General Description

Russian wildrye, *Psathyrostachys juncea*, is an introduced, large-statured, cool-season bunchgrass. It is a long-lived perennial with an abundance of long, dense, basal leaves 6 to 18 inches long and up to \( \frac{1}{4} \)-inch wide. Plants vary from light to dark green, with many shades of blue-green. The erect, naked stems are about 36 inches tall, and have flowering heads forming a dense, erect spike. It is unique among grasses because of its high digestibility and exceptionally long season of use. Its fibrous roots may penetrate 8 to 10 feet deep, making the plant very competitive once established. About 75 percent of the total roots are within 6 inches of the surface, but they have a wide, horizontal spread and may draw heavily on soil moisture for a distance of 4 to 5 feet. Due to this growth characteristic, a minimum of 18-inches between-row spacing is recommended when planting Russian wildrye under dryland conditions. Once it is well-established, Russian wildrye has a long season of growth, making this species an excellent competitor with weeds. It has been known to exclude downy brome *Bromus tectorum*, even when planted in rows 18 to 24 inches apart.
Adaptation or Range

Russian wildrye is well adapted to the loam and clay soils of the prairies and grows best at elevations up to 6,000 feet. It can be grown on a fairly wide range of soil types, but is most productive on fertile loams. Russian wildrye is more difficult to establish on sandy soils in dry areas than crested wheatgrass *Agropyron desertorum*, but once established, it grows very well. Russian wildrye grows poorly on soils of low fertility. It begins growing in the spring about two weeks later than crested wheatgrass and, thus, should be grazed two weeks later than crested wheatgrass. Fall regrowth is better and more palatable than crested wheatgrass. If the soil is prone to wind erosion, 14- to 16-inch row spacing is recommended. It is exceptionally tolerant of cold, drought, and has moderate tolerance of salinity and sodic to saline-sodic soil conditions. Russian wildrye production is affected beginning at electrical conductivity (EC) levels of 12. This grass is not tolerant of spring flooding or high water tables.

Uses

Russian wildrye forage is very palatable and has the ability to cure on the stem, which supports a long grazing season. It is also very tolerant of grazing and regrows quickly after clipping, making it a good selection for dryland and sub-irrigated pastures, particularly in areas receiving 14 to 18 inches of annual precipitation. Although grazing can continue from early spring to winter, it is frequently best to graze this grass lightly in the spring and then stockpile most production for late summer and fall, when other grasses are unproductive or low in quality. As with all green, lush pastures grazed in the spring, the use of mineral supplements containing magnesium and potassium has been shown to alleviate the potential for grass tetany. Russian wildrye remains palatable and of adequate nutritive quality for mature stock on winter maintenance rations. Russian wildrye is very high in protein and retains higher protein content than most grasses after maturity. Crude protein levels of 5 to 7 percent can be expected in late fall through winter (Sedivec et al., 2007). Because of its high palatability, it should be planted in pure stands or in alternate- or cross-hatched rows with legumes and fenced for better utilization. In a dryland study at the Bridger Plant Materials Center (PMC) from 1996 to 1999, ‘Bozoisky-Select’ Russian wildrye, when planted alone, yielded more than when planted in alternate rows with sainfoin, *Onobrychis viciifolia*. The forage nutritional quality, however, would be higher when planted with a legume. Russian wildrye is also highly palatable to wildlife, especially deer, elk, and antelope, so young stands may need to be fenced to prevent over grazing injury by these animals. The minimum stubble height to maintain stand vigor for Russian wildrye is 3 inches.

Russian wildrye is well suited to dryland pasture production as most of the growth is from the fine, basal leaves, which are difficult to pick up with haying equipment. Hay yields are lower than those of crested wheatgrass, whereas forage yields in pastures are higher. At the University of Wyoming Sheridan Research and Extension Center (SREC) from 1991 to 1995, dryland forage yields for Bozoisky-Select averaged 1.60 tons dry matter per acre. At the same time ‘Nordan’ standard crested wheatgrass averaged 1.37 tons per acre. In a dryer climate, Bozoisky-Select, ‘Mankota’, and Syn-A (later released as ‘Bozoisky II’) Russian wildrye were tested for forage yield under dryland conditions at the Bridger PMC. From 1993 to 1995, these cultivars averaged 0.46 tons per acre, 0.54 tons per acre, and 0.71 tons per acre, respectively (Majerus, 1995a). From 2010 to 2013 at the Montana State University (MSU) Central Agriculture Research Center near Moccasin (15.5 inches average annual precipitation), Bozoisky-Select and Mankota Russian wildrye had average annual yields of 0.86 tons and 0.75 tons per acre, respectively (Hybner et al., 2014).

Russian wildrye responds to additional precipitation as the forage yields of Bozoisky-Select and Mankota demonstrated from 2010 to 2013 at the MSU Northern Agriculture Research Center (NARC) near Havre. In 2010 and 2011 at NARC, rainfall was 144 percent and 129 percent of the 95-year average (6.78 inches) from April 1 through July 31. This increased the 4-year yield average of Bozoisky-Select and Mankota to 3.60 and 3.64 tons dry matter per acre, respectively, even though 2012 and 2013 rainfall for that time period was lower than the 95-year average.
Research has shown wider row spacing, especially those between 24 and 30 inches, increases the forage yield of dryland plantings (Majerus, 1995b; Hybner, 1996). From 1993 to 1996, grass species yield response to 1- and 2-foot row spacing under dryland conditions were rated at the SREC and Bridger PMC. Bozoisky-Select averaged 1.34 tons dry matter per acre yield on the 2-foot row spacing compared to 0.74 tons per acre on the 1-foot row spacing at the SREC. ‘Hycrest’ hybrid crested wheatgrass averaged 0.67 tons per acre on the 1-foot row spacing and 0.96 tons per acre on the 2-foot row spacing. The identical trial at the Bridger PMC resulted in Bozoisky-Select averaging 0.67 tons per acre on 1-foot row spacing and 0.84 tons per acre on 2-foot row spacing. For comparison, Hycrest yielded 0.59 tons per acre and 0.84 tons per acre on 1-foot and 2-foot row spacing, respectively.

