Cytotaxonomic Notes on Genus *Polygonum*, Section *Polygonum*[1]

Donald N. Moore, Thomas R. Mertens and Joyce E. Highwood,
Ball State University

Abstract

The most accurate identification of species in genus *Polygonum*, section *Polygonum* is based on fruit and perianth characteristics. Preliminary investigations suggested that these morphological features could be effectively correlated with specific chromosome numbers. The achenes of five species of *Polygonum* collected in Indiana, Nova Scotia and New Brunswick are briefly described and chromosome numbers for these species are reported as follows: *P. aviculare* L. sensu stricto $2n = 60$; *P. buxiforme* Small $2n = 60$; *P. arenastrum* Bor. $2n = 40$; *P. fowleri* Robinson $2n =$ ca. 40; and *P.* erectum *L.* $2n = 40$.

Although numerous taxonomic investigations of genus *Polygonum*, section *Polygonum* (*Avicularia*) have been conducted, there is little agreement as to species identity in North America or elsewhere. Much of the taxonomic confusion comes from the tremendous morphological variation within the individual species of the section. At present the most accurate identification of *Polygonum* specimens is based on fruit and perianth characteristics. The purpose of this investigation was to attempt to gain evidence to support this basis of identification by showing that morphological features can be correlated with chromosome numbers. Plants identified as a given species on the basis of morphological characters may be expected to have identical chromosome numbers.

The fruit of *Polygonum* is a small, dry, indehiscent achene with a relatively thin wall. According to Styles (5), Mertens and Raven (2), Savage and Mertens (4), and Mertens (3), fruit and perianth characteristics are the most consistent morphological features used in the identification of species within section *Polygonum*. The criteria employed for identification in this investigation included: achene color, texture, shape, and size; the depth of perianth sinuses; and the position of inflorescences on the stem. Inflorescences are located either at the apices of branches or in the axils of the leaves along the stem, depending on the species.

Cytological investigation by Lőve and Lőve (1) has revealed that the chromosomes of species within section *Polygonum* are uniformly small in size with centrally located centromeres. The present investigation supports the same conclusion. Lőve and Lőve claim that the basic chromosome number of the section is $2n = 20$ with tetraploid and hexaploid plants being quite common. Mitotic chromosome counts of 40 and 60 for species in section *Polygonum* have been frequently reported in the literature (2, 5, 6).

This report consists of a brief discussion of achene characteristics and chromosome numbers for several species of section *Polygonum* collected in Indiana, Nova Scotia and New Brunswick.

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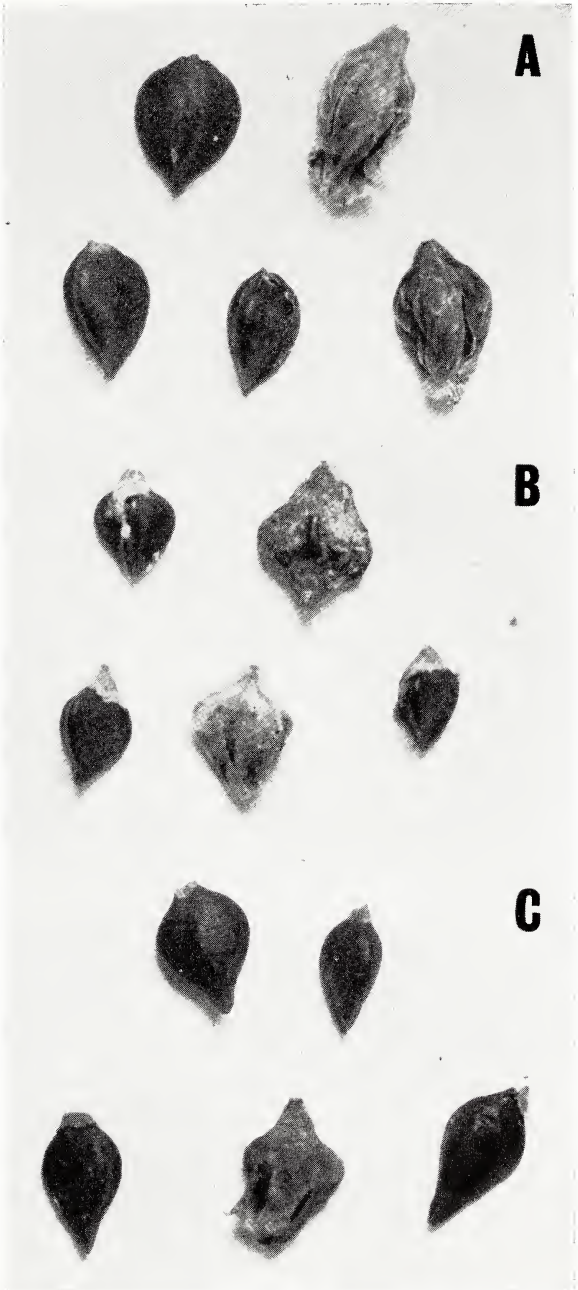

