LODORM GREEN NEEDLEGRASS --- A NEW VARIETY FOR REVEGETATING RANGELAND

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Green needlegrass **(Stipa viridula)** is a native perennial bunchgrass commonly found in rangelands of the northern Great Plains. The grass is adapted and has good potential for revegetating abused rangeland. Its yielding ability, nutritive quality, palatability, recovery growth and leaf-to-stem ratio are favorable characteristics. However, its use has been limited in part due to high seed dormancy. USDA scientists at the Northern Great Plains Research Center, Mandan, North Dakota, have developed the new variety, Lodorm, in an effort to make available to farmers and ranchers a variety with reduced seed dormancy (5).

Investigations have been conducted at the North Dakota Agricultural Experiment Station to determine the mechanisms responsible for dormancy, methods for reducing dormancy, and tests for predicting germination potential in green needlegrass seed. Both native and Lodorm seed were used in these investigations. Two types of dormancy exist: (1) association with presence of lemma and palea (glumes on the seed), and (2) unknown physiological mechanism(s). Dormancy in new Lodorm seed was caused more by the lemma and palea than by the physiological mechanism. In the highly dormant seed from native stands, the physiological mechanism was more influential than the presence of the lemma and palea in causing dormancy.

No practical commercial process has been devised for reducing seed dormancy. Although stratification of seed in moist sand at 2° to 4° C will reduce dormancy, this process is time consuming and difficult. The approach by plant breeders of selecting strains possessing low seed dormancy is one logical method for solving this problem. This was done in the development of Lodorm.

Rogler (3) found that seed dormancy of green needlegrass decreased with increasing age of the seed, with peak germination being reached after seven years of storage. However, he observed wide variations among strains and among years of harvest in degree of seed dormancy, age at which peak germination was reached, and period of viability. He reported that stratification in moist sand at 2° to 4°C for 60 days was superior to other treatments in relieving dormancy.

Schaaf and Rogler (4) reported that acid scarification, moist chilling, and late-fall seeding, in addition to aging, reduced dormancy. None of these methods has been entirely satisfactory, although late fall seeding is a practice farmers can use. Apparently, the thawing and freezing during late fall and early spring partially reduce dormancy so that many seeds will germinate and produce a stand in the spring.

Over a three-year period at Edgeley, North Dakota, Lodorm averaged 1.55 tons of dried hay per acre and Green Stipagrass averaged 1.45 tons (Table 1). Lodorm green needlegrass and Primar slender wheatgrass were similar in productivity, and both yielded less than Lincoln bromegrass at Edgeley in 1963 and 1965 (Table 2). At Langdon, North Dakota, based on a three-year average, both Lodorm green needlegrass and Nebraska 50 inter-

Table 1. Forage production of Lodorm and Green Stipagrass green needlegrass harvested once annually at Edgeley, 1960-63.[1]

Variety	Tons dry matter/Acre			
	1960	1961	1963	Average
Lodorm	1.51	1.09	2.05	1.55
Green Stipagrass	1.65	1.24	1.45	1.45

[1]Lodorm not harvested in 1962 as plants retained as seed source for seed dormancy investigations.

Table 2. Forage production of Lincoln bromegrass, Lodorm green needlegrass and Primar slender wheatgrass harvested twice annually at Edgeley during 1963 and 1965.[1]

Species	Tons dry matter/acre		
	1963	1965	Average
Lincoln	2.55	2.73	2.64
Lodorm	1.85	2.08	1.96
Primar	1.84	1.85	1.84

[1]Lodorm not harvested in 1964 as plants retained as seed source for seed dormancy investigations.

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Table 4. Pounds of seed per acre of several grasses seeded in 2-foot spaced rows and solid stand at Fargo, 1965-69.

Species	Pounds per acre[1]											
	Row						Solid					
	1965	1966	1967	1968	1969	Ave	1965	1966	1967	1968	1969	Ave
Lodorm green needlegrass	378	255	269	259	92	251	520	244	309	359	141	315
Neb. 50 intermediate wheatgrass	346	97	117	280	227	213	190	13	23	76	16	64
Nordan crested wheatgrass	503	297	483	517	326	425	304	125	246	359	116	230
Vinall Russian wildrye	696	123	185	147	272	285	476	43	43	84	81	145
Southland bromegrass	286	273	243	356	127	257	110	258	241	497	145	250
Climax timothy	551	401	212	263	382	362	293	247	265	184	204	239

[1]Yields are averages from plots fertilized annually in the fall with 0, 33, 66, 100 and 133 pounds of nitrogen per acre.

mediate wheatgrass yielded approximately three tons of dried forage per acre, which was approximately 0.5 and 0.3 ton less than Lincoln bromegrass and Nordan crested wheatgrass, respectively. Bromegrass is the preferred grass species for hay and pasture in northeastern North Dakota. Lodorm was more productive than Primar slender wheatgrass, Vinall Russian wildrye and Climax timothy during the three years at Langdon.

Table 3. Forage production of Lodorm green needlegrass and several other grasses harvested twice annually at Langdon, 1963-65.

