UNIVERSITY of IDAHO-College of Forestry, Wildlife and Range Sciences

MOSCOW

Station Note

No. 11 March, 1969

Forest, Wildlife, and Range Experiment Station

A Simplified Chemical Method for Sagebrush Identification

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Taxonomic recognition of additional kinds of woody sagebrush (**Artemisia**) in recent years has re-emphasized that this is a difficult group to identify. People working with range lands, whether as administrators, technical advisors or researchers have come to realize the importance of correct identification in this group. This means recognition at species and often subspecies level, and here lie the difficulties.

This report presents a simple and rapid method to aid in making some of the more difficult separations in the sagebrush complex. It was developed during a study of the ecology and taxonomy of mountain big sagebrush (**Artemisia tridentata** subsp. **vaseyana**).[2] Both thin-layer chromatography and morphological characters are being used in this investigation. During the course of the research we found that the general fluorescent color of a sample of **Artemisia** foliage under ultraviolet light could be helpful in separating certain groups. Young (1965) used this method for initial separation of **Artemisia** samples, followed by chromatographic tests for detailed information. The fluorescent extract method has been tested further by the authors, and is presented here as a field aid for identification of difficult species and/or subspecies in **Artemisia.** Although this is designed for use with fresh leaf material, it works equally well with dried leaves from the field or from herbarium specimens. The method involves placing a few grams of sagebrush leaves into a clear glass bottle. Add enough methanol or ethanol to just cover the leaves. Allow the alcohol to react approximately one-half hour (addition of 5 percent HC1 to the alcohol or heat from direct sunlight will reduce the reaction time by one-half). In a darkened area, hold a long wave ultra-violet lamp (3660 angstroms) over the bottle and observe the fluorescent color of the leaf extract directly through the glass bottle. This may be done in the field by using a battery power-pack or after returning to an area where electricity is available. Two general groups may be observed: (1) those that fluoresce shades of bluish-cream and (2) those that fluoresce shades of brownish-red.

Group 1.

Fluoresce shades of bluish-cream

- **A. tridentata** subsp. **vaseyana** (mountain big sagebrush)
- **A. rothrockii** (rothrock sagebrush)
- **A. cana** subsp. **bolanderi** (bolander silver sagebrush)
- **A. arbuscula** subsp. **arbuscula** (low sagebrush)
- **A. arbuscula** subsp. **thermopola** (hotsprings sagebrush)
- **A. longiloba** (alkali sagebrush)
- **A. tripartita** subsp. **tripartita** (three-tip sagebrush)
- **A. bigelovii** (bigelow sagebrush)

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[2]Assistance from the Intermountain Forest and Range Experiment station of the U. S. Forest Service, and funds provided under the National Defense Education Act are gratefully acknowledged.

Group 2.

Fluoresce shades of brownish-red

A. tridentata subsp. **tridentata** (basin big sagebrush)

A. tridentata subsp. **wyomingensis** (wyoming big sagebrush)

A. nova (black sagebrush)

A. tripartita subsp. **rupicola** (wyoming three-tip sagebrush)

A. cana subsp. **cana** (silver sagebrush)

A. rigida (scabland sagebrush)

Greater difficulties are encountered in morphologically separating taxa of these two groups than taxa within either group. Examples of the use of this fluorescent technique are provided below. The nomenclature follows Beetle's (1960) classification. Other studies by Young (1965), Holbo and Mozingo (1965) and work at the University of Idaho substantiate to a large degree the taxonomic separations outlined by Beetle.

Suppose one wishes to know whether the dwarf sagebrush of an area is **A. nova** or **A. arbuscula.** Within **A. nova** are two color variants. One has dark green leaves and the other is a more pubescent and therefore gray colored form. The green form is distinct and more easily recognized while the gray form more closely resembles **A. arbuscula** and is easily confused with it. These species are easily separated by the fluorescent method. When treated with alcohol both forms of **A. nova** fluoresce a brownish-red color while both subspecies of **A. arbuscula** fluoresce a bluish-cream color.

This technique also is valuable in separating subspecies within the big sagebrush group. **A. tridentata** subsp. **vaseyana** fluoresces bluish-cream while the subspecies **tridentata** and **wyomingensis** fluoresce brownish-red. Fortunately it appears that the newly recognized subspecies **wyomingensis** can be distinguished from the subspecies **tridentata** by morphological characters, for the fluorescence test will not separate these two.

For plants lacking flower shoots, some difficulty may be encountered in separating young plants of big sagebrush from those of the dwarf species. The fluorescence test will be valuable here. **Artemisia tridentata** subsp. **wyomingensis** and subsp. **tridentata** can be separated from **A. arbuscula** and as skill is acquired with this method, it will be possible to separate subspecies **vaseyana** and **A. arbuscula** (though both are in the bluish-cream group) by the shade of bluish-cream fluorescence.

Other species such as **A. tripartita, A. cana, A. rigida, A. rothrockii** and **A. bigelovii** are readily identified by their morphological characteristics and/or geographic location. Although useable, the fluorescence test is not usually necessary to separate these species.

After identifying the more difficult sagebrush species and subspecies several times with the fluorescence test, one should be able to separate them by their subtle morphological characteristics alone and the test will be necessary only as an occasional check.

Research at this University suggests that accurate separation of sagebrush species and subspecies has more than taxonomic value. In addition to distinctive morphological and chemical differences, each taxon has its own ecological requirements and associated species. These are important considerations for management of the vegetation types involved. Differences are also being found in behavior and palatability among some of these species. Future study should provide more information on these differences as well as additional taxonomic data.

Literature Cited

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