# *Urtica galeopsifolia* Wierzb. ex Opiz (Urticaceae) confirmed for Britain by its chromosome number

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ABSTRACT

The 'stingless' Fen Nettle from Wicken Fen, Cambridgeshire, England and similar nettles from elsewhere in southern England are found to be diploid (2n = 26) and a new character, non-stinging hair-base diameter of less than 25 μm, is given to distinguish this diploid *Urtica galeopsifolia* Wierzb. ex Opiz from the tetraploid *U. dioica* L.

KEYWORDS: Stingless nettle, *Urtica dioica*, key, Wicken Fen.

## INTRODUCTION

The 'stingless' Fen Nettle (*Urtica* sp.) which grows at Wicken Fen, Cambridgeshire, was thought to be the eastern European *U. galeopsifolia*, by Geltman (1992). This suggestion stimulated considerable interest and there have since been several reports of *U. galeopsifolia* at other British locations (Last 1995; Showler 1995; Bull 1995; Killick *et al.* 1998). Geltman suggested that as *U. galeopsifolia* was known to be diploid in E. Europe (Geltman 1984), a chromosome count should be made on the Wicken Fen plant.

In studies of the Wicken Fen population, Pollard & Briggs (1982) concluded that it was distinct, although other populations had individuals that tended towards the characteristics of the form found at Wicken. They showed that shaded plants tended to have a much lower density of stinging hairs than plants grown in in full sun. However, they found that the density of stinging hairs was genetically based and heritable, and was the best character for distinguishing the Wicken Fen variant.

Although Geltman (1984, 1993) records both diploids and tetraploids in *U. galeopsifolia* and *U. dioica*, Geltman (1992) regards the former as largely diploid and the latter as largely tetraploid. Given the difficulties of distinguishing between the species on the basis of morphology and the possibility of diploid to tetraploid gene transfer, atypical counts could be the result of misidentification. Accordingly I carried out chromosome counts on a range of *Urtica* plants to assess the ploidy level and to determine suitable characters for distinguishing between the cytotypes.

## MATERIALS AND METHODS

Living specimens were obtained from Wicken Fen and from three other localities where *U. galeopsifolia* had been reported (Table 1). These plants were grown in pots and root tips removed for chromosome counting. Counts were made by a modification of the method described by Dyer (1963). The chief modifications to the method were (a) the omission of rinsing following pretreatment and (b) the squashing of the root tips in a mixture of equal parts of lactic and propionic acids.

TABLE 1 COLLECTION LOCALITIES AND CHROMOSOME COUNTS OF *URTICA DIOICA* AND *U. GALEOPSIFOLIA*

| Species | Locality (with grid reference for English localities) | Chromosome number |
|---|---|---|
| *Urtica dioica* | England, Kew, Richmond, Surrey; woodland. TQ/17.76 | 2n = c. 52 |
| *Urtica dioica* | England, Norfolk, Surlingham, footpath (more stinging hairs than marsh plant), TG/322.068 | 2n = c. 52 |
| *Urtica dioica* | England, Norfolk, North Tuddenham, Dirty Lane, TG/042.148 | 2n = c. 52 |
| *Urtica dioica* | England, Wiltshire, Wylye, SU/01.37 | 2n = c. 52 |
| *Urtica dioica* | Scotland, Ayr, R. Ayr walk, woodland | 2n = c. 52 |
| *Urtica dioica* | Germany, Mecklenburg, Rugen, Wissender Klinker, *Fagus* wood on chalk | 2n = c. 52 |
| *Urtica dioica* | Netherlands, Doorn, Gimborne Arboretum, wet ditchside in shade | 2n = c. 52 |
| *Urtica galeopsifolia* | England, Berkshire, Woolhampton, Froud's Bridge, N. side of river, SU/580.665 | 2n = c. 26 |
| *Urtica galeopsifolia* | England, Cambridgeshire, Wicken Fen, TL/55.70 | 2n = c. 26 |
| *Urtica galeopsifolia* | England, Norfolk, Surlingham, Coldham Hall Marsh (very wet with *Glyceria maxima*), TG/324.071 | 2n = c. 26 (× 2) |

## RESULTS

Chromosome counts made on nettles collected as *U. galeopsifolia* or superficially similar morphologically (Table 1) show a clear separation into two cytotypes, *U. galeopsifolia* as diploid and *U. dioica* as tetraploid. Observations made in the field confirm that the two cytotypes grow in different habitats, for example at Surlingham the diploid plants were collected from a marsh dominated by *Glyceria maxima* (Hartman) O. Holmb., while the tetraploid grew in a drier situation close by near a footpath (Bull 1995). The diploid had many fewer stinging hairs than the tetraploid, this being particularly noticeable on the upper surface of the leaf. This observation confirms the view of Pollard & Briggs (1982) that the stinging hair density variation is more or less discontinuous, the Wicken Fen population having a much lower density than any other in their samples. Taken together, these observations suggested that stinging hair density might be the best, if not the only, character to reliably distinguish between the two cytotypes.

