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Use of Seed Coating and Fungicide Seed Treatment in Establishing Alfalfa

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Establishing a good stand is an important step in the efficient and profitable production of alfalfa. Site selection, seedbed preparation, seeding method, depth of seeding, and other agronomic factors can affect stand establishment.

In some cases, seed and seedling diseases can be a significant problem in alfalfa. Damping-off (caused by Pythium spp. and Phytophthora megasperma) generally is recognized as the primary disease problem affecting alfalfa establishment. Problems due to damping-off can be significant, particularly when alfalfa is planted into poorly drained soils. In addition to site selection, fungicide seed treatment is one way to minimize losses from damping-off.

For maximum plant vigor and N-fixing capability, inoculation of alfalfa seed with the appropriate rhizobia bacteria prior to planting is essential. Seed coating is a relatively new development in the alfalfa seed industry. Lime is used as the seed coating base to which rhizobia and possibly fungicide seed treatments are added. Seed coating is intended to increase stand density compared to noncoated seed, but results have been variable.

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The primary objective of the following study was to compare alfalfa stand establishment, disease activity, and yield in coated and noncoated alfalfa seed in combination with various fungicide seed treatments.

Materials and Methods

Plots were established at Brookings and Beresford in 1991 and again in 1992. In each case, a low, wet area was used for planting to encourage seedling disease.

Plots were seeded in late April of each year using the variety "Arrow." Each plot consisted of five rows 20 feet long with 6-inch row spacings. The experimental design was a randomized complete block with four replications. Seed treatments and coatings were applied prior to seeding (Table 1).

Rhizo-Kote is a seed coating of lime, *Rhizobium*, and other additives (CelPril Industries, Manteca, CA). It accounts for 1/3 of the total weight in coated seed (Table 1). Thus, seeding at 15 lb/A constitutes seeding 10 lb/A of actual alfalfa seed.

Apron is a fungicide seed treatment with particular activity against *Pythium* spp. and *Phytophthora* spp. Rovral (ipridione) has reported activity against *Scierotinia, Rhizoctonia, Fusarium* and *Helminthosporium*. Quantum 4000 (*Bacillus subtilis*) is a general seed inoculant. At the time of the study, Apron was the only labeled treatment for use on alfalfa.

Initial stand counts were taken in early June by counting the total number of plants per one meter section in each of two center rows in each plot. Plots were harvested for dry matter yield determination three times per year with a sickle-bar mower. The entire total forage in each plot was weighed, and then a subsam-

Table 1. Alfalfa seed treatment information.

Treatment	Seeding Rate (lb/A) (alfalfa seed + treatment)
Rhizo-Kote	15
Rhizo-Kote + Apron	15
Rhizo-Kote + Rovral	15
Rhizo-Kote + Quantum 4000	15
Rhizo-Kote + Apron + Rovral	15
Noncoated*	15
Noncoated*	10
Noncoated + Apron*	15

*Noncoated treatments inoculated with Rhizobium prior to planting.

ple taken, weighed, dried at 140° F in a forced-air dryer, and re-weighed. Forage dry matter yield was calculated from total-plot fresh weight and subsample dry matter concentration.

Final stand counts were taken in the fall by excavating a 2.1 ft^2 area in the middle of each plot and counting total number of roots.

Disease observations were made in each plot when seedlings were initially counted (ex. damping-off) and after final harvest when plants were dug (ex. root/crown rot). All data were averaged across replications and analyzed using analysis of variance procedures (Tables 2 and 3). A least significant difference (LSD) was used to determine differences among treatment means.

Results and Discussion

Significant differences among treatments were found for initial seedling counts taken in 1991 at both locations (Table 2). In each case, the noncoated seed plus Apron planted at 15 lbs/A had the highest count. This treatment provided significantly higher counts than all of the coated treatments at Beresford and for all of the coated treatments except one at Brookings.

Differences among the noncoated treatments were not significant, except at the Beresford location in which the noncoated treatment plus Apron at 15 lbs/A provided higher counts than the noncoated treatment without Apron at 10 lbs/A.

Damping-off was not observed during initial stand counts.

