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Cool Season Grass Variety Comparisons in Jackson County

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Summary

Two varieties of crested wheatgrass were consistently the highest yielding of six successfully esetablished cool season pasture-type grasses over a 5-year period. The crested wheatgrass also exhibited the greatest response to added nitrogen. Average longevity[1] was highest for the two varieties of crested wheatgrass and Russian wildrye.

Only three cool season hay-type grasses were productive 5 years after planting. There was no clear difference in yields of longevity of Luna and Mandan 759 pubescent wheatgrass and Oahe intermediate wheatgrass.

Objectives

The purpose of the plant nursery trial in Jackson County, South Dakota, was to (1) provide information for landowners on planting a special use pasture for grazing or hay production, (2) assimilate longterm comparative yield and longevity data to support seeding recommendations and (3) provide a visual comparison of sufficient size plantings for area residents, agency technicians and others to observe growth and survival characteristics of various grasses.

Description of Plant Nursery Location

The nursery was located on the Cottonwood Range Field Station in northwestern Jackson County. The station is about 13 miles west of Philip, South Dakota.

Surface soils in the nursery were clays derived from Pierre shales. Soil textures varied from light silty clays to heavy clay loams. Subsoils were heavy clays but with no restrictive claypan layer.

Weather data were collected daily at the station headquarters approximately 1 mile north of the nursery. Total annual, growing season and vegetation year precipitation for 1971 through 1979 are shown in table 1.

[1] Average longevity is an average of the estimates of the percentage of the seeded variety remaining in the stand in 1977, 1978 and 1979.

Procedures

Cool season grasses, planted with a Nisbet[2] grass drill in early April, 1972, included crested wheatgrass (Fairway and Nordan), Russian wildrye (Vinall), western wheatgrass (Mandan 456), green needlegrass (Lodorm and SD-93), intermediate wheatgrass (Oahe), pubescent wheatgrass (Luna and Mandan 759), smooth bromegrass (Lincoln), meadow bromegrass (ND-195), Basin wildrye (M-718), wildrye (Altai) and Garrison creeping foxtail (NDG-772). Similarly, warm season grasses were planted in early June, 1972, and included switchgrass (SD-149), sideoats grama (Pierre and Killdeer), little bluestem (ND-384), big bluestem (NDG-4), alkali sacaton and prairie sandreed. Each variety was randomly assigned to a 1/4-acre plot without replication. The entire nursery was fenced to prevent grazing by domestic livestock.

Samples were harvested in late June or early July with a Jari[2] mower. Two yield samples, each 3 x 30 feet, were mowed and weighed in the field. Subsamples, collected from whole samples, were also weighed and then oven dried to determine moisture content of the whole samples. Yields represent only weight of the seeded variety; other vegetation was separated and removed. At the end of each growing season, all plots were mowed and/or grazed as uniformly as possible to remove old growth.

Grasses were fertilized with 80 pounds per acre actual nitrogen (ammonium nitrate) in the fall of 1973 and with 60 pounds of nitrogen (urea) in April, 1978.

Results and Discussion

Average annual precipitation at the Cottonwood Station through 1973 was reported to be 14.6 inches. In 1974, that average was adjusted by the U. S. Weather Bureau to 16.1 inches.

Precipitation and probably soil moisture were above normal the year of seeding (1972) as well as the previous year (table 1). Annual and growing season precipitation were both above normal only in 1979. Although growing season precipitation was normal in 1978, June precipitation was 2.7 inches below normal. In general, precipitation was not favorable for survival and continued maximum yields of improved grass varieties during the period of the study.

Pasture-type Grasses

Visual estimates of stand density and vigor of the pasture grasses near the end of the second growing season (1973) were rated "good" or "excellent" for all varieties except Russian wildrye. Yet, yields of that variety were slightly above the average yield of all varieties in 1978 and 1979 (table 2).

Some carryover effect from the 1973 nitrogen application was evident in 1975. Plants were able to use little, if any, nutrients in the dry year of 1974. Western wheatgrass and the green needlegrass varieties did not respond to nitrogen fertilizer in 1978. Only 20% of the western wheatgrass stand was

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[2] Mention of trade names does not constitute endorsement by the authors or South Dakota State University.

estimated to be remaining in early July, 1978, and March through June precipitation was 2.23 inches below normal. Hence, there was inadequate soil moisture for most cool season grasses to respond to added nitrogen.

The two varieties of crested wheatgrass had the highest yields nearly every year and also had about 95% of the stand remaining during the last 2 years. Average yields of the two varieties over the 5 years were just over 2000 pounds per acre. The previously reported yield of crested wheatgrass at Cottonwood for 1949-53 was .47 ton per acre or about 940 pounds.

The two green needlegrass varieties had only 50 to 70% of the stand remaining in the last 2 years, while Russian wildrye had an estimated 95% remaining in both 1978 and 1979.

Hay-type Grasses

Yields of the hay-type grasses (table 2) consistently decreased between 1975 and 1979. Stands of Lincoln smooth bromegrass and Regar meadow bromegrass were, in essence, failures after 1976.

