In Northwestern North Dakota

GRASS SPECIES STUDIES

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Tame grasses constitute a significant amount of the forage used for hay and pasture by farmers in northwestern North Dakota. In 1967 about 150,000 acres of introduced grasses were harvested for hay (1) while additional thousands of acres were utilized as pasture. The two species most commonly grown are crested wheatgrass and bromegrass. Both species have been evaluated extensively (2,3), but several introduced and native species have not been fully evaluated for adaptability and productiveness.

A study was initiated at the Williston Experiment Station in May, 1962, to evaluate various species for their potential in the area.

Materials and Methods:

Twelve grasses were sown at 12 pounds per acre with nine-inch row spacing on summerfallow. The trial was designed as a split plot with six replications. The plot site was fertilized with a broadcast application of 200 pounds per acre of 27-14-0 per acre before seeding. After establishment the trial was divided and 50 pounds of ammonium nitrate nitrogen per acre was applied annually in the fall to three of the replications, while the other three were not fertilized.

The soil type at the plot site is a Williams loam, typical of a large per cent of the area in northwestern North Dakota.

The grasses evaluated in this study were Nordan crested wheatgrass (**Agropyron desertorum** Fisch.), western wheatgrass (**Agropyron smithii** Rydb.), slender wheatgrass (**Agropyron trachycaulum** Link), Nebraska 50 intermediate wheatgrass (**Agropyron intermedium** Host), Vinall Russian wildrye (**Elymus junceus** Fisch.), green needlegrass (**Stipa viridula** Trin.), Pennlate orchardgrass (**Dactylis glomerata** L.), switchgrass (**Panicum virgatum** L.), and Canadian No. 1, Manchar, and Lincoln smooth bromegrass (**Bromus inermis** Leyss.). Good stands of all grasses were established except for switchgrass, which did not have sufficient stand for evaluation.

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Each grass was harvested at the bloom stage of growth. Stand and yield data were taken for the 1963-68 period and analysis of the hay for crude protein was made in 1963, 1967, and 1968.

Annual precipitation at the Williston Experiment Station for each of the six years of the study is given in Table 1.

Table 1. Annual Precipitation, July 1 to June 30 at the Williston Experiment Station. 1962-1968.

June - July	Annual Rainfall Inches	Deviation from Normal[1]
1962-1963	18.94	+4.52
1963-1964	16.09	+1.67
1964-1965	17.50	+3.08
1965-1966	10.41	−4.01
1966-1967	11.76	−2.66
1967-1968	10.27	−4.15
Average	14.16	−0.26

[1]Williston Weather Bureau data.

Results:

Pennlate orchardgrass winterkilled the first winter of the study. Pure stands of slender wheat-

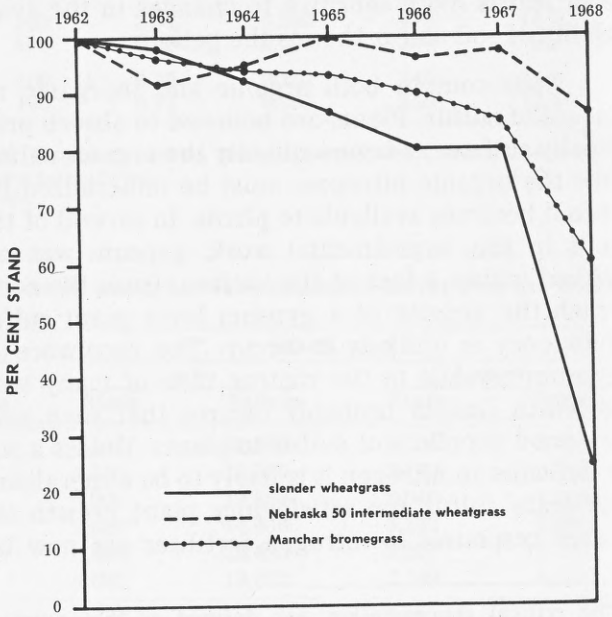

Fig. 1. Per cent stand of slender wheatgrass, Nebraska 50 intermediate wheatgrass, and Manchar bromegrass without nitrogen fertilizer at Williston, 1962-1968.

Table 2. Forage production of ten grasses without nitrogen fertilization at Williston, 1963-1968.

