Perennial grass emergence and establishment using a micro-nutrient seed treatment

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Introduction Resource managers have become increasingly frustrated with restoration seeding failures in semi-arid and arid environments. In response to this frustration, some resource managers have attempted restoration seedings using non-conventional methodologies such as propriety seed treatments. The exact nature of these propriety treatments is often confidential, but they generally consist of either nutrient or micro-nutrient enrichment or inoculation with unspecified micro-organisms. One of the more popular propriety seed treatment used in Nevada, USA, is GERM-N-8®. This product is a suspension of nutrients (N 2%, P 14%, and K 3%) applied to dry seed. Resource managers often report excellent success using these propriety treatments, but lack of experimental design make it impossible to assign cause and effect.

Materials and methods Dry seed of 8 native, *Poa secunda*, *Festuca idahoensis*, *Elymus lanceolatus*, *Elymus elymoides*, *Pascopyrom smithii*, *Hesperostipa comata„ Achnatherum hymenoides*, *Psuedoroegneria spicata* and 1 introduced grass, *Agropyron desertorum* were treated with the propriety seed treatment GERM-N-8® at a rate of 182 g per 45 kg of each seed species. Treated and untreated seed was sown by hand in October 2001 at a rate of 12 seeds per 30 cm row, or 120 seeds per 300 cm plot and replicated 3 times at 2 separate locations in north-western Nevada, USA. The first site, Beddell Flat is at an elevation of 1581m and received an average of 21.25 cm of precipitation over the 2 years of this study. The site is dominated by *Artemisia tridentata* ssp. *wyomingensis* with a *Achnatherum thurberianum* understorey. The second site, Granite Peak is at an elevation of 1780 m and received an average of 26.5 cm of precipitation over the 2 years of this study. The habitat is dominated by *Artemisia tridentata* ssp. *vaseyana* with an understorey of *Achnatherum thurberianum*, *Festuca idahoensis*, *Elymus elymoides*, and *Poa secunda*. Treatments were checked monthly from October 2001 through August 2003 as initial sprouting, mortality, and persistent establishment were recorded.

Results The initial sprouting of *Elymus elymoides*, *Hesperostipa comata*, and *Psuedoroegneria spicata* seedlings were significantly ($P \leq 0.05$) greater when treated with GERM-N-8 at the Beddell Flat site. This did not hold true at the Granite Peak site nor was this the case for the other seed species tested. The application of treating these perennial grass seeds with GERM-N-8 did not significantly ($P \geq 0.05$) enhance seedling establishment. In fact, *Elymus lanceolatus* at the Beddell Flat site and the introduced *Agropyron desertorum* at the Granite Peak site had significantly ($P \leq 0.05$) more establishment than their treated counter parts. Untreated *Agropyron desertorum* established as a rate of 1 per 60 cm compared to 1 per 120 cm when treated with GERM-N-8.

Conclusion Resource managers may very well be visually experiencing success using some of these propriety products as favourable climate conditions, site potentials, and other factors can play an important role in any seeding success or failure. Nitrate-N is the ingredient most likely to enhance seed germination. The application rate of 3 mg of 0.3% nitrate-N in this particular propriety product, GERM-N-8®, is far below the rate of enrichment that has been shown to enhance grass seed germination in our laboratory. The establishment of 1 perennial grass per 30 cm is desired on arid and semi-arid rangelands when attempting to suppress exotic invasive weeds such as *Bromus tectorum*, the introduced *Agropyron desertorum* was the perennial grass species that came closest to achieving this density of all the species we experimented with.