbels or contracted cymes; capsule more than 3 times as long as broad.
 E. Stem rooting at nodes; leaves alternate; stipules obvious, oblong. *corniculata*
 EE. Stem not rooting; leaves whorled or fascicled; stipules inconspicuous or absent.
 F. Peduncles not reflexed after flowering; inflorescence often cymose, with 4 or more flowers; stipules absent. *europaea*
 FF. Peduncles reflexed after flowering; inflorescence umbellate, 2-3 flowered; stipules narrow-oblong, adnate. *stricta*
- AA. Flowers pink, pale lilac, or red.
 B. Stem slender, erect, bearing bulbils. *incarnata*
 BB. Stem a \pm procumbent rhizome, sometimes buried.
 C. Rhizome slender, scaly. *acetosella*
 CC. Rhizome woody, over 1 cm. thick, often consisting of oblong or spherical joints. *articulata*
 BBB. No stem; leaves springing from a bulb (or mass of bulbils).
 C. Leaves 4-foliate. *tetraphylla*
 CC. Leaves 3-foliate.
 D. Bulb with stipitate bulbils at base; leaflets broadest at or near apex, almost glabrous and without dots on edge beneath. *latifolia*
 DD. Bulb breaking up into a cluster of sessile bulbils at maturity; leaflets broadest at or below the middle, hirsute, with dark dots beneath near the edge. *corymbosa*

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APPENDIX I.

Unpublished vice-county records for *Oxalis corniculata* and *O. europaea*.

Only the earliest record, and in some cases a modern record as well, is given.

O. corniculata

6. N. SOM. : see above, sub var. *microphylla*; Tickenham, 1951, N. Y. Sandwith (var. *atropurpurea*).
8. S. WILTS : Salisbury, 1954, R. C. L. Howitt (hb. Howitt).
15. E. KENT : St. Martin's churchyard, Canterbury, teste J. Codrington (var. *atropurpurea*).
33. E. GLOS. : Campden churchyard, 1933, G. W. Hedley (BM).
38. WARWICK : Arbury Hall, 1849, M. Evans (BM).
40. SALOP : under walls, Clun, 1939, J. A. Webb (NMW).
46. CARDIGAN : greenhouse weed, Llanbadarn, 1929, J. H. Salter (NMW); Aberporth, 1951, J. A. Webb (NMW).
49. CAERN. : gardens, Llanfairfechan, 1938, J. A. Young.
57. DERBY : near Kedleston, 1858, F. Mason (BM).
58. CHESHIRE : Thelwall, 1908 (BM).
60. W. LANCS. : Langcliffe Gardens, Lancaster, 1834, S. Simpson (OXF).
61. S.E. YORK : Bampton Lane, Bridlington, n.d., Flintoff (var. *atropurpurea*).
71. MAN : Peel, 1937 † (hb. Young) (? var. *microphylla*).
85. FIFE : St. Davids, 1845, A. Dewar (NMW).
- H38. DOWN : Singer's nurseries, Newcastle, 1956, teste D. McClintock (and var. *microphylla*).

O. europaea

5. S. SOM. : walls of old town, Minehead, 1905, A. Loydell (OXF).
6. N. SOM. : on tipped earth by laneside, Harter's Hill, Wookey, 1956, V. S. Summerhayes (K).
13. W. SUSSEX : garden weed, Woolbeeding, 1875, H. E. Fox (OXF); Henfield Common !
18. S. ESSEX : Brentwood, 1954, B. Welch (BM) (non vidi).
26. W. SUFFOLK : shrubbery, Nayland, 1893, J. D. Gray (BM).
33. E. GLOS. : garden weed, Cheltenham, 1953, N. Saunders (hb. Young).
38. WARWICK : Arbury Hall, 1853, M. Evans (BM) ; garden, Birmingham, ? introduced, 1955, W. H. Hardaker (var. *rufa*).
47. MONTG. : garden weed, Cemmaes, 1901, G. C. Druce (OXF) ; Powis, 1955, H. A. Hyde (NMW).
48. MERION. : Ffrith Gate, 1923, W. C. Barton (BM etc., see Appendix II).
49. CAERN. : Bangor, 1919, G. C. Druce (OXF).
55. LEICS. : weed in gardens, Knighton nr. Leicester, 1951, T. G. Tutin.
57. DERBY : " plantations," 1823, M. Berkeley (CGE); Matock Bath, 1873 (BM).
59. S. LANCs. : Hyndburn, Accrington, 1852, G. F. Dugdale (BM); several later records.
69. WESTMD. : nr. Ulverston, 1867, E. Hawks (CGE) : garden weed, The Craig, Windermere, 1915, F. Long (BM).
70. CUMBERLD. : garden weed, Near Sawrey, 1956, M. R. Gilson (hb. Young) (var. *rufa*).
74. WIGTOWN : Newton Stewart, 1955, R. C. L. Howitt (hb. Young).
80. ROXB. : introduced, Makerston Wood, 1872, A. Brotherston (BM).
83. EDINB. : garden weed, Liberton, 1908, R. S. Adamson (BM).
87. W. PERTH : gardens, Callendar, teste D. McClintock (var. *rufa*).
- H22. MEATH : Pitton House, Drogheda, 1955, D. McClintock (hb. Young) (var. *rufa*).

APPENDIX II

Some Distributed Gatherings of the *Corniculata* Group

As labelled	Locality (v.c.), date, collector	Reference	Determination by D.P.Y.
<i>O. corniculata</i>	Par (1), 1908, Mrs. Graham	Watson B.E.C. Rep., 2, 178 (1909)	<i>O. corniculata</i>
<i>O. stricta</i>	Edmondsham (9), 1914, E. F. Linton	<i>ibid.</i> , 489 (1915)	<i>O. europaea</i>
<i>O. corniculata</i>	Ledbury (36), 1917, S. H. Bickham	B.E.C. Rep., 5, 215 (1918)	<i>O. corniculata</i>
	Ledbury (36), 1917, S. H. Bickham	<i>ibid.</i>	<i>O. corniculata</i> var. <i>microphylla</i>
<i>O. stricta</i>	Caston (28), 1918, F. Robinson	<i>ibid.</i> 497 (1919)	<i>O. europaea</i>
<i>O. corniculata</i>	Ffrith Gate (48), 1923, W. C. Barton	<i>ibid.</i> , 7, 379 (1924)	<i>O. europaea</i>
<i>O. stricta</i>	Monmouth (35), 1945, R. Lewis	<i>ibid.</i> , 13, 155 (1947)	<i>O. corniculata</i>
<i>O. stricta</i>	Rhandirmwyn (44), 1952, I. M. Vaughan	B.S.B.I. Year Book, 1953, 105	<i>O. europaea</i>
<i>O. europaea</i> var.	Horley (17), 1953, F. M. Gurteen & D. P. Young	Proc. B.S.B.I., 1, 463 (1955)	<i>O. europaea</i> var. <i>rufa</i>