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EVALUATION OF VARIETIES IN *STANLEYA PINNATA* (CRUCIFERAE)

Robert W. Lichvar¹

ABSTRACT.—*Stanleya pinnata* var. *gibberosa* Rollins is a narrow endemic from southwestern Wyoming. This taxon is based upon the morphological characters of crooked petals and all leaves bipinnate. During field work in 1980, a population near the type locality of this variety was located that had plants with both bipinnate and entire leaves. Due to this unusual population, further field and herbarium studies were done to resolve the taxonomy of var. *gibberosa*. These further studies showed that this taxon is based upon young individuals of var. *bipinnata*.

Rollins (1939), in his monograph of the genus *Stanleya*, treated four varieties under *S. pinnata* (Pursh) Britt. He felt that this polymorphous species treated with just four varietal entities was rather unsatisfactory because such a large range of variation had to be included.

During field work in 1980 to evaluate the threats to, and distribution of *Stanleya pinnata* var. *gibberosa* Rollins for proposed protection under the Endangered Species Act, an unusual population of *S. pinnata* was discovered near the type locality for var. *gibberosa*. Var. *gibberosa* was characterized by Rollins (1939) as having a crooked petal and all leaves bipinnate. The unusual population from near Ft. Bridger, Wyoming, had plants with both bipinnate and entire leaves and straight and crooked petals. Another population located in 1982 near the Owl Creek Range in central Wyoming showed the same variable characteristics as those from Ft. Bridger. These two populations were studied further.

METHODS

Both field and herbarium studies were undertaken to sample the range of variation for *Stanleya pinnata* var. *gibberosa*. The closest variety morphologically, var. *bipinnata* (Greene) Rollins, was used for comparison. Field observations included flowering dates, habitats, leaf and petal shapes, and variations within the populations. Herbarium studies were done at the Rocky Mountain Herbarium (RM), Laramie, Wyoming, the New

York Botanical Garden (NY), Bronx, New York, and the Gray Herbarium (GH), Cambridge, Massachusetts. All the characters used to separate varieties of *S. pinnata* were studied. The following set of specimens were most pertinent to the study: at RM: Rollins 2320, 2351, 2382, 2388, 3077; Dorn 2942; Lichvar 2859, 4196, 5174; Nelson 3562, 7375; Porter 3367, 7768; Freytag 16; Berth s.n.; Goodding 1925; and Osterhout 1094; at GH: Rollins 2320, 2351, 2382, 2388, 3077, 57265, 79155; and at NY: Rollins 57265.

RESULTS AND DISCUSSION

The questionable status of *Stanleya pinnata* var. *gibberosa*, a narrow endemic, was first apparent after a visit to a population at Ft. Bridger, Wyoming, on 11 June 1980. This population had individuals with two different types of leaves and a wide range of plant heights. Those plants that were smaller in stature had all leaves bipinnate, and those individuals larger in stature had bipinnate, pinnate, and entire leaves. A continuum of these characters existed in this population between the two extremes of all bipinnate or all simple leaves, however. These observations, combined with those of Dorn (1979), stating that the key character of a crooked petal had broken down due to it being found in other varieties of the species, warranted further field and herbarium studies.

The main morphological characters that have been used to separate var. *gibberosa* and var. *bipinnata* are:

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- 1. Petals straight or nearly so; leaves bipinnate to entire var. *bipinnata*
- Petals strongly crooked between blade and claw; all leaves bipinnate .. var. *gibberosa*

Rollins (1939) stated that these two varieties each had a separate unified range in certain parts of Wyoming and Colorado. Based on his interpretation of ranges of these taxa, all the specimens that are used in this study had been previously identified according to the ranges given by Rollins.

Specimens of both varieties were compared (Table 1) and showed that three specimens of var. *gibberosa* had crooked petals and five specimens had straight petals. Four collections of var. *bipinnata* had crooked petals and four had either all straight or a mixture of crooked and straight petals. This variation confirmed observations made by Dorn (1979).