The morphology of the plants collected in this study showed that all diploids had narrower leaves with many fewer stinging hairs, especially on the upper surface of the leaves, than the tetraploids. It was very difficult to find qualitative characters to distinguish between them though the two cytotypes differ considerably in general appearance and under the microscope. The diploids always look much more delicate and have a much lower density of stinging hairs.

The two characters, pubescence density and lowest node of inflorescence, given by Geltman (1993), either did not distinguish between the cytotypes or could be difficult to assess. The pubescence density does not differentiate between the *galeopsifolia*-like tetraploids and the diploids and the lowest node can be difficult to determine. Known diploids and morphologically similar tetraploids were examined very carefully to see if any other characters could consistently differentiate between them. Under a hand lens or dissecting microscope the indumentum of the tetraploids always seemed to be much coarser than that of the diploids. The difference is due to the greater width of the non stinging hairs in *U. dioica* giving a much coarser appearance to the indumentum. In diploids the base of these hairs are 20–25 μm (0·02–0·025 mm) in diameter whereas in the tetraploids the hair bases are 25–35 μm (0·025–0·035 mm) in diameter. The hairs taper gradually from base to apex and are finely patterned with protuberances, but no consistent differences in length or pattern was found. Perhaps the easiest way to identify the diploid would be

by comparison with the common stinging nettle which is usually available. A × 20 hand lens is adequate to observe the difference in hair diameter when comparison is possible.

## DISCUSSION

The detection of two cytotypes which can be separated on morphological grounds means that the diploid growing at Wicken Fen and elsewhere is therefore a distinct biological species.
In contrast, superficially morphologically similar specimens from elsewhere are tetraploid (2n = 52). They are not quite so stingless as the Wicken Fen plant but looked rather similar with elongated, narrow, upper leaves.

The following key was developed to distinguish between *Urtica dioica* and *U. galeopsifolia.*

Leaves relatively long and narrow with very few stinging hairs, especially on upper surface of leaf; not flowering till mid July; lowest flowering on 13th to 22nd node; tomentum of non-stinging hairs appearing fine with hair bases 20–25 μm across (detectable by comparison with *U. dioica* using 20 × hand lens)..... ***U. galeopsifolia***

Leaves very variable but with some conspicuous stinging hairs on the upper surface of the leaves; flowering from June; lowest flowering on 7th to 14th node; tomentum of non-stinging hairs appearing coarser with hair bases 25–35 μm across ..... ***U. dioica***

Most *U. dioica* plants are of course very distinct and easy to identify but nettles in deep shade and fenlands may greatly resemble *U. galeopsifolia* and only be identifiable with careful observation.

Pollard & Briggs (1992, 1983) concluded that intermediate individuals between the Wicken Fen and 'ordinary' nettles occur. This is supported by results here and their possible mode of origin is exemplified by the reported crossing of a Wicken Fen plant with an 'ordinary' nettle. Pollard & Briggs (1982) reported six progeny from a single cross between a Wicken Fen and a normal nettle. Of the six offspring they report five varying from intermediate to resembling an 'ordinary' stinging nettle. This suggests that hybridization between the ploidy levels occurs readily, producing either triploids or perhaps some tetraploids. Their conclusion of "high interfertility of the Wicken variant with ordinary weedy plants" may be correct but the mechanism needs to be studied now that it is known that two ploidy levels are involved. Hybrids would be expected to be largely triploid with the occasional tetraploid as a result of a non-reductional meiosis in the diploid. Any such tetraploids would be likely to be freely interfertile with tetraploid *U. dioica* and would result in one way gene transfer from the diploid to the tetraploid (Anamthawatt-Jonsson & Tomasson 1990). Such gene transfer can also occur through triploids (Bielawska 1964). However, because of the ploidy level difference, there is unlikely to be any gene transfer to the diploids, which will therefore remain pure, though gene transfer from tetraploid to diploid is possible and has been documented in *Betula* (Anamthawatt-Jonsson & Tomasson 1990).

The hybrid most similar to *U. galeopsifolia* would be a tetraploid arising from the union of an unreduced gamete from *U. galeopsifolia* and a normal reduced gamete from *U. dioica.* The genome of such a hybrid would have received half of its chromosomes from each parental species. However, repeated interbreeding of such hybrids with *U. dioica* could result in tetraploid plants more closely resembling *U. dioica.*

It would be very instructive to repeat such diploid *U. galeopsifolia* × tetraploid *U. dioica* crosses and examine the ploidy level and fertility of the offspring. The reported intercrossing of Wicken Fen plants yielded only similar progeny, confirming the distinctness and true breeding nature of what we now know to be the diploid.

Pollard & Briggs (1982) noted that plants fairly similar in appearance to those at Wicken were found at both Woodwalton Fen, Cambridgeshire, TL/230.840 and South Tawton, N. Devon, SX/655.947 and this suggests other possible sites for the diploid *U. galeopsifolia.* Dr. J. Edmondson has also drawn my attention to two specimens in the herbarium of the National Museums and Galleries on Merseyside (**LIV**) which have been identified by Geltman as *U. galeopsifolia*: v.c. 59, Cheshire: Eastham on the Wirral, collected by J. A. Wheldon in 1894; v.c. H2, North Kerry: Muckross, one mile (1·5 km) N. of Killarney, collected by M. Goodfellow in 1961.

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