# THE TAXONOMY OF *POLYGONUM LAPATHIFOLIUM* L., *P. NODOSUM* PERS., AND *P. TOMENTOSUM* SCHRANK

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ABSTRACT

An account is given of the variation in *Polygonum lapathifolium* L., and of its previous taxonomic treatment. The taxonomic value of various characters is examined. Herbarium, field, and cultivation studies are described. It is suggested that *P. nodosum* Pers, and *P. tomentosum* Schrank are in fact merely parts of the range of variation found within *P. lapathifolium* L. and that they should no longer be regarded as distinct species.

## 1. HISTORICAL INTRODUCTION

*Polygonum lapathifolium* L. is a species which exhibits considerable intraspecific variation and is frequently regarded as 'plastic' or 'critical'. There are two main sources of confusion:

(a) From at least the time of Linnaeus many botanists have regarded *P. lapathifolium* as a pale form of *P. persicaria*. Chromosome counts have shown that *P. lapathifolium* has $2n = 22$; while *P. persicaria* has $2n = 44$, and there are constant morphological differences between the species. Identification, however, has often still been made on the basis of perianth colour, and herbarium material of the white form of *P. persicaria* is often incorrectly labelled. *P. persicaria* may easily be distinguished from *P. lapathifolium* since the former has eglandular perianths, peduncles and leaves.

(b) Two other names, *P. nodosum* Pers. (1805) and *P. tomentosum* Schrank (1789) have been described and published as species. Unfortunately, the characters given in the literature for the delimitation of these from *P. lapathifolium* vary from author to author and sometimes they are regarded as synonyms or subspecies, etc.

Britton (1933) states that the only reliable character is the fruits of *P. nodosum* which are 'smaller on the whole, less roundish and with a more ovate outline' than those of *P. lapathifolium*. In fact the size of the fruits, which is discussed later, is largely dependent on the environment of the parent plant. Britton also states that the glands of the peduncles and perianths are less numerous in *P. nodosum*. There is certainly some variation in the density of glands in different populations but there is no agreement in the literature with regard to this character. Tutin (1952) uses 'peduncles sparsely glandular' against 'peduncles densely glandular' to separate *P. lapathifolium* from *P. nodosum* respectively. Tutin also states that *P. lapathifolium* has 'leaves with sunk pellucid glands beneath' while *P. nodosum* has 'leaves with golden glands beneath'. Moss (1914) and Davey (1909) regard the presence of red spots on the stem as characteristic of *P. nodosum*, and Persoon in his original description gives the stem as spotted.

*P. tomentosum* is a name rarely used in Britain but commonly used by authors on the Continent. Schrank in his original description states that the leaves are tomentose beneath, and it is interesting to note that he does not give a description for *P. lapathifolium*. Plants which correspond to his description of *P. tomentosum* are not uncommon in Britain where they are usually regarded as *P. lapathifolium* or *P. nodosum*.

Schuster (1906) erected an elaborate hierarchy of taxa which he believed to be an approach to a natural system of classification for *P. lapathifolium*. The first division in his key uses the leaf glands character to divide subsp. *verum* which has pellucid glands, from subsp. *punctatum* which has yellow glands. Each of these subspecies is further divided

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into varieties and some of the latter are subdivided into several forms. Most of the characters used for the varietal and form divisions are phenotypically variable, *e.g.* degree of branching, length of internodes, etc. Some of the forms seem rather improbable; in particular f. *natans* Schröter (*Veg. d. Bodensees* **2**, 1902), which is described as inhabiting lakes as a free-floating form with internodes 15 cm long, and with many adventitious roots on the greatly swollen nodes.

Danser (1921) carried out cultivation experiments and found that the variation due to the environment was less than had been previously thought. He lists the following characters as being affected by the environment: plant height and habit, the abundance of branching, the swelling of the nodes and the splitting of the ochreae, the size of the leaves and whether they are tomentose or not. He regards the following characters as constant: the shape of the leaves, the colour of the perianth and other organs, the presence or absence of red spots on the stem, and the shape and the presence or absence of the leaf blotches. On the basis of this work Danser erects a classification in which the shape of the leaves and of the leaf blotches is important. The data presented here agree with Danser's conclusions with the following exceptions:

1. The tomentose leaves were only found during the cultivation experiments on plants raised from the fruits of tomentose plants.

2. The leaf blotches vary even on a single plant and there is even more variation within a population which is otherwise uniform.