Ease of Establishment

Weed control in developing Russian wildrye stands requires diligence since this species is slow to establish. During periods of extended drought, Russian wildrye may require two years to become fully established. Plant into a firm, weed-free seedbed no deeper than a ¼-inch, especially in predominately clay soils. Stands are often open because Russian wildrye is usually seeded on wide row spacings, leaving the soil surface exposed and susceptible to erosion. Because of this, Russian wildrye should always be planted in rows perpendicular to prevalent winds. As with most grasses, it should be planted on the contour when slopes are excessive. Russian wildrye has limited or no usefulness as a single species when rapid site establishment for erosion control is needed.

Stand Establishment

The recommended seeding rate for Russian wildrye (170,000 seeds per pound) is 6 pounds PLS per acre for a pure stand seeding using a drill with 12-inch spacing (Majerus et al., 2013). When planting with legumes, an alternate-row planting is recommended to accommodate differences in seedling vigor, and the seeding rates must be adjusted accordingly (Scianna et al., 2012). The most common method for adapting single box planting equipment is to cut out and place a cardboard divider in the drill box to keep the seed separated by species. When a drill is equipped with a legume and a grass box; duct tape alternate openings across each box to obtain alternate rows. When using small-seeded legumes, the legume box’s drop tubes should be pulled from the openers, the seed dropped onto the ground, and the seed pressed into the soil by the drill’s press wheels for proper depth placement. New dryland plantings should not be grazed until late-summer or fall of the second growing season. Seedlings may be severely damaged or killed by overgrazing, especially during the seedling year.

For optimum production of Russian wildrye, recommended row spacing for dryland conditions are 18 to 24 inches apart. For irrigated production or in areas having over 18 inches of precipitation,
12- to 16-inch row spacing is recommended. To attain the desired row spacing, cover the necessary drill box openings with duct tape. For example, a drill box with 7-inch row spacing would have two of every three openings covered for dryland planting (21-inch row spacing) and one of every two openings covered for irrigated planting (14-inch row spacing). Row spacing beyond 30 inches is not recommended due to concerns for water and wind erosion on the exposed soil between the rows. Forage yields are also increased by seeding mixtures with legumes in alternate-or cross-hatched rows. From 1997 to 2000 under dryland conditions at the Bridger PMC, alternate rows of Bozoisky-Select and sainfoin yielded 1.04 tons dry matter per acre compared to 0.49 tons per acre when Bozoisky-Select was grown alone. In an irrigated, 4-year trial at Powell, Wyoming, alternate-row, dry matter yields of Bozoisky-Select and sainfoin were 2.5 tons per acre and 3.1 tons per acre for Bozoisky-Select and alfalfa. At Moccasin, Montana, from 2010 to 2012, Mankota Russian wildrye, paired with alfalfa in alternate rows, had an average yield of 1.2 tons dry matter per acre under dryland conditions (Hybner et al., 2014).

**Seed Production**

Russian wildrye seed production is enhanced by wide row spacing. Row spacing of 24 inches-irrigated (seeding rate 3.0 pounds PLS per acre) to 30 inches-dryland (seeding rate 2.4 pounds PLS per acre) are recommended. Seed harvests may be difficult due to lodging and seed shattering. Yields range from 50 to 200 pounds per acre on dryland and from 100 to 500 pounds under irrigation. Seed production declines as stands age and stands may need mechanical renovation to improve seed yield. Seed production fields must have crop residue removed after harvest in order to maintain good seed yields. Light grazing should begin as soon after seed harvest as possible. For seed production, Russian wildrye benefits from low levels of fertilization based on current soil tests. The Bridger PMC applies a split application of 50 pounds N and 25 pounds of phosphorous (P$_2$O$_5$) in the early fall and spring for furrow-irrigated, ‘foundation’ seed production. Seed remains viable for up to 10 years under good seed storage conditions (when humidity in percent plus temperature in degrees Fahrenheit equals 100 or less).

**Limitations**

Russian wildrye has poor seedling vigor and is an inconsistent and generally poor seed producer. This species does not tolerate spring flooding and is generally not well adapted to the more cool and moist areas of Montana and Wyoming. It is subject to attack by grasshoppers, cutworms, and other insects, but no troublesome diseases have been noted.

**Available Cultivars**

The Russian wildrye cultivars performing the best in replicated plantings in the Northern Great Plains and Intermountain West (Idaho, Montana, Nevada, North Dakota, Wyoming, and Utah), are Bozoisky-Select, Bozoisky II and Mankota. Bozoisky-Select was chosen by the USDA-ARS at Logan, Utah, for improved seedling vigor and increased forage yield. It was released in 1984 and has shown good seedling performance. Forage yields are about 123 percent of the old variety, ‘Vinall’. The replicated plantings in Montana and northern Wyoming showed no differences between Bozoisky-Select and Bozoisky II for stand establishment or forage yield. In southern Wyoming, however, Bozoisky II had higher stand establishment than Bozoisky-Select. Bozoisky II Russian wildrye was also developed by the USDA-ARS at Logan and selected for seedling vigor (emergence from a deep planting depth), seed mass, seed yield, vegetative vigor, total dry matter production, and response to drought. It is a broad-based, 15 clone synthetic that was released in 2004. Mankota Russian wildrye was selected by the USDA-ARS at Mandan, North Dakota, for resistance to leaf spot, improved forage yields, and was released in 1991.
References


