THE HABITAT OF CUSCUTA EUROPAEA L. IN BRITAIN

By Bernard Verdcourt.

Except in certain restricted areas *Cuscuta europaea* is not a very well-known plant in this country. I have briefly commented on its typical habitat (Verdcourt, 1948) and these notes are an expanded account of this subject. Three factors at least seem to be necessary in order to make a habitat suitable for this species, and these will be dealt with separately.

1. *Presence of Water.* The species shows a marked preference for the banks of running water, and this fact is sometimes mentioned in local Floras (e.g., Druce, 1886; 1897). I have studied the plant in six widely separated loci and in each case it has been growing within a yard of the water. Four of these six loci are situated on the banks of large rivers, one on the bank of a small stream and the other on the bank of a very small streamlet. In order to confirm this preference for the nearness of water as many herbarium specimens as possible were examined. For some of these, precise locality data were available, but in other cases the label gave only the name of a town or district (as is so often the case). In such cases as these the name was traced on a map and the features of the district ascertained. This analysis is very speculative but the results are significant. Of the 115 records which were investigated 95 were from places where there are large rivers, 14 where there are large streams, 3 no information available, and 3 from places where there is no running water. It is also significant that the last three records are all of plants with cultivated *Vicia* sp. as host and it is therefore likely that the dodder was introduced in these cases. The proximity of running water is not in any way essential for germination, but humid conditions are necessary for the development of the seedling and for its attachment to the host plant. Though the reason for this preference for the nearness of water is obscure there is no doubt that it is very real. The banks of rivers are often composed of nitrogen-rich soils, particularly if dredging has been carried out. The plant and its preferred host favour such soils and dredging activities frequently result in an increase in the amount of dodder. Water stimulates growth, and the following example of the action of flooding was observed in a scrub by the R. Ouse at Stevington, Beds. There has been a well-established patch of dodder in this locality for several years, and on 17th August 1946 a small patch which had obviously resulted from a single seedling was found some twenty yards further upstream from the main patch. This small patch was only a few inches from the river and was in full flower, nettles being the only host. When revisited on 20th September 1946 the water had risen and was covering

the plant to a certain extent. Vigorous new growth had taken place and many shoots bearing what seemed to be cleistogamous flowers had made their appearance. The flowers on the main stem had died and ripe fruits were present. The new shoots had attached themselves to thistles and grasses. Laboratory work as well as field work will be necessary to elucidate the relation of this species to water. I am not certain whether this preference is marked throughout the wide range of the plant, but one frequently notices that the presence of water is noted on the labels attached to herbarium specimens from other countries. The preference for a riparian environment naturally influences the altitudinal distribution and, as I (1948) have stated, *C. europaea* in Britain grows at altitudes ranging from 0-150 ft. (by rivers and streams) and more rarely in localities at heights ranging from 150-400 ft. These latter localities are as would be expected mostly the banks of streams.

2. *Shade.* There is a little evidence to show that shade is a necessary factor. I have only found the plant in the shade of bridges, hedges, or dense herbage. Physiological experiments support these observations. Direct light retards elongation of the seedling and diffuse illumination favours its healthy development.

3. *Host-plant.* Many works, particularly continental ones, indicate that practically any plant is suitable as a host, but in this country at any rate, and probably in Europe also, *Urtica dioica* L. is the most important host. Linnaeus' herbarium specimen was found on nettle and Gerard (1597) gave the host as nettles. A good deal of erroneous host information has resulted through the misidentification of the dodder concerned (even by many botanists who should have known better!). Numerous records of *C. europaea* from gorse, bracken and other typical heathland plants are, when the plant on which the record was based is examined, found to be referable to *C. epithymum* (L.) Murr. Numerous alien dodders have been wrongly identified as *C. europaea* and this has resulted in further erroneous host information. In the analysis which is included in this section, all the specimens were critically examined microscopically. In the six loci studied by the writer, *Urtica dioica* has been the main host, though in one, *Humulus Lupulus* was as much parasitised as the nettles. J. E. Lousley states (*in litt.*) "on all the occasions when I have seen this plant it has been clear that *U. dioica* was the primary and perhaps the only true host."

This fragmentary personal knowledge was supplemented by a survey of herbarium and other records. In all cases where the plant preserved with the parasite was not *Urtica* it is impossible, in the absence of full data, to state whether or not the latter was present. Owing to the rarity of the plant only 102 occurrences were investigated.

Data concerning the association of *C. europaea* with the common nettle are summarised in Table 1. Even if we assume that, in the 32 cases where nettles are not preserved with the dodder, they were not

present in the locality, then the results are still significantly in favour of the hypothesis that *C. europaea* and *U. dioica* are in some way related.

TABLE 1.

Association of *C. europaea* with *Urtica dioica*.

	Nettles as host	Nettles absent	Host some other plant and no information as to the presence of nettle	No host information
Number out of 102	62	2	32	6

Several authors state that *Humulus Lupulus* L. is a frequent host, and data concerning the association with hops in the same sample of 102 occurrences are given in Table 2.

TABLE 2.

Association of *C. europaea* with *Humulus Lupulus*.