Leaves corresponding to two of Danser's taxa have been found more than once on a single plant.

## 2. Taxonomic characters studied

### (*a*) *Vegetative characters*

*Habit*

The habit and size of the plant have been used by various authors to delimit taxa below the species level, e.g. Fernald (1950). Habit varies with the immediate environment of the plant, and fruits from prostrate plants will produce erect plants in suitable habitats. There appears to be only one taxon in which habit is important. This is subsp. *danubiale* Kern. ( = *brittingeri* Opiz) which von Koch (1935) showed retained a prostrate habit in cultivation. This plant does not appear to occur in Britain. With living material the habit has been scored as E = erect or D = decumbent.

*Stems*

The stem is clearly divided into nodes and internodes and the amount of swelling of the nodes has been used as a diagnostic character. Danser (1921) showed that this swelling was largely the result of moist conditions. Anatomical examination showed that the nodes contained many starch grains and appear to function as storage organs. It is not surprising, therefore, that larger plants growing in favourable habitats with a fairly high water content should have swollen nodes. The stems are sometimes glabrous but are more usually very slightly pubescent; they are never very pubescent. Stem pubescence is, therefore, not suitable for biometrical treatment and has been scored as P = present or A = absent.

The anthocyanin pigment of the stems, which appears as the stem matures, may be in the form of a diffuse, unlocalised, light red colouration, or in the form of discrete, more intensely red spots. The former occurs mainly on the south-facing sides of the stems and is not formed on the ventral side of prostrate stems. It is clearly correlated with the environment and probably with light incidence. The red spots are found on the entire stem surface including the ventral part of prostrate stems although the colour is darker on the parts with the highest light incidence. Both characters were scored as 'present' or 'absent'.

*Leaves*

The leaves of *P. lapathifolium* are lanceolate to linear-lanceolate and vary in size with

the environment. The length of the leaves was measured in centimetres from the apex to the point of fusion with the petiole. The maximum breadth was also measured in centimetres. An index was then obtained by dividing the length by the breadth. The presence or absence of a leaf blotch, and of hairs on both surfaces was recorded. Where the tomentose condition was found this was recorded as T. Yellow glands on the lower surface were recorded as P if present; the A, recording absence of yellow glands, indicates that the glands were in fact pellucid.

*Ochreae and ochreolae*

The fused membranous stipules known as ochreae which are characteristic of the family Polygonaceae are of little taxonomic value in section *Persicaria* in which *P. lapathifolium* is placed. The cilia of the ochreae are often said to be longer in *P. persicaria* than in *P. lapathifolium*, and some authors regard the latter as eciliate. This is rarely if ever quite true as it is usually possible to find at least a few short cilia. The difference in length is an indifferent character for separating the species.

The ochreolae or floral ochreae are found in the inflorescence and like the ochreae may be ciliate or eciliate, glabrous or pubescent, and glandular or eglandular.

*Peduncles*

The peduncles of *P. lapathifolium* are glandular with stalked glands. Those of *P. persicaria* are usually regarded as eglandular. Schotsman (1950), however, records the presence of 'sometimes a few stalked glands' on the peduncle of *P. persicaria.* It is not impossible that this plant was an anthocyanin-containing specimen of *P. lapathifolium.* The peduncles are also occasionally pubescent.

### (*b*) *Flower and fruit characters*

*Flowers*

The flowers of *P. lapathifolium* are hermaphrodite, and the perianth segments, which are free, are not divided into sepals and petals. They are not large, seldom reaching 4·0 mm in length and they remain attached to the fruit when it is shed. The perianth segments of *P. lapathifolium* are glandular and those of *P. persicaria* are usually regarded as being eglandular. References to microscopic perianth glands on *P. persicaria* have been found on herbarium sheets in the British Museum and Schotsman (1950) records 'pluricellular yellowish glands on some flowers' of this species. I have not seen these; they are in any case of a different order of magnitude from the perianth glands in *P. lapathifolium* which can be clearly seen with a hand lens. There are usually 4 perianth segments (occasionally 5) in *P. lapathifolium* and 6 (5) stamens with 2 (3) styles. The styles of *P. lapathifolium*, unlike those of *P. persicaria*, are separate to below the middle.

The perianth glands were scored as present or absent, and the number of perianth segments was recorded on fresh material. The colour of the perianth was scored as Pk = pink (i.e. with anthocyanin) or W = white (i.e. without anthocyanin). The number of stamens and styles was also recorded.

