



Baker Seed Technologies, Inc.  
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JRM Chemical  
Liquid Polymer and Polymer Compound Seed Coating Ingredients  
12 April – 5 June 2019

**Introduction**

The objectives of this trial were to determine differences in (1) germination vigor; (2) germination viability; (3) plant mass dry matter; and (4) speed and percentage of turf establishment, between five samples of raw uncoated and coated tall fescue grass seed samples of the same variety, crop year and lot numbers including control treatments. Control treatments will be uncoated seeds. Active ingredient treatments included graphite polymer compound and a biostimulant formulation.

IDENTIFIER	RANDOM	REP	CROP	VARIETY	LOCATION	GRAMS				
						SEED	BIO (SLURRY)	BIO (DRY)	POLY+BIO (DRY)	POLY+GRA (DRY)
2060	2	2	TF	Rain Dance	FARM	200				
2061	1	2	TF	Rain Dance	FARM	200	2			
2062	3	2	TF	Rain Dance	FARM	240		3		
2063	4	2	TF	Rain Dance	FARM	200			5	
2064	5	2	TF	Rain Dance	FARM	200				2

Optimum treatment with highest speed of germination and % germs, maximum grams dry matter, and turf establishment, was identified as **2064 POLY+GRA (DRY)**.

**Materials and Methods**

Acquired trials data was recorded for entry into Microsoft Excel spreadsheets and imported into computer software programs for statistical analysis

Greenhouse trials

Greenhouse environment was calibrated to optimum cool season growing conditions of 12.8°C (55°F) dark / 21.1°C (70°F) light with 14 h day lengths. Industry-standard grow-in irrigation regime will be conducted until conclusion of trial.

Study 1 Seed germination vigor: this study determined differences in speed of germination and consisted of five treatments grass seeds X 36 plastic cones (2.5 cm X 12.0 cm per cone) X three reps = 540 experimental units. From 12 – 29 April germination data was collected every two days. Results follow:



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**SPEED OF GERMINATION**

**Descriptive Statistics**

Treatments	N	N Missing	Mean	Standard Deviation	SE of Mean
2061	3	0	11.1516	6.0889	3.5154
2060	3	0	14.2640	7.8800	4.5495
2062	3	0	14.6961	5.3172	3.0699
2063	3	0	15.7735	1.7667	1.0200
2064	3	0	17.8276	2.1657	1.2504

**SPEED OF GERMINATION**

**ANOVA**

	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	71.1201	17.7800	0.6573	0.6353
Error	10	270.5047	27.0505		
Total	14	341.6249			

At the 0.05 level, the population means are not significantly different.

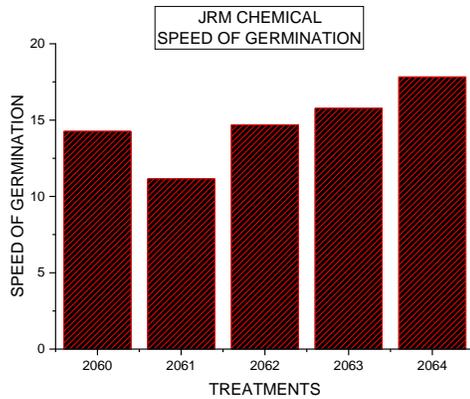
**SPEED OF GERMINATION**

**Fisher Test Means Separations**

Treatments	MeanDiff	SEM	t Value	Prob
2060 2061	3.1124	4.2466	0.7329	0.4804
2062 2061	3.5445	4.2466	0.8347	0.4234
2062 2060	0.4321	4.2466	0.1018	0.9210
2063 2061	4.6219	4.2466	1.0884	0.3020
2063 2060	1.5095	4.2466	0.3555	0.7296
2063 2062	1.0774	4.2466	0.2537	0.8049
2064 2061	6.6760	4.2466	1.5721	0.1470
2064 2060	3.5636	4.2466	0.8392	0.4210
2064 2062	3.1315	4.2466	0.7374	0.4778
2064 2063	2.0541	4.2466	0.4837	0.6390