Entry	Tons/acre at 12 per cent moisture						
	1963	1964	1965	1966	1967	1968	Avg.
Wheatgrass							
Nordan crested[1]	1.84	1.11	1.45	0.76	0.60	0.27	1.00
western	1.00b	1.01	0.93b	0.94	0.50	0.30	0.78b
slender	1.91	0.93	0.61b	0.62	0.60	0.10	0.80b
pubescent	1.94	1.11	1.16	0.86	0.70	0.42a	1.03
Nebraska 50 intermediate	1.72	1.06	0.68b	0.54	0.69	0.29	0.83b
Bromegrass							
Canadian No. 1	1.73	1.02	0.62b	0.48b	0.54	0.22	0.77b
Manchar	1.34b	1.07	1.07b	0.70	0.80a	0.29	0.88
Lincoln	1.86	0.95	0.57b	0.61	0.77	0.31	0.84b
Vinall Russian wildrye	0.81b	0.86	0.83b	0.80	0.51	0.28	0.68b
Green needlegrass	1.14b	0.71	1.12b	0.50	0.73	0.74a	0.78b
l.s.d. @ 5%	0.37	0.61	0.32	0.28	0.20	0.14	0.14

[1]Check species
a — statistically significant yield above Nordan crested wheatgrass
b — statistically significant yield below Nordan crested wheatgrass

grass and Nebraska 50 intermediate wheatgrass decreased significantly during the trial period with or without fertilizer added and Manchar bromegrass only when fertilized. Yearly changes in stand of these grasses are illustrated in Figures 1 and 2. All other grasses had little or no stand reduction.

Annual applications of 50 pounds of N per acre had a detrimental effect on the stand of these three grasses as stand reductions were more severe in the fertilized plots than in the unfertilized plots.

Forage yields of each grass at the two fertility levels are given in Tables 2 and 3.

None of the grasses, when either fertilized or unfertilized, yielded significantly more than Nordan crested wheatgrass over the six year period. Pubescent wheatgrass yields were equal to Nordan crested wheatgrass with or without fertilization. In the unfertilized plots, Manchar bromegrass yields were similar to Nordan crested wheatgrass, and in the fertilized plots, Lincoln bromegrass yields were similar to Nordan crested wheatgrass. All other species and strains yielded significantly less than Nordan crested wheatgrass in both fertilized and unfertilized plots.

The addition of N fertilizer resulted in a statistically significant increase in average forage yields only in 1964 and 1965. In 1963 the potential response of added N fertilizer probably was not expressed because of stored available N in the sum-

Table 3. Forage production of ten grasses fertilized with 50 pounds of nitrogen per acre applied annually at Williston, 1963-1968.

Entry	Tons/acre at 12 per cent moisture						
	1963	1964	1965	1966	1967	1968	Avg.
Wheatgrass							
Nordan crested[1]	1.80	1.50	2.19	1.12	0.76	0.51	1.31
western	1.04b	1.74	1.53b	0.84	0.54b	0.53	1.04b
slender	1.91	1.80	0.26b	0.52b	0.18b	0.00	0.78b
pubescent	1.93	1.89	2.08	0.98	0.69	0.57	1.36
Nebraska 50 intermediate	1.78	1.72	0.81b	0.82b	0.68	0.42	1.04b
Bromegrass							
Canadian No. 1	1.84	1.40	1.62b	0.61b	0.70	0.42	1.10b
Manchar	1.57	1.56	1.48	0.82b	0.90	0.26b	1.10b
Lincoln	2.16	1.34	2.06	0.82b	0.74	0.34	1.23
Vinall Russian wildrye	1.10b	1.65	2.11	0.87	0.74	0.46	1.14b
Green needlegrass	1.10b	1.43	1.68b	0.70b	0.62	0.65a	1.03b
l.s.d. @ 5%	0.37	0.61	0.32	0.28	0.20	0.14	0.14