*Fruit*

The 'seeds' of *P. lapathifolium* are in fact nuts which fall from the parent plant with the dead perianth still attached. The length of the perianth relative to the fruits has been used by some authors with but little success. Moss (1914) records all species in section *Persicaria* as having nuts 'as long as the persistent perianth' except for *P. nodosum* which had nuts 'scarcely as long as the perianth'. Styles (1962) found this relationship of use in section *Polygonum* but it appears to be of little value in section *Persicaria.* The length and maximum breadth of the nuts (without perianth) were measured in millimetres to the nearest 0·1 mm, each set of measurements being on a sample of mature nuts usually fifty or more in number. An index was obtained by dividing the length by the breadth. The arithmetic mean, standard deviation and the range of these measurements were calculated.

TABLE 1
Data from herbarium material.

| | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |
|---|---|---|---|---|---|---|---|---|---|---|
| Leaf length | 13·3 | 12·3 | 13·4 | 10·0 | 13·7 | 6·8 | 6·5 | 14·3 | 10·2 | 7·3 |
| Leaf breadth | 3·2 | 3·8 | 3·9 | 2·5 | 4·1 | 1·3 | 1·3 | 4·1 | 2·3 | 2·4 |
| Leaf index | 4·2 | 3·3 | 3·4 | 4·0 | 3·4 | 5·2 | 5·0 | 4·5 | 4·4 | 3·0 |
| Leaf blotch | P | P | P | A | A | P | P | P | P | P |
| Leaf hairs above | P | P | P | P | P | P | A | P | P | P |
| Leaf hairs beneath | P | P | P | P | P | T | P | P | P | T |
| Leaf yellow glands | P | P | P | A | A | P | P | P | P | A |
| Ochrea cilia | A | A | A | A | A | A | P | P | P | P |
| Ochrea hairs | P | P | P | A | A | P | P | P | A | P |
| Perianth colour | Pk | Pk | Pk | ? | W | W | W | Pk | W | Pk |
| Perianth glands | P | P | P | P | P | P | P | P | P | P |
| Peduncle glands | P | P | P | P | P | P | P | P | P | P |
| Peduncle hairs | P | P | A | A | A | A | A | A | A | A |
| Ochreola cilia | A | A | A | A | P | A | P | P | P | P |
| Ochreola hairs | A | A | A | A | A | A | P | P | A | A |
| Stem hairs | P | P | P | P | P | P | A | P | A | P |
| Stem red spots | A | A | P | A | A | A | P | P | A | A |

Origin :

1. European Russia, 1908 (**BM**, No. 95/6/8/2848).
2. Tepelen, Albania, 1935 (**BM**, No. 95/6/8/2420).
3. Athens, Greece, undated (**BM**, No. 95/6/8/789).
4. Valais, Switzerland, 1895 *R. Murry* (**BM**, No. 95/6/8).
5. Barcelonia, Spain, 1923 *F. Jenner* (**BM**, No. 95/6/8a/4857).
6. Surrey, 1959 *B. A. Kneller* (Herb. Univ. Leicester).
7. Scotland, 1959 *U. K. Duncan* (Herb. Univ. Leicester).
8. Tlemcen, Algeria, 1929 (**MANCH**).
9. Osses, France, 1961 *E. K. Horwood* (Herb. Univ. Leicester).
10. Thraki, Greece, 1961 *P. W. Ball* (Herb. Univ. Leicester).

The nuts of *P. lapathifolium* are usually ovate, biconcave to planoconcave, brown and shiny; a few trigonous nuts also occur.

### (*c*) *Results*

*Herbarium data*

More than 500 herbarium specimens have been seen and about 150 (well-preserved specimens selected to cover a wide geographical area) have been scored. Some typical scoring data are presented in Table 1. It will be seen that the length and breadth of the leaves varies considerably but that there is much less variation in the leaf index. The leaf blotch is usually present and has been found in most cases but it is not always easy to see on preserved material and is, therefore, an uncertain character to score on herbarium material. The perianth colour usually preserves well enough for scoring purposes but in the case of specimen No. 4 it was no longer possible to see it, perhaps because of the age of this specimen.

