

# Yearly Variation in Germination in Three Subspecies of Big Sagebrush

R. O. HARNISS AND W. T. McDONOUGH

**Highlight:** Yearly variation in germination between individual plants of three subspecies of big sagebrush (*Artemisia tridentata*) was examined. The subspecies *vaseyana* germinated less than *tridentata* or *wyomingensis*. Only *tridentata* showed a significant difference in year-to-year variation. In all years, germination rates of the three subspecies were high enough to exclude seed germination as a limiting factor in sagebrush reinvasion.

Recognition of subspecies of big sagebrush (*Artemisia tridentata* Nutt.) and of the differing environmental habitats of each has led to interest in the germination and seedling growth requirements among subspecies.

In studies of the temperature required for germination of three big sagebrush subspecies (*tridentata*, *vaseyana*, and *wyomingensis*) McDonough and Harniss (1974a, b) found that small differences between subspecies were due mostly to the stratification treatment needed by subspecies *vaseyana*. Temperature as a requirement for seed germination was eliminated as a critical factor for successful reestablishment. In a related study (Harniss and McDonough, 1975), seedling growth of the subspecies was reduced under a below average temperature requirement, but there was no difference in growth among subspecies under any one temperature requirement.

Good years for big sagebrush invasion and reestablishment following eradication treatment have been noted by Pechanec (1945); Mueggler (1956); Johnson (1958); and Daubenmire (1970). The study reported here examined the possibility that

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Authors are range scientist and plant physiologist, Intermountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service, Ogden, Utah; stationed in Logan, Utah, at the Forestry Sciences Laboratory maintained in cooperation with Utah State University.

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sagebrush seed has different germination ability in different years.

## Procedures

In 1971, 1972, and 1973, big sagebrush seed collections were made from the same 10 plants of each of three big sagebrush subspecies in the vicinity of the U.S. Sheep Station near Dubois, Idaho.

Seeds were separated from chaff and germinated in 9-cm petri dishes on double layers of filter paper wetted with 3 ml of distilled water. There were 50 seeds per treatment and two dishes per treatment for each of the 30 individual plant collections. Dishes were stacked in metal cans with transparent lids. Cans were placed in temperature cabinets under controlled temperatures of 20/10°C (8/16 hours). An 8-hour photoperiod (1,100 lumens/m<sup>2</sup>) coincided with the higher temperature. Germinating seeds were inspected daily for the first 10 days and then every third day until the 30th day, when the experiment was completed.

Germination was considered to have occurred when root growth was visible. Germination percentages were subjected to variance analysis and studentized range tests at the 5% level.

## Results and Discussion

There was a significant difference in germination among the subspecies over the 3 years (Table 1). The subspecies *vaseyana* germinated less than the other two. This difference in germination is similar to that noted earlier over different temperature regimens (McDonough and Harniss, 1974a) and is caused by the requirement of the *vaseyana* seed for a stratification treatment (McDonough and Harniss, 1974b). This result corresponds to the topographic location of these

**Table 1. Average seed germination (%) for 3 years by three subspecies of big sagebrush.**

| Year              | <i>Artemisia tridentata</i> var. |       |                     |       |                 |       |
|-------------------|----------------------------------|-------|---------------------|-------|-----------------|-------|
|                   | <i>tridentata</i>                |       | <i>wyomingensis</i> |       | <i>vaseyana</i> |       |
|                   | Average                          | Range | Average             | Range | Average         | Range |
| 1971              | 50.2 a <sup>1</sup>              | 22-75 | 43.2 a              | 1-78  | 17.1 a          | 1-22  |
| 1972              | 60.5 ab                          | 36-94 | 50.0 a              | 22-73 | 23.0 a          | 4-50  |
| 1973              | 69.8 b                           | 50-88 | 70.0 a              | 27-91 | 11.0 a          | 4-19  |
| Average $\bar{x}$ | 60.2                             |       | 54.4                |       | 17.0            |       |

<sup>1</sup> Average germination values within a subspecies with the same letters do not differ significantly (P=5% level) between years.

subspecies; *vaseyana* is found at a higher elevation than the other subspecies, where there are shorter growing seasons and more snow cover.

Only the subspecies *tridentata* showed a significant difference in year-to-year germination between 1971 and 1973. This difference is likely due to less plant-to-plant variation for *tridentata* than for the other subspecies (Table 1). Between years, there was no difference in germination of seed from the same plant.

None of the results of this study indicate that year-to-year differences in seed germination are the cause of seemingly

“good” years for sagebrush reestablishment. In our study, sufficient seed was available for adequate germination each year, even at the lowest germination rates observed.

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