For total forage yield, there were no significant differences among treatments at Beresford, but at Brookings the two noncoated treatments seeded at 15 lbs/A produced higher yields than the Rhizo-Kote treatment and the noncoated treatment seeded at 10 lbs/A (Table 2).

Final stand counts taken in the fall provided results similar to initial seedling counts in that the noncoated treatments generally produced the highest values. The exception was the noncoated treatment seeded at 10 lbs/A at Beresford, which provided final counts similar to the coated treatments.

It is interesting to note that the noncoated treatment seeded at 10 lbs/A at Brookings had a slightly higher stand count than the noncoated treatment seeded at 15 lbs/A. Visual inspection of roots and crowns showed no evidence of root/crown rot diseases in any treatment.

In 1992, a season which was dry early, no significant differences were detected among the treatments for initial stand counts at either location (Table 3). In fact, initial counts in 1992 were approximately 2.5 and 4 times lower at Beresford and Brookings, respectively, than were reported in 1991.

Damping-off was not observed during initial stand counts.

No significant differences among treatments were found for total forage yield at either location (Table 3). At Brookings no significant treatment differences were detected for final stand counts, but at Beresford the noncoated treatments seeded at 15 lbs/A had higher counts than four of the other treatments. Visual inspection of roots and crowns showed no evidence of root/crown rot diseases in any treatment.

It is not surprising that the noncoated treatments seeded at 15 lbs/A had, in some instances, higher initial and final stand

Table 2. Initial and final stand counts and forage yields of alfalfa established with different seed treatments at Beresford (BF) and Brookings (BK), South Dakota in 1991.

Treatment	Initial Count		3-cut Yield		Final Count	
	BF	BK	BF	BK	BF	BK
	seedling/m		Tons/A		plants/ft^2	
Rhizo-Kote (RK)	62	84	4.0	5.8	31	34
RK + Apron	60	89	4.2	6.1	32	39
RK + Rovral	53	81	4.2	6.0	27	31
RK + Quantum 4000	62	93	3.9	6.3	33	39
RK + Apron + Rovral	51	90	4.0	6.0	25	37
Noncoated (15 lbs/A)	78	108	4.3	6.5	45	41
Noncoated (10 lbs/A)	67	104	4.1	5.9	28	47
Noncoated + Apron	97	117	4.3	6.5	45	52
LSD (.05)*	26	35	NS	0.5	11	10

*Treatment means separated by less than the LSD for each column are not considered to be statistically different at the .05 level. NS indicates no significant difference between any of the treatments for that column.

Table 3. Initial and final stand counts and forage yields of alfalfa established with different seed treatments at Beresford (BF) and Brookings (BK), South Dakota in 1992.

Treatment	Initial Count		3-cut Yield		Final Count	
	BF	BK	BF	BK	BF	BK
	seedling/m		Tons/A		plants/ft²	
Rhizo-Kote (RK)	24	18	4.6	4.0	39	19
RK + Apron	26	18	4.7	4.0	37	24
RK + Rovral	28	21	5.0	3.7	43	21
RK + Quantum 4000	28	15	5.0	3.7	35	21
RK + Apron + Rovral	25	14	4.8	3.9	31	25
Noncoated (15 lbs/A)	32	26	5.1	4.1	55	27
Noncoated (10 lbs/A)	27	16	4.2	3.9	41	21
Noncoated + Apron	30	21	4.9	4.3	55	29
LSD (.05)*	NS	NS	NS	NS	15	NS

*Treatment means separated by less than the LSD for each column are not considered to be statistically different at the .05 level. NS indicates no significant diference between any of the treatments for that column.

counts than the other treatments. This can be attributed to seeding 50% more seed than the coated treatments.

An interesting comparison is between the noncoated treatment seeded at 10 lbs/A and the coated treatments, since all of these had the same amount of alfalfa seed. In all cases, except for Brookings in 1991, these treatments had similar stand counts and yield.

Although no damping-off was noted in any of the trials, there was a trend for increased stand counts where Apron was used, whether on coated or noncoated seed. This suggests some disease activity was present and fungicide seed treatment may be of value.

Based on the results of this study, it is more likely to see a benefit from fungicide seed treatment than from seed coating.

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