

Density and germination characteristics of seeds of *Bromus tectorum* in field seedbanks

J.A. Young and C.D. Clements

US Department of Agriculture, Agricultural Research Service, 920 Valley Road, Reno, NV 89512, USA, Email: jayoung@scs.unr.edu

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Introduction *Bromus tectorum* is a highly invasive exotic weed that has spread over millions of hectares of grazing land in the semi-arid regions of far western North America. The annual grass is an important grazing resource, but herbage production is highly variable among years, depending on the amount and periodicity of precipitation. When production is abundant, the accumulations of fine-textured, early-maturing herbage increase the chance of ignition and the rate of spread of wildfires. On certain years the area burned in such fires may be several million hectares. Such fires destroy forage resources and degrade watershed quality on extensive areas as well as threaten human property and lives. *Bromus tectorum* plants can produce a very large number of caryopses. Caryopses that fail to find a safe site for germination acquire a dormancy in the field that leads to the building of large seedbanks (Young *et al.*, 1968). It is critical for managers to have estimates of the size and extent of *Bromus tectorum* seedbanks during the planning and implementation of pasture restoration treatments. Our objective was to obtain an estimate of *Bromus tectorum* seedbank size and germinability through bioassay of samples obtained from a variety of plant communities and to relate this information to site characteristics easily ascertained by pasture managers.

Materials and methods In the autumn of 2003, before germination of the current year's crop of *Bromus tectorum* caryopses had initiated, we collected 1,000 samples from the seedbed surface (5 by 10 by 2.5 cm) in 100 different pasture communities infested with the annual grass. The samples were placed in individual cups in the glasshouse, moistened with tap water and emerging seedlings identified and removed weekly for 4 weeks (wk). After the initial 4 wk, the process was repeated after enriching the samples with a solution containing 0.1 M potassium nitrate. After 4 wk the process was repeated after enrichment with 0.014 M gibberellin.

Results The emergence subsequent to the initial wetting with water of the bioassay samples provides an estimate of the readily germinable seedbank. The average *Bromus tectorum* seedling emergence was 3,900 per m². The range was 0 (6% of samples) to 8,200 per m². Subsequent enrichment of the germination substrate with a nitrate source increased emergence by an average of 15%. Subsequent enrichment with gibberellin increased seedling emergence by an additional 10%. Nitrate and gibberellin enrichment of the samples reduced the number of samples without any *Bromus tectorum* seedling emergence to less than 1% of the total. Enrichment provides an estimate of the viable, but dormant seeds in the seedbank (Evans & Young, 1975). The site characteristic most highly correlated with the density of the *Bromus tectorum* seedbank was the recent wildfire history of the collection site. Sites burned the previous year had much lower seedbanks, while sites burned two to five years before sampling had markedly higher seedbanks of both initially germinable and initially dormant *Bromus tectorum* caryopses compared to sites with no recent history of wildfires. This reflects the extreme dynamics of *Bromus tectorum* populations following wildfires (Young *et al.*, 1976). The presence of litter on the soil surface and the visible presence of *Bromus tectorum* caryopses on the soil surface were also highly correlated with increased seedbank density.

Conclusions Recent wildfire history and visible characteristics on the surface of seedbeds can be used to estimate the density of *Bromus tectorum* seedbanks.

References

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