

PLANT MATERIALS TECHNICAL NOTE

Hybrid Wheatgrass *Elymus hoffmannii*

Introduced Grasses for Conservation Use in Montana and Wyoming

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A test plot of AC Saltlander green wheatgrass near Havre, Montana

Introduction

'AC Saltlander' and 'NewHy' are commercially-available hybrid wheatgrass cultivars, resulting from crosses of quackgrass, *Elymus repens*, with the North American and Eurasian bluebunch wheatgrasses. In 1996, USDA-Agriculture Research Service (ARS) researchers determined that these hybrid wheatgrasses formed a new species, *Elymus hoffmannii* (Jensen and Asay, 1996).

NewHy, a hybrid wheatgrass released in 1989, was developed by ARS grass breeders in Logan, Utah from the man-made cross of the North American bluebunch wheatgrass, *Pseudoroegneria spicata*, and naturalized quackgrass (Asay et al., 1991). The description for *Elymus hoffmannii* was written to encompass the released cultivar NewHy. Some taxonomists believe NewHy should be identified as *x Pseudelymus* 'NewHy' because it is derived from an artificial cross between *Elymus repens* and *Pseudoroegneria spicata* (Barkworth et al., 2007).

AC Saltlander green wheatgrass, as a cultivar of *Elymus hoffmannii*, is a natural hybrid between one of three possible Eurasian bluebunch wheatgrasses, *Pseudoroegneria strigosa*, *Pseudoroegneria geniculata*, or *Pseudoroegneria stipifolia*, and quackgrass. This natural hybrid came from a collection made in 1979 by J.A. Hoffmann and R.J. Metzger (ARS) from the edge of a wheat field approximately 56 kilometers (34.8 miles) northwest of Eleskirt, Erzurum Province, Turkey. It was initially included in the U.S. National Plant Germplasm System as *Elytrigia repens* (formerly known as *Agropyron repens*). From 1984 through 1995, seed from this collection became the foundation of a pre-varietal breeding program conducted by the ARS Forage and Range Research Laboratory scientists at Logan, Utah. Plants were selected for bunch-growth, seed set, and desirable morphological characteristics. Selected 1995 seeds of this natural hybrid were provided to the Salinity Tolerance Testing Laboratory at Swift Current, Saskatchewan in 1996 to evaluate and select for forage production and resistance to root-zone salinity. After each of three selection cycles at Swift Current, the selected salinity-tolerant plants were harvested, cloned, and separated into two populations, one of which was delivered to Logan and the second planted in Swift Current field nurseries. The pre-varietal populations at Logan contributed to a 2002 release of the “RS-H hybrid” germplasm for use in future breeding programs (Jensen et al., 2003).

The 1995 salinity-tolerant germplasm growing at Swift Current was co-selected for frost tolerance, winter hardiness, freedom from plant pests, uniform plant color, leafiness, plant vigor, and seed-set. The Swift Current plants underwent a total of five selection cycles over 10 years. In 2006, AC Saltlander green wheatgrass was released by Agriculture Canada’s Semiarid Prairie Agricultural Research Centre from the Swift Current populations, specifically for use in areas with salinity issues (Steppuhn et al., 2006).

General Description:

Hybrid wheatgrass plants are taller, the spikelets are more open, the flag leaves are longer, and the glumes and the awns of the lemmas are longer than quackgrass. In addition, there are usually three florets per spikelet for AC Saltlander green wheatgrass and five for quackgrass. The leaves of both AC Saltlander and NewHy remain greener and more succulent during the late summer, unlike other wheatgrasses. Hybrid wheatgrass produces moderately-aggressive spreading rhizomes, especially NewHy, which allow stands to fill in as the less competitive forage species and weeds decline. In a Swift Current research study to determine vegetative spread by rhizomes, quackgrass advanced at about twice the rate as either hybrid wheatgrass, whether cut for hay (two cuts per year) or clipped to simulate grazing. In addition, the vegetative aggressiveness of both hybrid wheatgrasses ranked well below quackgrass when grown on non-saline soil (Steppuhn et al., 2006).



Side-by-side comparison of AC Saltlander and NewHy in dryland test plots near Moccasin, Montana.



Seed head comparison between AC Saltlander green wheatgrass and quackgrass.

Adaptation:

Hybrid wheatgrass readily adapts to saline seeps and recharge areas. These grasses are often recommended for soils with Bureau of Soils Cup measurements of very slight to slight (2 to 8 EC) to strong (> 16 EC) root-zone salinity (Ogle and St. John, 2009). Both cultivars have better salinity tolerance than intermediate wheatgrass. AC Saltlander is rated equal to tall wheatgrass, *Thinopyrum ponticum*, while the salinity tolerance of NewHy averages significantly less than that measured for tall wheatgrass. The salinity tolerance indices (wherein tolerance increases as the index values increase) for tall, NewHy, and green wheatgrasses averaged 11.2, 5.7, and 12.9, respectively (Steppuhn and Asay, 2005).

Hybrid wheatgrasses form long-lived, perennial, cool season grass populations developed specifically for semi-arid production areas. These grasses are best suited for use in areas receiving 13 or more inches of annual precipitation and show drought tolerance similar to intermediate wheatgrass, *Thinopyrum intermedium*.