Oahe intermediate wheatgrass and Luna and Mandan 759 pubescent wheatgrass had only 50, 40 and 60%, respectively, of the seeded stand remaining in 1979. Those varieties appeared to be the only ones adaptable to dryland hay production, yet the stands were quite thin 7 years after planting. They may have had better vigor, especially in years of above normal precipitation, if they had received added nitrogen more frequently. Those varieties did not respond to nitrogen fertilizer in 1978 because of deficient cool season soil moisture.

The 11 grasses reported in table 2 were the only cool season varieties successfully established of 14 planted. All warm season grasses planted were considered to be failures.

The 8-foot wide alleys between the 1/4-acre plots were seeded to Fairway crested wheatgrass to eliminate periodic cultivation for weed control. Crested wheatgrass is a strong competitor, especially in drought cycles, and may have contributed to the decline of other seeded varieties by invading the plots.

Conclusions

New seedings should be deferred from grazing during the first two growing seasons to aid in stand establishment. Soil tests should be made before applying fertilizer. In general, soils at the Cottonwood Station nursery appear to require about 40 pounds of nitrogen annually in order for improved grass varieties to achieve maximum potential.

Based on their response to annual mowing, the grasses reported in this trial appear to require intensive management, such as fertilization and weed control, in order to prolong their life span. The pasture grasses would very likely respond differently to grazing than they did to mowing once every year.

Cost input for land preparation, seeding, deferment, fertilization, weed control and intensive grazing management must be considered before implementing a special use planting. Such plantings should be separately fenced to facilitate the intensive management required. Since the investment required for

establishing and maintaining a dryland special use pasture or hayland planting is quite large, these types of plantings should be made on productive sites on the ranch rather than on the least productive sites. Improved selections of cool season grasses can be an important addition to the ranch. Grazing such a special use pasture in spring and early summer can provide a valuable period of deferment for native range. Fall grazing may also be possible with some grasses.

Additional information on improved grasses for specific purposes may be found in South Dakota Agricultural Experiment Station Bulletin 642 and South Dakota Cooperative Extension Service Fact Sheets 546, 547, 548 and 549.

TABLE 1. TOTAL ANNUAL, GROWING SEASON AND VEGETATION YEAR PRECIPITATION AND DEPARTURES FROM NORMAL AT COTTONWOOD, SOUTH DAKOTA, 1971-79

	Total annual	Departure	Growing season[a]	Departure	Vegetation year[b]	Departure
1971	26.36	(11.71)	18.76	(7.50)	21.20	(6.55)
1972	15.68	(1.03)	13.59	(2.33)	23.18	(8.53)
1973	E16.28	(1.63)	10.71	(-.52)	13.02	(-1.60)
1974	11.96	(-4.10)	10.89	(-1.82)	16.11	(.39)
1975	E15.77	(-.29)	10.92	(-1.79)	15.14	(-.92)
1976	E11.61	(-4.45)	10.06	(-2.65)	12.21	(-3.85)
1977	20.28	(4.22)	12.41	(-.30)	15.30	(-.76)
1978	14.62	(-1.44)	12.71	(0.00)	18.86	(2.80)
1979	17.03	(.97)	13.86	(1.15)	16.75	(.69)

E = estimated.
[a] Growing season = April through September.
[b] Vegetation year = previous September through August of current growing season.

TABLE 2. ANNUAL YIELD (LB/ACRE TO NEAREST 25 LB) AND RANK (%) OF 11 SURVIVING GRASSES SEEDED APRIL 1972 AT COTTONWOOD RANGE FIELD STATION, JACKSON COUNTY, SOUTH DAKOTA, 1975-79

	1975 Yield/rank[a]	1976 Yield/rank	1977 Yield/rank	1978 Yield/rank	1979 Yield/rank
	Cool Season Pasture-Type Grasses				
Crested wheatgrass (Fairway)	3000/100	700/100	2000/100	3500/ 98	1125/ 79
Crested wheatgrass (Nordan)	2925/ 98	475/ 68	1700/ 85	3575/100	1400/ 98
Russian wildrye (Vinall)	1650/ 55	300/ 43	150/ 8	2025/ 57	1100/ 77
Western wheatgrass (Mandan 456)	1325/ 44	400/ 57	300/ 15	400/ 11	350/ 25
Green needlegrass (SD-93)	1725/ 58	650/ 93	450/ 23	1325/ 37	1075/ 75
Green needlegrass (Lodorm)	1825/ 61	600/ 86	250/ 13	1125/ 31	1425/100
Average annual yield	2075	521	808	1992	1079
	Cool Season Hay-Type Grasses				
Intermediate wheatgrass (Oahe)	1925/ 95	550/ 71	1175/ 76	1125/100	700/ 97
Pubescent wheatgrass (Luna)	2000/ 99	775/100	1550/100	1075/ 96	350/ 48
Pubescent wheatgrass (Mandan 759)	2025/100	625/ 81	1250/ 81	1075/ 96	725/100
Meadow bromegrass (Regar)	1175/ 58	500/ 65	50/ 3	-- / --	-- / --
Smooth bromegrass (Lincoln)	1800/ 89	325/ 42	125/ 8	-- / --	-- / --
Average annual yield	1785	555	830	1091	592

[a] Rank = percentage of highest annual yield in each group.