	Hop present and nettle absent	Hop and nettle present	No information as to presence of hop	Hop present but no information as to presence of nettles	No host information
Number out of 102	2	6	73	15	6

In view of the fact that no other plant is preserved as host more than five times in the sample these 23 occurrences on hop indicate that it is an important host and it is interesting to note that hop and nettles are closely related phylogenetically. J. D. Grose states (*in litt.*) that he has found *C. europaea* growing in a hedge at Burpham Court, Surrey, and that the host appeared to be solely the hop. A note appended to a specimen collected by J. E. Little at Somerton, W. Suffolk, states that the original host was hop but that the parasite had spread later to other plants. It has been assumed that nettles were not present as a host in these two instances.

In pot experiments, seedlings of *C. europaea* take equally well on a wide variety of plants, even onions and grasses, and it is difficult to account for so definite an association with nettles. Possibly the only explanation is that the two plants like the same kind of habitat. Nettles prefer a soil rich in nitrogen and for this nitrification a pH of 5-7 and ample moisture are needed. Such conditions frequently obtain in riparian habitats. This hardly seems sufficient to explain the association and there is doubtless a physiological cause.

Once the dodder has taken on nettles it will spread on to a wide variety of plants. It would serve no useful purpose to give a complete list of all the hosts which have been recorded the most important are given in the lists of sample communities (below). Although chiefly con-

fined to herbaceous plants, it will successfully parasitise shrubs and even trees, e.g., *Acer campestre* L., *Crataegus monogyna* Jacq., and *Prunus spinosa* L. White (1912), reporting the species along the bank of the R. Avon near Bristol, states that the chief host was the nettle, but that the dodder occasionally got into overhanging willows. It is frequently found twining round a part of itself and haustoria are sometimes inserted. The samples that follow show the type of communities favoured by the parasite and the plants listed are believed to be true hosts (i.e., ones from which nourishment is being drawn and not merely acting as supports). This has been ascertained in doubtful cases by section cutting. All these communities were more or less closed, in the normal sense of the word. From the point of view of the parasite, however, once it has become firmly affixed to the host, all communities are open.

SAMPLE COMMUNITIES.

1. On the bank of a small stream bordering a fallow field at Leighton Buzzard, Bedfordshire. Since 1943 nettles have very greatly increased in this locality. The dodder has been observed to start on the nettle each year that the locality has been visited, and has then subsequently spread to other plants including *Calystegia sepium* (L.) R. Br., *Glyceria maxima* (Hartm.) Holmb. and *Equisetum arvense* L.

2. On the banks of the R. Loddon at Wargrave, Berks. These are covered with mud and débris dredged from the river. The dodder is restricted to the riparian community and does not extend to the masses of *Polygonum* spp. which occur just behind it. The riparian community includes the following parasitised plants:—*Epilobium hirsutum* L., *Cirsium* spp., *Atriplex* sp. and *Urtica dioica* L.

3. On the bank of a very small streamlet at Sonning, Oxon., spreading to a nearby hedge. Nettles were the sole host on the bank, but in the hedge the following were parasitised:—*Rubus* sp., *Crataegus monogyna* Jacq., *Heracleum Sphondylium* L., *Galium Aparine* L., *Humulus Lupulus* L., *Urtica dioica* L. and various grasses not in flower. The dodder was also twining on ivy but no haustoria had penetrated.

4. By the R. Ouse at Harrold, Beds. *Urtica dioica* only.

5. By the R. Ouse at Milton Ernest, Beds. (J. G. Dony). *Urtica dioica* L. was the chief host, also *Angelica sylvestris* L., *Galium Aparine* L., *Achillea Ptarmica* L., *Cirsium vulgare* (Savi) Ten., *C. arvense* (L.) Scop., and *Solanum Dulcamara* L., but it had not spread to the grasses or sedges.

6. By the R. Ouse at Stevington, Beds. Chiefly on nettles but later spreading to *Cirsium arvense* (L.) Scop. and grasses.

7. By the R. Avon at Bath, Somerset. *Conium maculatum* L. appeared to be the plant most parasitised, together with *Brassica nigra* (L.) Koch, *Eupatorium cannabinum* L., *Urtica dioica* L., and occasionally *Cardamine flexuosa* With. and *Cornus sanguinea* L.

8. Banks of the R. Avon from Bathford to Bristol (Murray, 1896). Chief host was *Urtica dioica* L., also *Brassica nigra* (L.) Koch, *Conium maculatum* L., *Epilobium hirsutum* L., *Galium Mollugo* L., *Carduus crispus* L., *Cirsium arvense* (L.) Scop., *Solanum Dulcamara* L., *Glechoma hederacea* L., and *Sparganium erectum* L.

A study of herbarium specimens has shown that nettles are a common host of *C. europaea* on the continent, but it would be very interesting to have host preference data from throughout the plant's range. Possibly climate, etc., affect this preference, and there may exist races preferring other hosts.

DRUCE, G. C., 1886, *Flora of Oxfordshire*, London.
——, 1897, *Flora of Berkshire*, Oxford.
GERARD, J., 1597, *The Herbal*, London.
MURRAY, R., 1896, *The Flora of Somerset*, Taunton.
VERDCOURT, B., 1948, Cuscuta europaea L. in Biological Flora of the British Isles, *J. Ecol.*, **36**. 358-365.
WHITE, J. W., 1912, *The Bristol Flora*, Bristol.