*Data from field material*

About 40 natural populations were scored and the data from some typical populations are given in Table 2.* In the case of measurements, the entries in the table are means. Where there was variation in quantitative (scored) characters, as in numbers of flower parts, within a population, the less common type is given in brackets. Although the leaf blotch was present in all the populations the amount of pigment present in each leaf varied widely within each population. It appeared that the plants growing in less exposed situations had less pigment.

*Small populations are usually quite uniform and this becomes evident quite rapidly. With larger populations, e.g. No. 1 in Table 2, about 100 specimens selected at random were scored.

TABLE 2
Data from natural populations

| | *1* | *2* | *3* | *4* |
|---|---|---|---|---|
| Habit | E | E | E | E |
| Stem pigment | P | P | P | A |
| Stem red spots | P | P | P | A |
| Stem hairs | P | P | P | A |
| Leaf length | 12·9 | 7·0 | 15·1 | 9·4 |
| Leaf breadth | 3·2 | 1·5 | 4·6 | 2·5 |
| Leaf index | 4·1 | 4·6 | 3·3 | 3·8 |
| Leaf hairs above | P | P | P | P |
| Leaf hairs beneath | T | T | P | T |
| Leaf yellow glands | P | P | P | A |
| Leaf blotch | P | P | P | P |
| Ochrea cilia | P | P | P | P |
| Ochrea hairs | P | P | P | P |
| Peduncle glands | P | P | P | P |
| Peduncle hairs | A | A | A | A |
| Perianth glands | P | P | P | P |
| Perianth colour | Pk/W | W | Pk | Pk |
| Perianth segments | 4 (5) | 4 | 4 | 4 |
| Stamens | 6 | 6 | 6 | 6 |
| Styles | 2 (3) | 2 | 2 | 2 |
| Ochreola cilia | P | P | P | P |
| Ochreola hairs | P | A | A | A |
| Ochreola glands | P | P | P | P |

The habitats: 1. Borough-on-the-hill v.c. 55. 19 July, 1959. A large population of c. 2–3,000 plants in wheat and barley fields.
2. Skeffington, v. c. 55. 31 July, 1960. Hollow by roadside containing water.
3. Billesdon, v.c. 55. 18 Sept., 1960. Damp ground by side of road.
4. Burton Overy, v.c. 55. 24 July, 1961. Roadside, bare patch of ground with few other plants.

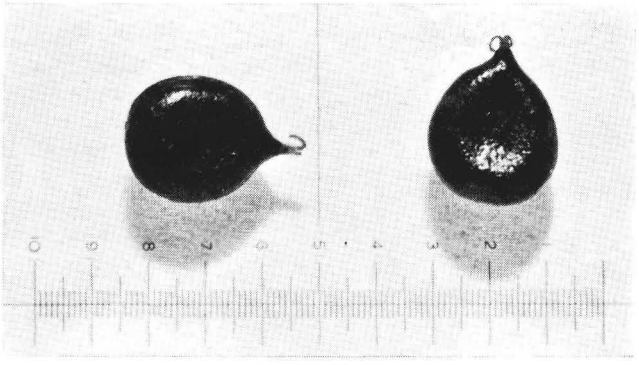
TABLE 3
Data from cultivated plants.

| | *1* | *2* | *3* | *4* | *5* | *6* |
|---|---|---|---|---|---|---|
| Habit | E(D) | E(D) | E(D) | E | D | E |
| Stem pigment | P | P | P | P | P | P |
| Stem red spots | A | P | P | P | P | A |
| Stem hairs | A(P) | P | P | P | P | P |
| Leaf length | 3·7 | 6·7 | 5·5 | 7·8 | 9·2 | 8·2 |
| Leaf breadth | 0·7 | 1·6 | 1·3 | 1·9 | 1·9 | 2·0 |
| Leaf index | 5·3 | 4·3 | 4·2 | 4·1 | 4·6 | 4·1 |
| Leaf hairs above | P | P | P | P | P | P |
| Leaf hairs beneath | P | T | T | T | T | T |
| Leaf yellow glands | P | P | P | P | P | P |
| Leaf blotch | P | P | P | P | P | P |
| Ochrea cilia | P | P | P | P | P | P |
| Ochrea hairs | P | P | P | P | P | P |
| Peduncle glands | P | P | P | P | P | P |
| Peduncle hairs | A | A | A | A | A | A |
| Perianth glands | P | P | P | P | P | P |
| Perianth colour | W | Pk | W | W | W | Pk |
| Perianth segments | 4(5) | 4 | 4 | 4(5) | 5 | 4 |
| Stamens | 6 | 5 | 6 | 6 | 6 | 6 |
| Styles | 2(3) | 2 | 2 | 2 | 2 | 2 |
| Ochreola cilia | A | A | P | P | P | A |
| Ochreola hairs | A | A | A | A | P | A |
| Ochreola glands | A | A | P | P | P | P |

