NATIVE ILLINOIS *DELPHINIUM*

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ABSTRACT

Native Delphinium *species of Illinois were studied to clarify the status of these species in the state.* Delphinium tricorne *Michaux,* D. carolinianum *Walter and* D. virescens *Nuttall had previously been reported in Illinois. Taxonomic problems involving* D. carolinianum *and* D. virescens *were solved using systematic techniques including flavonoid chemistry, seed protein analysis and morphological examination. These data suggested that the* Delphinium *plants occurring naturally in Illinois belong to two taxa:* D. tricorne *and* D. carolinanum. Delphinium tricorne *was found to be the most common* Delphinium *in the state. The species was widespread south of a line through Henry and Vermilion counties and less common northward.* Delphinium carolinianum *was restricted to hill prairies and prairie remnants. Chemically and morphologically,* D. tricorne *and* D. carolinanum *are quite distinct from one another. It was determined that plants identified as* D. virescens *from Illinois were actually white flowered specimens of* D. carolinianum.

INTRODUCTION

Three species of *Delphinium* (Ranunculaceae) are presently listed as native to Illinois. *Delphinium tricorne* Michaux is a common late spring blooming wildflower in much of Illinois. *Delphinium carolinianum* Walter is much less common and found locally on hill prairies and prairie remnants. Another larkspur, *D. virescens* Nuttall is included in the Illinois flora by Jones (1971) and Mohlenbrock (1975). Previous references to *D. virescens* in Illinois are based on an 1847 collection by S.B. Meade, made near Augusta in Hancock County. Meade referred the specimen to *D. azureum* Michaux, a synonym for *D. carolinianum* and Kibbe (1952) included the plant in *D. carolinianum.* A survey of the literature indicates extensive confusion as to the taxonomic status of *D. carolinianum* and *D. virescens* (Ewan, 1945: Keener, 1976).

MATERIALS AND METHODS

Herbarium sheets of the *D. carolinianum—D. virescens* complex from twenty-two nationwide herbaria were examined. Specimens of *D. tricorne* from herbaria at ILL, ILLS, MO and MWI were examined. Extensive field sampling and observations were made of *Delphinium* in Illinois. Taxonomic problems in the *D. carolinianum* complex were solved using several systematic techniques (Warnock, 1979). Flavonoids were examined using the separation and identification techniques outlined in Mabry *et al.* (1970). Seed proteins were separated electrophoretically on polyacrylamide gels using techniques developed by Ornstein (1964). Protein banding patterns were assessed using the similarity index of Crawford (1974). Morphological measurements of twenty-four characters were made on live plants as well as herbarium specimens.

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RESULTS

Although 24 morphological characters were examined, not all of these were important in distinguishing the taxa. Root type, pedicel length and orientation, seed coat and shape, fruit shape and leaf structure were used to separate *D. tricorne* from the *D. caorlinianum—D. virescens* complex. Within the complex, sepal color, spur length and structure and placement of leaves were the most important morphological characters for recognizing the taxa. Compared with specimens from other parts of the range of *D. carolinianum—D. virescens,* plants of the complex in Illinois were all very similar to one another morphologically. The major source of morphological variation in Illinois populations of *D. carolinianum* was in sepal color.

Flavonoid analysis of the floral pigments of *D. carolinianum* showed that white and blue flowers of this group contain identical compounds but in differing proportions. Thus, the anthocyanin (a delphinin derivative) is in relatively greater concentrations in the bluer flowers and the flavonol copigment (a 3-O-glycoside of quercetin) is relatively more common in the whiter flowers. Flower color is apparently environmentally controlled since the colors were altered when the plants bloomed following transplantation to a greenhouse.

Chromatographic patterns of leaf flavonoids from four populations (Fig. 1) of the *D. carolinianum—D. virescens* complex in Illinois were nearly identical. Comparatively more variation was found in patterns of flavonoids of plants from other parts of the range of the complex and the flavonoids of Illinois plants were most similar to those of subspecies *carolinianum. Delphinium tricorne* was easily distinguished using morphological characters. Therefore, neither flavonoids nor seed proteins were studied.