Conservation Uses:

Use for Hay:

Cool season grass forage trials were initiated in May 2009 at Montana State University Central and Northern Agricultural Research Centers near Moccasin (CARC) and Havre (NARC), Montana, respectively. At the CARC and NARC test plots, both dryland and irrigated dry matter forage yields for AC Saltlander and NewHy hybrid wheatgrasses were statistically similar for all 3 years during which production data were taken. Mean NewHy and AC Saltlander dryland forage yields for that time period were 1.21 and 1.07 tons per acre (CARC) and 3.25 tons per acre and 3.13 tons per acre (NARC), respectively. The dryland yields were higher at NARC due to more abundant May and June rainfall in both 2010 and 2011. Mean irrigated forage yields at NARC had a trend for NewHy to exceed the forage yield of AC Saltlander at 4.78 tons per acre and 4.09 tons per acre, respectively.

Use for Pasture:

If properly managed, both hybrids produce comparable forage quality to those of brome, *Bromus* spp., and orchardgrass, *Dactylis glomerata*, grown in non-saline conditions. These hybrid wheatgrasses resist moderate grazing pressure after establishment and recover rapidly after grazing or swathing (St. John et al., 2010).

Erosion control/reclamation:

Hybrid wheatgrasses are especially suited for erosion control and reclamation on moderately saline soils. They can also be used for reclaiming weed-infested pastures in saline areas. After an existing stand of foxtail barley, *Hordeum jubatum*, or downy brome, *Bromus tectorum*, were initially burned down with herbicides, plantings of AC Saltlander gradually displaced these weeds from the hay field or pasture over a period of one or more years depending on the severity of the salinity (Unpublished data, Steppuhn, personal communication).



AC Saltlander seeded in 2004 into a foxtail barley-infested, severely saline hay field near Swift Current, Saskatchewan. The picture was taken in June 2010 after 6 years of growth and annual harvests.

Ease of Establishment:

Under both dryland and irrigated conditions in the grass forage trials at CARC and NARC, respectively, AC Saltlander green wheatgrass showed significantly greater stand density in the first year establishment than NewHy hybrid wheatgrass. In the second year of growth, however, NewHy stands were equal to those of AC Saltlander, due to NewHy's more aggressive vegetative spread by rhizomes. AC Saltlander seedlings are vigorous and stands are easy to establish on firm, weed-free seedbeds. Seeding depth should be no deeper than $\frac{1}{4}$ to $\frac{1}{2}$ inch.

AC Saltlander has approximately 111,000 seeds per pound, whereas NewHy has 134,000 seeds per pound. For dryland and irrigated plantings, a seeding rate of 8 pounds Pure Live Seed (PLS) per acre is recommended. If broadcast or planted for critical area treatment, however, double the normal seeding rate to 16 pounds PLS per acre. Broadcasting on critical areas, those having EC's over moderate levels, may require as much as 32 PLS pounds per acre. Recent test plot results in Saskatchewan indicate 5.5 pounds of AC Saltlander and 3.5 pounds of slender wheatgrass establish well together when planted as a mix in the same row or separately in alternate rows (Unpublished data, Steppuhn, personal communication).

To control weeds in the establishment year, apply herbicides after seedlings have reached the 3 to 4 leaf stage. The same broadleaf chemicals used for wheat are recommended for AC Saltlander green wheatgrass (Miller Seeds).



An AC Saltlander pasture in Alberta

Limitations:

Although half of the genetics inherent in these hybrids originate from quackgrass, NewHy and AC Saltlander differ morphologically and express separate genetic pedigrees from this parent. Both wheatgrasses were bred and selected for bunch-growth, and exhibit much less vegetative spread than quackgrass. Nevertheless, stands of these hybrid grasses might be mistaken for quackgrass. Because of its vegetative aggressiveness and potential to spread into agricultural fields, quackgrass is classed as a prohibited weed in most states and Canadian provinces. Thus, to minimize buyer rejection, producers who grow weed-free hay for domestic and foreign markets should avoid growing hybrid wheatgrasses.

Also, hybrid wheatgrass seed cannot be differentiated from quackgrass seed in certified seed labs. Because of this characteristic, both NewHy and AC Saltlander seed fall under the Plant Variety Protection Act of 1970. The license specifies that both NewHy and AC Saltlander seed can only be marketed as a class of field-inspected certified seed.

Availability and Releases:

NewHy was developed and released by the USDA-ARS in cooperation with the Utah Agricultural Experiment Station and the USDA-Soil Conservation Service. Breeder and Foundation seed is maintained and produced by the USDA-ARS at Logan, Utah.

A private seed company, Miller Seeds, has exclusive rights to increase and market AC Saltlander green wheatgrass seed in Canada and the United States (Ag Canada, 2010). Currently, Alforex Seeds serves as the primary certified seed supplier of this selection in the United States. In some cases, AC Saltlander may be purchased in a saline tolerant grass mix composed of 50% certified AC Saltlander, 25% slender wheatgrass, and 25% tall fescue.

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