Origin of nuts: 1. Cambridge Botanic Garden; collected Ryston, Norfolk.
2. Botanical Garden, Lund, Sweden, as *P. lapathifolium* subsp. *nodosum*.
3. as 1. Collected West Dereham, Norfolk, as *P. nodosum*. Grown 1959.
4. as 3. Grown 1960.
5. Habitat 1 in Table 2. Plant with no anthocyanin in perianth.
6. Hortus Botanicus Bergianus, Stockholm, as *P. lapathifolium* subsp. *nodosum*.

PLATE 15a

PLATE 15b



(a) Fruits of *Polygonum lapathifolium* and (b) fruits of '*P. nodosum*.' The scale is 1 cm divided into 10mm.

*Data from cultivation experiments*

Many plants have been grown both in the greenhouse and in the University Botanic Garden at Leicester. Some typical results from these cultivated plants (usually grown in populations of not less than ten individuals) are presented in Table 3. They have been scored in the same way as the natural populations and show the same kind of intraspecific variation. The population (No. 2) which was grown from Swedish nuts had five stamens instead of the more usual six. Careful observation of the plants grown from the fruits of scored plants showed that the Critical Characters (see later) were stable in cultivation and did not vary qualitatively with the environment.

*Fruit Data*

The averages of the data for all the nuts measured are given in Table 4. From this it is clear that the British and foreign material is essentially similar. In Table 5 data for *P. lapathifolium* (No. 1 in Table 3), *P. nodosum* (No. 3 in Table 3), and *P. persicaria* (from the same source as the other specimens), grown under uniform conditions are given. From these data it is clear that, while there is no significant difference between *P. lapathifolium* and *P. nodosum*, *P. persicaria* has narrower nuts in relation to the length and this produces a significant difference in the index obtained. Typical nuts from these samples of *P. lapathifolium* and *P. nodosum* are shown in Plate 15 and it can be seen that they are extremely similar.

TABLE 4
Combined data for all fruits measured in the *P. lapathifolium* complex

| | | *British* | *Foreign* | *Total* |
|---|---|---|---|---|
| Length | mean | 2·67 | 2·61 | 2·64 |
| | s. d. | 0·14 | 0·12 | 0·13 |
| | range | 2·0–3·3 | 2·2–3·0 | 2·0–3·3 |
| Breadth | mean | 2·38 | 2·15 | 2·27 |
| | s. d. | 0·14 | 0·12 | 0·13 |
| | range | 1·7–2·9 | 1·8–2·5 | 1·7–2·9 |
| Index | mean | 1·12 | 1·22 | 1·17 |
| | s. d. | 0·04 | 0·05 | 0·045 |
| | range | 1·0–1·3 | 1·1–1·5 | 1·0–1·5 |
| Shape | % *biconcave* | 99·4 | 99·0 | 99·2 |
| | % *trigonous* | 0·6 | 1·0 | 0·8 |
| Average weight (mg) | | 2·94 | 2·19 | 2·57 |

In all cases the surface was shiny and the colour brown to brown-black.

TABLE 5
Fruit data. Plants grown under uniform conditions in greenhouse 1959.

| | | *P. lapathifolium* | *P. nodosum* | *P. persicaria* |
|---|---|---|---|---|
| Length | mean | 2·47 | 2·54 | 2·62 |
| | s. d. | 0·13 | 0·15 | 0·14 |
| | range | 2·2–2·7 | 2·3–2·9 | 2·3–2·9 |
| Breadth | mean | 2·32 | 2·33 | 2·07 |
| | s. d. | 0·16 | 0·15 | 0·15 |
| | range | 2·0–2·6 | 2·0–2·7 | 1·7–2·4 |
| Index | mean | 1·05 | 1·08 | 1·27 |
| | s. d. | 0·07 | 0·01 | 0·04 |
| | range | 1·0–1·2 | 1·0–1·2 | 1·1–1·4 |
| Shape | % *biconcave* | 100 | 100 | 57 |
| | % *trigonous* | 0 | 0 | 43 |

Styles (1962) found that fruit length was very stable in section *Polygonum* and useful in the delimitation of species in that section. The data presented here, however, indicate that this is not so in section *Persicaria*. Not only do different species have much the same length of nut but there is also some variation with environment, *e.g.* in the *P. nodosum* of Table 5, the nuts of the original wild material had a mean length of 2·95 mm; the maximum breadth mean was 2·68 mm, and thus the mean index of 1·11 was the most stable character.