FIGURE 1. *Typical achenes.* A. *Polygonum aviculare L.*, B. P. buxiforme *Small*, and C. P. fowleri *Robinson.*

Polygonum aviculare L. *sensu stricto,* has achenes (Fig. 1A) which are dull and heavily striated (5). Their color ranges from dark brown to black. The achene has two more-or-less equal concave sides and a third flat side, and is completely enclosed in the perianth, which is divided for three-fourths or more of its length. The achenes of *P. aviculare* from Nova Scotia and New Brunswick varied from 3.58 to 4.08 mm in length (mean: 3.93 mm) and from 2.16 to 2.92 mm in width (mean: 2.54 mm).

Chromosome counts of $2n = 60$ and $2n =$ ca. 60 were obtained for *P. aviculare* from specimens collected in Nova Scotia and New Brunswick. Counts of $2n = 60$ for this species are well documented in the literature (2, 5, 6):

1) *P. aviculare* L., rocky beach on Sand Beach south of Yarmouth, Yarmouth Co., Nova Scotia, August 14, 1968, T. R. Mertens NS-2. (BSU). $2n = 60$.

2) *P. aviculare* L., Yarmouth Co., Nova Scotia, August 16, 1968, T. R. Mertens NS-16. (BSU). $2n =$ ca. 60.

3) *P. aviculare* L., St. John Co., New Brunswick, August 19, 1968, T. R. Mertens NB-35. (BSU). $2n =$ ca. 60.

4) *P. aviculare* L., Deer Island, Charlotte Co., New Brunswick, August 19, 1968, T. R. Mertens NB-42. (BSU). $2n =$ ca. 60.

The achenes (Fig. 1B) of *Polygonum buxiforme* Small are small in size in comparison to those of the closely related *P. aviculare.* Specimens from Nova Scotia and New Brunswick measured 2.58 to 3.16 mm in length (mean: 2.87 mm) and 1.58 to 2.93 mm in width (mean: 2.25 mm). The achene is dull to mildly shiny, dark brown in color and heart-shaped with two equal, concave sides and one flat side. The achene is enclosed in the perianth, which has a distinctive flanged edge (Fig. 1B). The perianth is divided for ⅔ to ¾ of its length.

Chromosome numbers of $2n = 60$ and $2n =$ ca. 60 were obtained for the following specimens of *P. buxiforme:*

1) *P. buxiforme* Small, Dearborn Co., Indiana, July 9, 1966, A. D. Savage 17-2. (BSU). $2n = 60$.

2) *P. buxiforme* Small, Dearborn Co., Indiana, July 9, 1966, A. D. Savage 17-3. (BSU). $2n = 60$.

3) *P. buxiforme* Small, Halifax Co., Nova Scotia, August 18, 1968, T. R. Mertens NS-26. (BSU). $2n = 60$.

4) *P. buxiforme* Small, Queens Co., Nova Scotia, August 17, 1968, T. R. Mertens NS-22. (BSU). $2n =$ ca. 60.

5) *P. buxiforme* Small, Queens Co., Nova Scotia, August 17, 1968, T. R. Mertens NS-23. (BSU). $2n =$ ca. 60.