The same group of herbarium specimens was also compared for pubescence and leaf shape. Three specimens of var. *gibberosa* had scant pubescence, three had dense, and two had a combination of dense and scant hairs. In var. *bipinnata*, five specimens had scant hairs and three had scant to dense hairs. Complete overlap occurs in the pubescence. Var. *gibberosa* had five specimens with some upper leaves entire and three with all leaves bipinnate. Var. *bipinnata* had five specimens with entire upper leaves and three with bipinnate upper leaves. The leaf characters of these two varieties overlap. Also, three other

characters were recorded from herbarium sheets, the flowering dates, fruit shapes, and habitat types. All three of these features showed a continuous overlap.

The combination of petal and leaf shapes in these two varieties showed similar overlap. Var. *gibberosa* had four specimens with straight petals and entire leaves at the summit of the plants, the combination for var. *bipinnata*. Var. *bipinnata* had two specimens with crooked petals and all leaves bipinnate, the combination for var. *gibberosa*. These two specimens, Porter 3367 and Nelson 7375, are from southeastern Wyoming and are far outside the supposed range of var. *gibberosa*.

Field studies showed the same kind of overlap. Lichvar 5174 was collected in 1982 in the upper edge of the Wind River Basin along the south flank of the Owl Creek Mountains, Wyoming. This population of *Stanleya pinnata* included a series of plants that ranged from all bipinnate leaves to ones with a mixture of pinnate and entire leaves. The plants in this population also had flowers that had both straight and crooked petals. The individuals that had a combination of all bipinnate leaves and crooked petals were small in stature and were young in age. As the individuals in this population grew in stature and older in age, the leaf shapes

TABLE 1. Analysis of herbarium specimens of two varieties of *Stanleya pinnata*.

Character	Var. <i>gibberosa</i>	Var. <i>bipinnata</i>
Petal shape	3 crooked* 5 straight	4 crooked 4 with a mixture of crooked or straight
Leaf shape	3 all bipinnate 5 entire	3 all bipinnate 5 entire
Pubescence	3 scant 3 dense 2 with dense and scant	5 scant 3 scant to dense
Flowering dates	24 May to 29 June	2 May to 3 July
Fruit shape	Torulose	Torulose
Habitat type	disturbed soil of canal banks to limy bluff	gumbo swales to limy gravelly ridge
Combination of petal and leaf shapes	4—straight petals with some entire leaves 1—crooked petals and all leaves bipinnate 3—crooked petals and some entire leaves	2—straight petals and some leaves entire 2—crooked petals with all leaves bipinnate 2—straight petals with all leaves bipinnate 1—plants in fruit with some leaves entire 1—plants in fruit with all bipinnate leaves

*The number represents the number of herbarium specimens with that character.

ranged from pinnate to entire and had a mixture of crooked and straight petals. The smaller individuals in the population were of the var. *gibberosa* aspect and the larger individuals were both the var. *bipinnata* and var. *pinnata* aspects. This population expressed the same type of variability as the one at Ft. Bridger but was 180 miles (288 km) outside the previously known distribution of var. *gibberosa*.

CONCLUSIONS

A reevaluation of the status of *Stanleya pinnata* var. *gibberosa* can now be made because of the availability of more collections and further field observations. The small stature of var. *gibberosa* with nearly all or all bipinnate leaves is not necessarily unique to this taxon. Several specimens from well outside the supposed range of var. *gibberosa* are identical. Also, at least two populations exist with highly variable morphology encompassing both var. *gibberosa* and var. *bipinnata*. Both populations have a continuum of var. *gibberosa* type individuals that are small in stature and young in age with all leaves bipinnate and crooked petals to older individuals with pinnate leaves plus a mixture of crooked and straight petals.

Other genera in Cruciferae have similar variation in leaf shapes. Within *Lepidium densiflorum* Schrad. there are several different shapes of leaves. The basal leaves range

from entire to pinnatifid, but no varietal distinctions have been based upon these various leaf shapes.

If the Ft. Bridger and the Owl Creek Range populations represent two varieties at each location that are hybridizing and backcrossing with the parents, then one would expect several different types of plants with various age groups for each. Instead, these two populations have a continuum of characters that are associated with variously aged individuals.

It appears that var. *gibberosa* is based on young individuals with a small stature. Therefore, it is concluded that var. *gibberosa* is synonymous with var. *bipinnata*. Further study may show both are synonymous with var. *pinnata*.

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