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Study 2 Seed germination viability: this study determined differences in percentage of germination and consisted of the same 540 experimental units as Study 1 (above). From 12 April – 9 May germination data was collected every seven days. Results follow:

**GREENHOUSE % GERM**

**Descriptive Statistics**

Treatments	N Analysis	N Missing	Mean	Standard Deviation	SE of Mean
2061	3	0	0.3889	0.2003	0.1157
2060	3	0	0.5000	0.3204	0.1850
2062	3	0	0.4907	0.1530	0.0883
2063	3	0	0.5093	0.0642	0.0370
2064	3	0	0.6389	0.0278	0.0160

**GREENHOUSE % GERM**

**ANOVA**

	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	0.0950	0.0237	0.6940	0.6130
Error	10	0.3421	0.0342		
Total	14	0.4370			

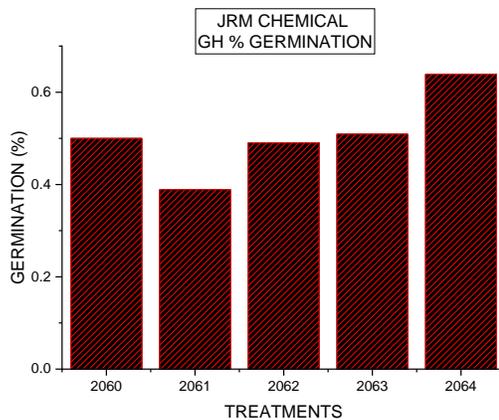
At the 0.05 level, the population means are not significantly different.



**GREENHOUSE % GERM**

**Fisher Test Means Separations**

Treatments	MeanDiff	SEM	t Value	Prob
2060 2061	0.1111	0.1510	0.7358	0.4788
2062 2061	0.1019	0.1510	0.6745	0.5153
2062 2060	-0.0093	0.1510	-0.0613	0.9523
2063 2061	0.1204	0.1510	0.7971	0.4439
2063 2060	0.0093	0.1510	0.0613	0.9523
2063 2062	0.0185	0.1510	0.1226	0.9048
2064 2061	0.2500	0.1510	1.6555	0.1288
2064 2060	0.1389	0.1510	0.9197	0.3794
2064 2062	0.1482	0.1510	0.9810	0.3497
2064 2063	0.1296	0.1510	0.8584	0.4108



Study 3 Plant dry matter: this study consisted of the same 540 experimental units as Study 1 (above). On 3 June germinated plants were extracted from the tubes and roots were washed with tap water to remove all soil media. Treatment with the least number of germinated plants set the standard for number of plants extracted from all treatments. Cleaned plant material was dried in a moisture oven. Resulting dry matter was weighed on a laboratory scale with data recorded in grams for analysis. Results follow:



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**DRY MATTER**

**Descriptive Statistics**

Treatments	N Analysis	N Missing	Mean	Standard Deviation	SE of Mean
2060	3	0	0.3348	0.0275	0.0159
2061	3	0	0.3465	0.0923	0.0533
2062	3	0	0.4181	0.0741	0.0428
2063	3	0	0.3855	0.0787	0.0454
2064	3	0	0.4165	0.0492	0.0284

**DRY MATTER**

**ANOVA**

	DF	Sum of Squares	Mean Square	F Value	Prob> F
Model	4	0.0180	0.0045	0.9601	0.4701
Error	10	0.0467	0.0047		
Total	14	0.0647			

At the 0.05 level, the population means are not significantly different.