Species	Tons dry matter/acre			
	1963	1964	1965	Average
Lodorm green needlegrass	3.89	2.47	2.54	2.97
Lincoln bromegrass	4.40	2.54	3.41	3.45
Nebraska 50 intermediate wheatgrass	4.03	2.08	2.76	2.96
Primar slender wheatgrass	3.26	.91	1.71	1.96
Vinall Russian wildrye	2.97	2.24	2.28	2.50
Climax timothy	3.25	1.85	1.55	2.22
Nordan crested wheatgrass	4.14	2.68	2.90	3.24

Seed production of Lodorm has been satisfactory under North Dakota conditions. Trials were conducted at several locations in the state to determine seed production potential in rows spaced 2 and 3 feet apart and in solid seeding (6-inch spacing). In general in eastern North Dakota most grasses produce more seed in cultivated rows than in solid stands and approximately 100 pounds of nitrogen per acre applied annually in the fall or early spring have given highest economic yields. However, Lodorm has not responded similarly to row spacing and to the nitrogen levels in that yields generally have been good in solid stands and at lower levels of nitrogen. Earlier tests showed that green needlegrass does not show nitrogen deficiency as much in solid stands as several other grasses (1).

Seed yields at Fargo are shown in Table 4. During four of the five years, yields of Lodorm, were higher in solid stands than in two-foot spaced rows. Seed yields are averages from individual plots fertilized annually in the fall with 0, 33, 66, 100, and 133 pounds of nitrogen per acre. Lodorm was the highest yielder in solid stands with 315 pounds of clean seed per acre as compared to 250 pounds for Southland bromegrass, the second highest yielding grass. In contrast, Lodorm produced better in three-foot spaced rows than in solid stand at both Langdon and Edgeley (Table 5).

Native grassland has been the primary source of seed of green needlegrass in the Great Plains. However, with the release of Lodorm, a new variety with reduced seed dormancy, the source of this seed will be from fields seeded and managed for seed production. Investigations in North Dakota have shown forage and seed production of Lodorm green needlegrass has potential and should be considered for revegetation of abused rangeland.

Previous studies (2,4) indicate that seed dormancy in green needlegrass is inversely related to maturity. This is especially critical since seed in the lower panicle branches is still immature when that in the upper branches has ripened and started to shatter. It is not surprising, therefore, that differences of a few days in harvest date can make large differences in seed dormancy. Seed harvest must be timed carefully to avoid excesses in both shattering and immaturity.

The market for Lodorm green needlegrass seed will be limited. It probably should be grown

Table 5. Pounds of seed per acre from several grasses seeded in 3-foot spaced rows and solid stands at Edgeley in 1964 and at Langdon in 1963-64.

	Pounds per acre[1]							
	Edgeley		Langdon					
	1964		Row			Solid		
Species	Row	Solid	1963	1964	Ave	1963	1964	Ave
Lodorm green needlegrass	312	237	307	157	232	154	147	150
Lincoln bromegrass	500	155	206	109	158	147	73	110
Primar slender wheatgrass	1057	879	308	71	190	461	52	256
Vinall Russian wildrye	241	106	70	286	178	132	60	96
Climax timothy	176	—[2]	384	170	277	359	127	243
Nordan crested wheatgrass	298	171	410	312	361	227	142	184

[1]Yields are averages from plot fertilized annually in the fall with 0, 50 and 100 pounds of nitrogen and 200 pounds of 0-46-0 per acre.
[2]Stand too thin in solid stand.

only under contract for delivery to a definite market. Limited amounts of Foundation Lodorm seed is available from the North Dakota Agricultural Experiment Station cooperatively with the Northern Great Plains Research Center, USDA, Mandan, North Dakota. Requests for Foundation seed should be directed to the Seed Stocks Project, in care of David Ebeltoft, at North Dakota State University, Fargo.

LITERATURE CITED

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FROM THE DIRECTOR (From Page 2)

protein in the bran than others, thus it is not transferred to the milled flour), and speck count are measured.

Following the milling of the wheat to flour, it is possible to develop further measurements of quality as the flour is converted to bread dough. Plasticity of the dough is recorded on Farinograph machines, the mixing time which is critical in automatic machine bakeries is measured, and the elastic properties of the dough are determined.

And finally, as the dough is allowed to ferment and then is baked into a loaf of bread, the loaf volume, crust color, crumb color, panning characteristics, and absorption are among the useful factors which are measured.

Quality of the durum wheat is determined in a similar manner to hard red spring wheat, except instead of the baking of the dough into bread the semolina is extruded into spaghetti or macaroni where similar characteristics may also be determined.

It is true that the domestic and foreign millers do not buy wheat from our area on the basis of a specific variety. Rather, this geographical area has developed a reputation over time as being dependable for consistently high quality from the several varieties produced each year. Therefore, the quality reports of our total crop are a reflection of the total or average quality of all the varieties combined during a particular season. These quality determinations can be accepted with a high degree of confidence so long as all the wheat, or at least a high percentage of it, is produced from varieties having comparable quality characteristics.

To the present time the North Dakota Agricultural Experiment Station has maintained a program of hard red spring and durum wheat research and information directed toward the dual objectives of maintaining as high a yield **and** as high a quality among our wheat varieties as we can. Based upon numerous visits by foreign trade teams and frequent consultation with domestic processors, it is our belief we have a unique market, both domestic and foreign, which is based upon this concept of quality. And unless the currently utilized standards of the several factors are at least maintained, if not improved, we stand the distinct risk of losing this unique market. Alternative sources of lower quality wheat are available to the millers. These sources would have an economic advantage over our area if our wheats were not of any higher quality than wheat from those areas.

A market once lost due to lowering of quality can be most difficult, if not impossible, to regain.