6) *P. buxiforme* Small, Lunenburg Co., Nova Scotia, August 17, 1968, T. R. Mertens NS-24. (BSU). $2n =$ ca. 60.

Polygonum arenastrum Bor., is characterized by achenes which are dark brown with two more-or-less equal convex and one narrow concave side. Savage and Mertens (4) report that the achenes of this species range from 1.58 to 2.50 mm in length and from 1.00 to 1.75 mm in width. The achene surface is dull but shiny along the edges.

A chromosome count of $2n = 40$ was obtained from the following specimen collected in Indiana:

1) *P. arenastrum* Bor., Delaware Co., Indiana, September 18, 1968, Joyce Highwood 1-2. (BSU). $2n = 40$.

Another specimen, identified on the basis of morphological features as *P. buxiforme*, was found to have a diploid chromosome number of 40 thus suggesting that it was, in fact, *P. arenastrum*.

2) *P. arenastrum* Bor., (?) Warrick Co., Indiana, September 17, 1966, A. D. Savage 62-1. (BSU). $2n = 40$.

Styles (5) and Mertens and Raven (2) also report $2n = 40$ for *P. arenastrum*.

Polygonum fowleri Robinson (= *P. allocarpum* Blake) produces highly distinctive achenes having a granular texture and a "beak-like" apex (Fig. 1C). A high incidence of biconvex fruits are encountered in this species (2). The length of the achenes determined from the study of specimens from New Brunswick, Canada, ranged from 2.92 to 3.67 mm with an average of 3.34 mm. The width of these achenes ranged from 1.63 to 2.08 mm with the average of 1.85 mm.

The color of the granular achenes varied from a light to a medium brown. Although normally three sided with two sides convex and one side concave, some achenes have only two sides (Fig. 1C).

The light green perianth completely encloses the achene of *P. fowleri*. The perianth is divided for ⅔ to ¾ of its length, varying with individual specimens. The inflorescences appear in the axils of the leaves along the stem.

Taylor and Mulligan (6) report $n = 20$ for *P. fowleri* specimens from Graham Island in the Queen Charlotte Islands, British Columbia, Canada. Supporting their data are the following chromosome counts of $2n =$ ca. 40 obtained from specimens of *P. fowleri* collected in New Brunswick:

1) *P. fowleri* Robinson, Lord's Cove, Deer Island, Charlotte Co., New Brunswick, August 19, 1968, T. R. Mertens NB-36. (BSU). $2n =$ ca. 40.

2) *P. fowleri* Robinson, Lord's Cove, Deer Island, Charlotte Co., New Brunswick, August 19, 1968, T. R. Mertens NB-38. (BSU). $2n =$ ca. 40.

The achenes of *Polygonum erectum* L. are light brown to tan in contrast to the much darker fruits exhibited by the other species of

section *Polygonum*. The *P. erectum* achene is dull and granular with two convex and one concave side. It has been reported that the achenes range from 2.33 to 2.92 mm in length and 1.58 to 2.17 mm in width (4). The perianth is characteristically bottle-shaped and divided for less than one-half of its length.

The chromosome number of $2n = 40$ was established for the following specimens from Indiana:

1) *P. erectum* L., Porter Co., Indiana, August 29, 1966, A. D. Savage 58-1. (BSU). $2n = 40$.

2) *P. erectum* L., Porter Co., Indiana, August 29, 1966, A. D. Savage 58-2. (BSU). $2n = 40$.

Voucher specimens for the plants for which chromosome numbers are reported in this paper are housed at Ball State University.

This investigation supports the importance of fruit and perianth characteristics and chromosome number in the identification of species within *Polygonum*, section *Polygonum*. Members of a given species, identified on the basis of morphological features, may be expected to have identical chromosome numbers. This was generally found to be the case in the present investigation. Chromosome numbers reported herein agree with those reported in the literature in those cases where such reports are known. On the other hand, the fact that morphologically distinct species (*e.g.*, *P. arenastrum*, *P. fowleri*, and *P. erectum*) have identical chromosome numbers (*i.e.*, $2n = 40$) indicates that chromosome number alone cannot be used in identifying species in section *Polygonum*.

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