**DRY MATTER**

**Fisher Test Means Separations**

Treatments	MeanDiff	SEM	t Value	Prob
2061 2060	0.0117	0.0558	0.2102	0.8377
2062 2060	0.0833	0.0558	1.4930	0.1663
2062 2061	0.0716	0.0558	1.2828	0.2285
2063 2060	0.0507	0.0558	0.9084	0.3851
2063 2061	0.0390	0.0558	0.6982	0.5010
2063 2062	-0.0326	0.0558	-0.5847	0.5717
2064 2060	0.0817	0.0558	1.4644	0.1738
2064 2061	0.0700	0.0558	1.2542	0.2383
2064 2062	-0.0016	0.0558	-0.0287	0.9777
2064 2063	0.0310	0.0558	0.5560	0.5904



Research Farm trials

Research Farm trials were conducted with industry-standard grow-in irrigation regime until conclusion of trial.

Study 4 turf establishment: this study determined differences in speed and percentage of turf establishment and consisted of five treatments grass seeds planted in 5 ft.<sup>2</sup> plots X three reps = 15 experimental units. From 12 April – 5 June digital establishment data was collected every seven days. Results follow:

**FARM TURF ESTABLISHMENT**

**Descriptive Statistics**

	N	N	Standard	SE of	
Treatments	Analysis	Missing	Mean	Deviation	Mean
2061	4	0	7.00	0.8165	0.4083
2060	4	0	5.50	2.0817	1.0408
2062	4	0	6.00	0.8165	0.4083
2063	4	0	6.00	1.4142	0.7071
2064	4	0	7.25	0.9574	0.4787

**FARM TURF ESTABLISHMENT**

**ANOVA**

	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	8.8000	2.2000	1.2816	0.3209
Error	15	25.7500	1.7167		
Total	19	34.5500			

At the 0.05 level, the population means are not significantly different.



**FARM TURF ESTABLISHMENT**

**Fisher Test Means Separations**

Treatments	MeanDiff	SEM	t Value	Prob
2060 2061	-1.5000	0.9265	-1.6191	0.1263
2062 2061	-1.0000	0.9265	-1.0794	0.2975
2062 2060	0.5000	0.9265	0.5397	0.5973
2063 2061	-1.0000	0.9265	-1.0794	0.2975
2063 2060	0.5000	0.9265	0.5397	0.5973
2063 2062	0.0000	0.9265	0.0000	1.0000
2064 2061	0.2500	0.9265	0.2698	0.7910
2064 2060	1.7500	0.9265	1.8889	0.0784
2064 2062	1.2500	0.9265	1.3492	0.1973
2064 2063	1.2500	0.9265	1.3492	0.1973

			MEANS			
			GREENHOUSE			FARM
IDENTIFIER	CROP	TREATMENT	SPEED OF GERMINATION	% GERMS	DRY MATTER	TURF ESTABLISHMENT
2060	Tall Fescue	CONTROL	14.260	0.500	0.335	5.500
2061	Tall Fescue	BIO (SLURRY)	11.152	0.389	0.347	7.000
2062	Tall Fescue	BIO (DRY)	14.696	0.491	0.418	6.000
2063	Tall Fescue	POLY+BIO (DRY)	15.773	0.509	0.385	6.000
Soil Moist Seed Coat	Tall Fescue	POLY+GRA (DRY)	17.828	0.634	0.417	7.250
Low $\mu$						
High $\mu$						

Speed of Germination showed that 2064 POLY+GRA ( $\mu=17.828$ ) exceeded 2061 BIO SLURRY ( $\mu=11.152$ ). Greenhouse % Germs showed that 2064 POLY+GRA ( $\mu=0.634$ ) exceeded 2061 BIO SLURRY ( $\mu=0.389$ ). Dry Matter results showed that both 2064 POLY+GRA ( $\mu=0.417$ ) and 2062 BIO DRY ( $\mu=0.418$ ) exceeded 2060 RAW ( $\mu=0.335$ ). Farm Turf Establishment results showed that both 2064 POLY+GRA ( $\mu=7.250$ ) and 2061 BIO SLURRY ( $\mu=7.000$ ) exceeded 2060 RAW ( $\mu=5.500$ ).

Optimum treatment with highest speed of germination and % germs, maximum grams dry matter, and turf establishment, was identified as 2064 POLY+GRA (DRY).