### 3. The breeding system

The relatively slight variation within the populations and the similarity of plants in cultivation to their parent plant, together with the much greater variation between the populations, suggests either apomixis or a high frequency of inbreeding. No evidence has been obtained of apomixis but inbreeding is apparently the rule. The anthers appear to dehisce before the flower buds open and pollen has been found on the stigmas of quite immature flowers. The pollen produced is sticky and there are relatively few grains; there are no regular insect visitors apart from aphids and these are usually found on the leaves and peduncles. It appears, therefore, that there is no mechanism for outbreeding and that *P. lapathifolium* consists of a number of pure breeding lines separated by the barrier of autogamy.

### 4. The critical characters

The various attempts to systematise the wealth of variation, both genotypic and phenotypic, found in *P. lapathifolium*, described in outline in the introduction, are unsatisfactory. Four characters were, therefore, chosen for investigation and named for convenience the Critical Characters. They were the presence or absence of:

1. red spots on the stem
2. yellow glands in the leaf
3. tomentose leaves
4. anthocyanin in the perianth.

These were chosen because:

1. they do not vary from one part of the plant to another
2. they were found to be constant in cultivation
3. the three taxa considered here have been distinguished by several authors using various combinations of these characters
4. they have been used by previous authors to define taxa below the species level.

There are theoretically sixteen possible combinations of these four characters. Of these combinations herbarium specimens have been found for twelve. The four not found are not correlated in any way and in the absence of contrary evidence may be presumed to exist. The possible combinations, together with the scoring of other characters on the specimens found, are given in Table 6. From this it seems clear that:

(a) these Critical Characters account for a large part of the variation within the species.

(b) there is no other character, at least amongst those scored, which is correlated with them.

### 5. Discussion and conclusions

*Polygonum lapathifolium* is a species which exhibits a wide range of variation and may reasonably be described as critical. The previous attempts to classify this variation either into a number of species or into taxa below the level of species fail, largely because of the large number of specimens which do not readily fall into any of the suggested groups. The species appears to consist of several distinct autogamous pure lines which differ from each other usually by only one or two characters. Over the whole range of variation, however, the canonical extremes appear to be quite different and an author with two of these extremes and no knowledge of the whole situation and the intermediate forms will naturally describe two species. If an intermediate form is later found it will probably be regarded as a hybrid. The most important variable characters appear to be those referred

TABLE 6
The Critical Characters

| | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | *12* | *13* | *14* | *15* | *16* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stem red spots | P | P | P | P | P | P | P | P | A | A | A | A | A | A | A | A |
| Leaf yellow glands | P | P | P | P | A | A | A | A | P | P | P | P | A | A | A | A |
| Leaf, tomentose | P | P | A | A | P | P | A | A | P | P | A | A | P | P | A | A |
| Perianth colour | Pk | W | Pk | W | Pk | W | Pk | W | Pk | W | Pk | W | Pk | W | Pk | W |
| Leaf length | 5·2 | – | 19·5 | 14·7 | 6·1 | 5·6 | – | – | 4·5 | 9·2 | 14·7 | 15·1 | 9·3 | – | 6·1 | 6·0 |
| Leaf breadth | 1·3 | – | 4·2 | 3·8 | 1·3 | 1·1 | – | – | 1·2 | 2·8 | 3·9 | 4·7 | 2·0 | – | 1·3 | 1·1 |
| Leaf index | 4·0 | – | 4·7 | 3·9 | 4·7 | 4·8 | – | – | 3·8 | 3·3 | 3·8 | 3·2 | 4·6 | – | 4·7 | 5·4 |
| Leaf blotch | P | – | P | P | P | P | – | – | P | P | P | P | P | – | P | P |
| Leaf hairs above | P | – | P | P | P | P | – | – | P | P | P | P | P | – | P | P |
| Leaf hairs beneath | T | – | P | P | T | T | – | – | T | T | P | P | T | – | P | P |
| Ochrea cilia | P | – | P | P | P | P | – | – | P | P | P | P | P | – | P | P |
| Ochrea hairs | P | – | P | P | P | P | – | – | P | P | P | P | P | – | P | P |
| Ochreola cilia | P | – | P | P | P | P | – | – | P | P | P | P | P | – | P | P |
| Ochreola hairs | P | – | P | P | P | P | – | – | P | P | P | P | P | – | P | P |
| Stem hairs | P | – | P | P | P | P | – | – | P | P | P | P | P | – | P | P |
| Number found* | 21 | 0 | 7 | 15 | 10 | 1 | 0 | 0 | 1 | 2 | 4 | 5 | 2 | 0 | 5 | 5 |