[1]Check species
a — statistically significant yield above Nordan crested wheatgrass
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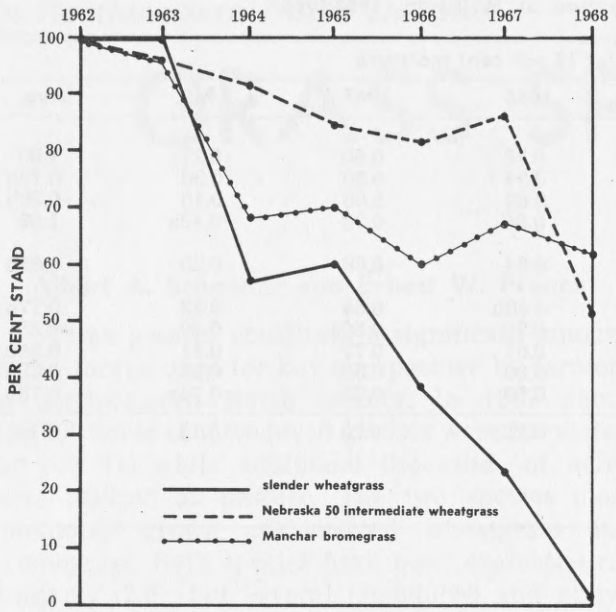

Fig. 2. Per cent stand of slender wheatgrass, Nebraska 50 intermediate wheatgrass, and Manchar bromegrass fertilized with 50 pounds of nitrogen per acre annually at Williston, 1962-1968.

merfallow and the fertilizer applied on the plots prior to the grass planting. Symptoms of nitrogen burning were evident in 1967 and 1968.

The three year average of fertilized and unfertilized forage yields from 1963-65 when precipitation was above normal and from 1966-68 when precipitation was below normal are given in Table 4.

Table 4. Forage production of ten grasses from 1963-65 and 1966-68 with and without 50 pounds of nitrogen per acre annually.

	Tons/acre at 12 per cent moisture			
	1963-65		1966-68	
Entry	No Fert	Fert	No Fert	Fert
Wheatgrass				
Nordan crested	1.47	1.83	0.54	0.80
western	0.98	1.44	0.58	0.64
slender	1.39	1.32	0.44	0.23
pubescent	1.40	1.97	0.66	0.74
Nebraska 50 intermediate	1.15	1.44	0.51	0.64
Bromegrass				
Canadian No. 1	1.12	1.62	0.41	0.58
Manchar	1.16	1.54	0.60	0.66
Lincoln	1.13	1.82	0.56	0.63
Vinall Russian wildrye	0.83	1.59	0.53	0.69
Green needlegrass	0.99	1.40	0.57	0.66
Average	1.16	1.60	0.55	0.65

In comparing the average yields of all ten grasses, the addition of fertilizer increased forage yields by 0.44 tons per acre, or 38 per cent, during 1963-65 and by 0.10 tons per acre or 18 per cent, during 1966-68.

The yield results of this trial indicate that some species respond either favorably or unfavorably, to the addition of fertilizer. This could be due, in part, to stand differences which have previously been discussed.

Although some of these miscellaneous introduced and native grass species do not yield as well as crested wheatgrass or smooth bromegrass for hay production, some may have certain advantages in pasture use in that they can be utilized at different times during the grazing season providing more flexible grass and livestock management. Vinall Russian wildrye can be grazed during the summer and fall. It maintains high forage quality and feed value all summer and into the winter, providing it has not been grazed heavily in the spring or early summer.

Crude protein in the forages at harvest time during the three years of analysis averaged 9.9 per cent in the unfertilized plots and 14.1 per cent in the fertilized plots.

Summary:

Twelve grasses were compared for their adaption and forage production in northwestern North Dakota from 1963-1968.

Stands in slender wheatgrass, Nebraska 50 intermediate wheatgrass, with or without fertilizer added and Manchar bromegrass when fertilized decreased significantly during the trial period. Pennlate orchardgrass winterkilled the first year of the study and switchgrass did not have a sufficient stand for evaluation.

None of the grasses evaluated yielded significantly more than Nordan crested wheatgrass, which was used as the check species.

An annual application of 50 pounds of N per acre increased forage yields by 38 per cent from 1963-65 when precipitation was above normal and by 18 per cent from 1966-68 when precipitation was below normal. The cost of an annual application of 50 pounds N per acre is approximately $6.00. The addition of this rate of N was not economical in years of below normal precipitation.

The addition of nitrogen fertilizer increased the protein content in the years studied by approximately 50 per cent.

Acknowledgement:

The authors are indebted to George Kapusta. former assistant agronomist, for studies conducted prior to 1964.

LITERATURE CITED:

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