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Seeding Alfalfa with Fluid Fertilizer

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Timely seedings are important to getting vigorous alfalfa stands. Persistent spring rains can result in untimely seedings. Use of fluid fertilizer as a carrier of alfalfa seed has not been thoroughly studied by agronomists. Advantages of using this seeding technique are speed of operation and completing two tasks, seeding and addition of nutrients, with one field application.

The objectives of the research were to determine the effect two fluid fertilizers, 10-34-0 and 4-10-10, and water had upon Sinorhizobium mehloli retention and survival, and germination and emergence of alfalfa seed that had a peat inoculant, a clay-based inoculant (Dormal), or a coating (Rhizo-Kote XL, a combination of ground limestone, inoculant and fungicide) and agitated for 0, 10, 20 and 40 minutes. Amount of fertilizer used did not exceed a nitrogen application rate of 30 lbs. per acre. A laboratory method 'determined Most Probable Number (MPN) of rhizobia per seed, a greenhouse procedure evaluated growth and nodulation of alfalfa (Leonard Jar), and germinator chamber, greenhouse, and field experiments provided germination or emergence data.

Block x treatment effects were pooled into experimental error and F-tests performed to determine whether treatments were significant ($P < 0.05$) or highly significant ($P < 0.01$). Where F-tests were significant, Student-Newman-Keuls (SNK) multiple range test was used to discern differences among treatment means at $P < 0.05$.

Rhizo-Kote XL seed had more rhizobia per seed than peat- or Dormal-inoculated seed, but all methods of providing inoculant were susceptible, in relative terms, to rhizobia loss with agitation (Table 1). Length of agitation, 10, 20 or 40 minutes, did not influence number of rhizobia per seed remaining on the seed or washed into the carrying solution. Seed in the 10-34-0 carrying solution had higher rhizobia counts per seed than seed in the water or 4-10-10 solutions.

Rhizo-Kote XL seed agitated in water did result in more rhizobia per seed originating from the carrying solution than peat- or Dormal-inoculated alfalfa seed (Table 2). Water did allow better survival of rhizobia than 10-34-0 or 4-10-10.

With use of the Leonard Jar procedure, Rhizo-Kote XL and Dormal-inoculated seed averaged more than four of five plants having nodules while peat-inoculated seed averaged 3.23 of five plants having nodules (Table 3). Carrying solution and time of agitation did not result in significant dry matter production or nodulation differences.
The only treatment variable with negative impact upon normal seed germination in the germinator chamber was the 10-34-0 carrying solution. Germination was reduced approximately 9 percentage units with 10-34-0 carrying solution as compared to water, 77.3) versus 86.2 %. Less alfalfa emergence in the greenhouse and field were not observed, however, with use of 10-34-0 fluid fertilizer as compared to other carrying solutions. (Table 4) Increased agitation time was not a deterrent to germination or emergence in the germinator chamber, greenhouse or field.

The prototype sprayer used in the field experiment aggressively agitated alfalfa seed and most of the Rhizo-Kote XL on the alfalfa seed had been removed within several minutes. However, when a commercial floater rig with 10-34-0 fluid fertilizer was used to document what would happen with field-scale equipment virtually all of the Rhizo-Kote XL was retained.

Based upon this research, expanded use of seeding alfalfa with fluid fertilizers by alfalfa growers should be considered if timeliness of operation can be improved and nutrient needs met with the application. Rhizobia death and alfalfa seed emergence with the use of 4-10-10 or 10-34-0 fluid fertilizers as a carrier should not be a concern to the producer.

Table 1. Most Probable Number of live rhizobia per alfalfa seed originating from the seed as influenced by seed treatment and carrier following agitation.[1]

Carrier	Seed Type			
	Rhizo-Kote XL	Peat	Dormal	Mean
	----------Log 10----------			
None	4.0699	1.6523	2.5859	2.7694
Water	1.9371	1.2612	0.7733	1.3239 y
10-34-0	3.7963	1.8762	1.6429	2.4385 x
4-10-10	2.9787	1.4664	0.5208	1.6573 y
Weighted Mean n=20	3.0207 a	1.5464 b	1.1397 b	

1 SNK mean comparison in rows utilize a, b, designation (P< 0.01) and mean comparison in columns utilize x, y designation (P< 0.05).

Table 2. Most Probable Number of live rhizobia per alfalfa seed originating from the

carrier as influenced by seed treatment and carrier following agitation.[1]

Carrier	Seed Type			
	Rhizo-Kote XL	Peat	Dormal	Mean
	----------Log 10----------			
Water	1.7116 a x	0.8025 b x	0.7755 b x	1.0965 x
10-34-0	0.2265 a y	0.2999 a x	1.0756 a x	0.5340 y
4-10-10	0.3480 a y	0.1466 a x	0.3605 a x	0.2832 y
Mean	0.7620	0.4145	0.7372	

[1]SNK mean comparison in rows utilize a, b, designation and mean comparison in columns utilize x, y designation ($P < 0.05$).

Table 3. Shoot, root and total dry matter weight per alfalfa plant and nodulation scores with different methods and internal controls[1].

Seed Type	Dry Weight			Nodulation Score
	Shoots	Roots	Total	Number of Plants, 0-5
	----------g----------			
Rhizo-Kote XL	0.3128	0.1551	0.4679	4.20 a
Peat	0.2591	0.1191	0.3782	3.23 b
Dormal	0.2737	0.1471	0.4208	4.03 a
Controls				
- N	0.0226	0.0262	0.0488	0
+ N	0.1874	0.0768	0.2642	0

[1]Comparison between designated means significant at $P < 0.05$

Table 4. Emergence of different alfalfa seed inoculation seed types in the greenhouse and field following agitation in different carriers.

Carrier	Greenhouse			Field	
	Seed Type				
	Rhizo-Kote XL	Peat	Dormal	Rhizo-Kote XL	Dormal
None (no agitation)	85.5	90.0	85.0	63.6	75.2
Water	82.3	84.8	84.0	---	---
10-34-0	81.8	86.2	82.2	74.2	78.3

4-10-10	82.3	83.2	82.8	80.6	79.7