* Among herbarium specimens that could be scored with certainty for perianth colour.

to above as the Critical Characters, but there are other less discrete variations which may also be important. Only controlled cultivation on a large scale would reveal the limits of genetical variation. Since all the pure lines will continue to exist and will not blend or segregate because of the autogamous breeding system, it is clear that *P. lapathifolium* will continue to consist of a number of distinct pure lines—at least twelve and probably more—and to name all these lines would only add to the existing confusion. It would probably be possible to give names to many combinations of characters so that a *Rubus*-like situation on a smaller scale would result. For a taxonomist taking a special interest in *P. lapathifolium* the 16 combinations of the Critical Characters could form the basis of a classification but for less specialised use, e.g. in floras, I suggest that the species *P. lapathifolium* should not be subdivided.

## 6. Taxonomic Revision

P. LAPATHIFOLIUM L. Spec. Pl. ed 1; 360 (1753).
Principal synonyms:
*P. tomentosum* Schrank, Baiersche Flora (1789)
*P. nodosum* Pers., Synopsis **1** (1805).
*P. brittingeri* Opiz, Natural. **8**: 74 (1824).
*P. danubiale* Kern., Oesterr. Botan. Zeitschr. **25**: 255 (1875).
*P. petecticale* Druce, Fl. Bucks. 287 (1926); *Rep. Bot. (Soc.) Exch. Cl.,* (1926).

Annual. Plant erect, decumbent or nearly prostrate. Stem green often becoming red from the base in the autumn, slightly pubescent, with or without discrete red spots. Leaves 3·7—15·1 × 0·7—4·6 cm, 3·0—5·3 times as long as broad, lanceolate, usually with dark central blotch, usually pubescent on both surfaces, with or without tomentose hairs beneath, glandular beneath with either pellucid or golden-yellow glands. Ochreae not or very shortly ciliate, pubescent, occasionally glandular. Peduncle glandular, with or without a few short hairs. Inflorescences dense-flowered, one or many, terminal. Perianth glandular, with or without pink anthocyanin, with 4 (5) segments. Stamens (5) 6; styles 2 (3). Ochreolae not or shortly ciliate, glabrous or slightly pubescent, sometimes glandular. Fruits biconcave, rarely trigonous, *c.* 2·5 × 2·25 mm, brown to dark brown, shiny.

*Holotype.* The specimen in the Linnean Herbarium (**LINN**) London is clearly not *P. lapathifolium* and does not appear to be a herb at all but to be a branch of a shrub. Fortunately Linnaeus refers in *Species Plantarum* to the specimen in *Hortus Cliffortianus*, and this specimen, which is in the British Museum Herbarium (**BM**) (No. 42/2), agrees with Linnaeus's description and with the generally accepted concept of *P. lapathifolium.*

*Geographical Distribution*

*P. lapathifolium* is a widespread weed in Britain and it is probably present in all vice-counties. Simmonds (1945) suggests that it may be more common in the south than in the north of Britain but there is no evidence that this is more than a reflection of the more intensive agriculture in the south. It is found as a weed throughout Europe to 65° N in Iceland (Moss 1914), 68° N in Lapland (Lindman 1926), 70° N in Norway (Blytt 1906), and in Russia to 70° 20′ N (Komarov 1936). It is also recorded from north India (Hooker 1890), South Africa (Moss), North, Central and South America and the West Indies (Small 1913). It is regarded as native in Europe and Asia and as a naturalised alien in America and Australasia. Specimens very similar to the British and European material have been seen in the British Museum Herbarium from the United States, Canada, Japan, China, and Tibet ('marshy places near Lhasa'). It is a weed of arable land, disturbed ground, and river banks and appears to be relatively intolerant of competition. It probably, therefore, does not extend far beyond the limits of cultivation.

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