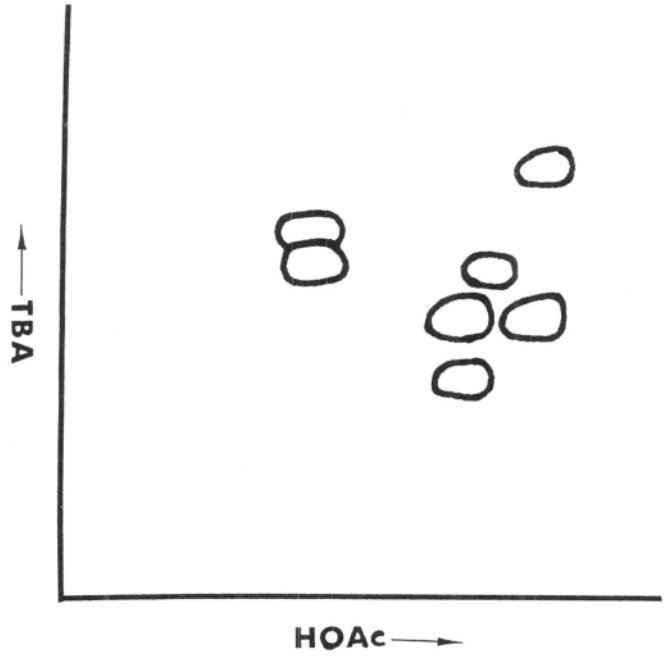

Figure 1. Two dimensional paper chromatograph of *Delphinium carolinianum.* All spots are purple, turning yellow with ammonia vapor under ultra violet light.

Analysis of seed protein patterns of *D. carolinianum* from Illinois showed average similarity of pattern of 69.2% between populations. Average similarities between individuals within single populations were 78.9%. Over the entire range of the complex, interpopulational protein banding pattern similarities averaged 63.6%. Morphological, flavonoid and seed protein data suggested the inclusion of all Illinois specimens of the *D. carolinianum—D. virescens* complex in *D. c.* subspecies *carolinianum*.

DISCUSSION

Delphinium tricorne is commonly referred to as the dwarf larkspur since it is the smallest larkspur (30-60 cm tall) native to eastern North America. This species grows in the woodlands and wood edges throughout most of Illinois south of a line through Henry and Vermilion Counties (Mohlenbrock and Ladd, 1978). Scattered recent collections of *D. tricorne* north of this line indicate that the species may be widespread in the northern counties which are less extensively collected than the rest of the state. *Delphinium tricorne* is found in eastern Iowa and southern Wisconsin. Therefore, new county records for *D. tricorne* in northern Illinois will not be surprising.

Plants of *D. tricorne* are usually rooted in fairly moist soil, often at the base of a bluff or on a hillside. Flowering begins in mid April in southern Illinois and may extend through May in north-central Illinois. Flowers are usually deep violet or blue-purple but may be lighter colored and rarely white. Flowers are borne on 2-5 cm long pedicels which diverge from the axis of the inflorescence at their origin. The inflorescence is a narrowly pyramidal raceme, usually without branches. Leaves are nearly all cauline and basically tripartite with the three main divisions more or less dissected near their apices. Follicles are normally three per flower and curved outwards at maturity, thus strongly apically divergent. Seeds are dark brown to black, somewhat oval and with a smooth, often shiny coat.

Delphinium carolinianum is generally a larger plant (70-120 cm tall) than *D. tricorne*. Plants of *D. carolinianum* are fairly common locally on the hill prairies on the bluffs of the Mississippi River from Pike to Henderson Counties. The plants are also common on the sand prairie areas of Henderson and Mercer Counties. A single locality in a prairie remnant near Dalton City on the Macon-Moultrie County line, indicates that *D. carolinianum* may once have been more widespread in the prairies of Illinois. The population near Dalton City may have been exterminated by the recent construction of a new highway in the area. An old collection of *D. carolinianum* from St. Clair County suggests that the species was once more widespread on the Mississippi bluffs in Illinois. *Delphinium carolinianum* is also found on the bluffs on the Missouri side of the river. Future collections from the sand prairies of Mason County and the Thomson and Savanna Army Depot sand prairies in Carroll and Jo Daviess Counties may include *D. carolinanum*. The species may also be discovered on the hill prairies of Mason County as well as bluffs in Carroll and Jo Daviess Counties.

Flowers of *D. carolinianum* are white to light blue in Illinois. Anthesis occurs from late May to mid June. Flowers are borne on 1.0-2.5 cm long pedicels. Pedicels are parallel to the axis of the inflorescence for most of their length, diverging only for the last 2-4 mm. The inflorescence is a strict virgate raceme without branches. Leaves at anthesis are all cauline, the basal leaves usually withering before the flowers open. Leaves are highly dissected, the three major divisions often indistinct. Ultimate leaf segments are normally less than 2 mm wide. Follicles are normally three per flower (4-6) and more or less erect at maturity. Seeds are wedge or crescent shaped and dark brown with seed coats of vesicled scales.

SUMMARY

Examination of *Delphinium* in Illinois by observing natural populations and study of herbarium specimens indicates the presence of two native species in the state. These are *D. tricorne* and *D. carolinianum. Delphinium virescens* is not found in the state although it had previously been reported. The specimen attributed to *D. virescens* is actually a white flowered form of *D. carolinianum* subspecies *carolinianum.*

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