A Simple Field Technique for Identification of Some Sagebrush Taxa

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Highlight: *A technique has been developed that provides an on-the-spot field test to aid in identification of some sagebrush taxa. Seeds, dried or green crushed leaf material, or stem cambium of various sagebrush taxa will produce distinctive shades of blue when wet and placed under longwave ultraviolet light. The technique is particularly helpful in separation of* Artemisia tridentata *subsp.* tridentata *from* A. tridentata *subsp.* vaseyana. *Subspecies* vaseyana *extracts are blue, whereas those of subsp.* tridentata *are not. All taxa producing blue water extracts are preferred by mule deer.*

Recent observations have demonstrated that palatability on winter ranges of some sagebrush taxa relates closely to chromatographic patterns (Hanks et al., 1971, 1973; Hanks and Jorgensen, 1973). Taylor et al. (1964) noted the differential fluorescence in moist seeds of *Artemisia tridentata* subsp. *tridentata* and subsp. *vaseyana* under ultraviolet light. Subspecies *vaseyana* seeds fluoresce and subsp. *tridentata* seeds do not. We have observed that different shades of blue are apparent in various sagebrush taxa immediately after application of water under longwave ultraviolet light (e.g., black light lamps M-16 for use in the field or UV-21 for laboratory use from Ultraviolet Products Inc., San Grabriel, Calif.). This test is effective on fresh or dried material (crushed leaves, seeds, or broken stems) any time of the year.

Because of the technique's simplicity and ease of use, it should prove useful for identifying sagebrush taxa. Taxa cannot be distinguished solely by color differences of water extract, but the color differences conveniently dovetail, so that taxa most likely to be confused on the basis of morphological criteria are in different color groups (Table 1); e.g., the subspecies of big sagebrush (*A. tridentata*). Subspecies *tridentata* extracts show little color, whereas those of subsp. *vaseyana* are an intense blue. The third subspecies, *wyomingensis*, is recognized by a light-blue water extract. Extracts of a larger statured ecotype of subsp. *wyomingensis* from north-central Nevada (Brunner, 1972) show more blue than those of subsp. *wyomingensis* collections from western Wyoming. *Artemisia tridentata* subsp. *tridentata* and *A. tridentata* subsp. *wyomingensis* cannot always be separated by the color test, but the short stature and spatulate leaves of the latter subspecies contrast with the taller stature and narrow leaves of subsp. *tridentata*.

Color extracts are helpful in identifying some palatable species and ecotypes; e.g., two forms of *A. nova* have been identified (Tables 1 and 2) and designated as forms (a) and (b). *Artemisia nova* (a) tends to be more palatable and produces a bluer extract than *A. nova* (b). Beetle (1960) and Winward and Tisdale (1969) also noted two forms of *A. nova*.

High preference is shown by mule deer for all taxa producing blue extracts. The intensity of the blue can be taken as a palatability indicator with two notable exceptions: *A. tridentata* subsp. *wyomingensis*, which exhibits little color, is highly palatable and *A. bigelovii*, which lacks color, is also palatable.

Table 1. Qualitative water soluble extract color groups of some *Tridentatae* taxa.

Intense blue	Light blue	Pale blue to colorless
A. arbuscula	*A. cana*	*A. bigelovii*
A. longiloba	*A. rigida*	*A. nova* (b)
A. nova (a)	*A. tridentata wyomingensis*	*A. tridentata tridentata*
A. rothrockii	*A. tripartita*	
A. tridentata vaseyana		

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Table 2. Quantitative water extract differences of six sagebrush taxa as determined with a spectrophotometer. Low percent transmittance indicates blue extract. Data are from foliar material.

Taxa	Percent transmittance		Number of accessions
	Mean[1]	Range	
A. nova (b)	43 ab	31-49	4
A. tridentata tridentata	41 ab	29-55	15
A. tridentata wyomingensis	33 b	30-38	6
A. nova (a)	18 c	12-25	5
A. tridentata vaseyana	12 c	6-18	13
A. longiloba	5 d	4-5	3

[1] Means followed by the same two letters are not significantly different, those sharing only one common letter are significantly different at the 5% level, and those sharing no common letters are significantly different at the 1% level.

When a color difference in leaf extract is not discernible and a difference in palatability exists between or within taxa, a wet cambium usually exhibits a color difference.

In order to quantify and test significance of color differences of certain sagebrush taxa, some standard laboratory procedures were employed. Foliar material from about 50 widely occurring accessions of *Tridentatae* was collected. A mortar and pestle was used to pulverize air-dried foliar material. A 100-mg sample was mixed with 50 ml of distilled water, shaken for 30 sec, allowed to extract for an additional 2-1/2 min, and filtered through Whatman No. 4 filter paper. The percent of light transmittance of the filtrate was measured with a Beckman Spectronic 20 Spectrophotometer at 364 mμ. An analysis of variance test was employed to determine whether significant color differences occur between *Artemisia* taxa. Quantitative color differences between taxa are shown on Table 2.

Comparison of two-dimensional chromatograms of both water- and alcohol-soluble extracts of foliar material indicated that the blue compounds are principally the coumarin derivatives and their glycosides described by Shafizadeh and Melnikoff (1970).

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