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Extension FactSheet

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2000 Ohio Soybean Inoculation Trials

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Sixteen inoculation products and three related materials were evaluated at six test sites in Ohio in 2000. Each treatment was replicated eight times at each site. The N1, N2, C1, C2, S1, and S2 sites were in Henry, Huron, Mercer, Delaware, Preble, and Clinton counties respectively.

Planting dates for the six sites were May 17, 8, 12, 6, 11, 15 respectively. Harvest dates were October 14, 10, 11, 4, 13, 12 respectively. At all test sites the previous crop was corn, and the soybean variety used was Noscoe 288RR. The N1, N2, C2, and S1 sites were no-till, and the C1 and S2 sites received conventional tillage in the fall. Plant stands, weed control, and soil fertility were very good at all six sites.

Weather had a significant effect on the results of these tests. All the products tested this year have performed very well in other years or at other test locations. Because we are dealing with biological products and a biological system, these products are sometimes negatively affected by weather. Too dry, too wet, and too hot can kill the bacterial cells or prevent their function in the field even though they survive. While all test sites were tiled and had good internal drainage, the relatively flat topography at the N1, N2, C1, and C2 sites resulted in surface flooding and saturated soil due to excessive rainfall for three weeks after planting. This resulted in most plots having reduced growth and small plants at harvest. Some of these sites received double-the-normal rainfall in June. Depending on the soil, micro-relief plots were differentially affected by the excessive water. The soil at these four sites contained 2.0 to 2.5 percent organic matter.

The S1 and S2 sites had good surface and subsurface drainage and were not adversely affected by slightly greater than normal rainfall. At harvest, plant size was normal at the S1 site. Plants were very tall and lodged at the S2 site. Grain yield was very good at both sites. The soil organic matter at the S1 and S2 sites was 2.5 and 5.5 percent respectively. Both sites had alternating moist and dry periods, which resulted in greater than normal oxidation of organic matter and subsequent release of large amounts of nitrogen, which probably masked the effect of nitrogen fixed by the Bradyrhizobium bacteria.

The yield increase produced by various soybean inoculation products at the six test sites is presented in Table 1. Table 2 contains information about several inoculation products.

Table 1. The Effect on Grain Yield of Soybean Inoculation Materials in Ohio in 2000

Location		N1	N2	C1	C2	S1	S2
Yield of Untreated Check Treatment		47.4	42.0	47.4	46.4	55.5	59.0
Company	**Product**	**Bu/Ac Yield Increase above Untreated Check**					
Urbana	Frozen Prep	—	2.5	3.0	2.2	—	0.7
Urbana	Mega Prep	—	0.3	0.1	—	—	1.4
Urbana	Exp. PreInoc	—	0.9	—	—	1.6	1.2
MicroBio	HiStick2	—	—	2.5	3.3	2.9	1.2
MicroBio	HiCoat	1.3	0.2	4.0	2.0	1.6	2.8
MicroBio	Exp. Liquid	—	—	0.1	0.4	1.0	—
LiphaTech	Cell-Tech 2000	—	—	1.0	1.4	0.3	—
LiphaTech	Cell-Tech 2000 + ApronMaxx	0.4	—	2.7	0.9	0.4	0.9
LiphaTech	NitraStick S	0.4	—	1.2	3.6	3.2	—
LiphaTech	Exp. Peat	0.6	—	0.2	0.7	4.5	1.0
Bird	T-22*	—	—	—	0.9	3.0	2.5
Bird	T-22 + Mega Prep	0.3	—	1.0	—	—	0.5
Trace Chemical	Nitro-Fix Liq. Inoc	0.4	2.5	—	0.8	0.9	0.9
Bios Ag.	Initiate/Signal*	—	0.9	2.6	—	2.3	1.7
Bios Ag.	Exp. A2000	0.9	—	—	1.1	—	
Loveland	SowFast	1.6	—	2.0	2.1	1.1	2.1
Loveland	Exp. Inoc	—	0.7	3.2	—	4.1	3.8
Agribiotics	PulseR	0.9	1.2	—	—	—	0.5
Agribiotics	Power-Pack	0.1	—	2.1	—	2.4	—

* **T-22** is a biological disease control product. **Initiate/Signal** is a chemical that stimulates existing soil Bradyrhizobium to infect soybean roots and produce nodules.

Observations and Recommendations

Six years of inoculation evaluation, including 43 field trials and 2000 plots, indicate that inoculating soybeans is a very profitable practice. Although the results have not always been positive, the long-term result is a profit of 400 to 500 percent. For many products, a yield increase of half a bushel per acre is profitable.

Dry and liquid formulations of the same product appear to perform similarly. Once the carrier of the inoculum dries on the seed, the bacterial cells start dying. Inoculated seed should be planted as soon as possible after treatment (four hours or less) so the bacterial cells will remain moist and survive long enough to infect soybean roots following germination.

When applying a fungicide or using fungicide-treated seed, be sure the fungicide has dried before applying inoculum to the seed. Currently, most inoculation products may NOT be mixed with fungicides and applied to seed together. One exception is that liquid formulations of inoculum may be mixed with ApronMaxxRTA fungicide and applied together. Work is underway to develop formulations of fungicides that can be mixed and applied with inoculants.

When loading a drill or planter using an auger, liquid or dry inoculation materials should be added to the seed as it enters the auger for thorough application. When loading a planter or drill from bags, fill the seed box to a depth of three inches and scatter an appropriate amount of inoculum over the seed and mix thoroughly. Continue to add seed in six-inch layers, treating each until the box is filled. With some dry materials, it may be necessary to slightly moisten seed to increase adherence. A few small specks of inoculum on each seed is adequate. At the recommended use rate, there will be more than 500,000 bacterial cells on each seed. Excessive amounts of inoculum on seed can reduce seed metering by up to 35 percent.

Table 2. Comparative Information about Several Soybean Inoculation Products.

Product Name	Formulation	Cells/gm. Product	App. Rate/100# seed	Cost ($)/100 # seed	Days Viable on Seed	
					Treated	Untreated
Frozen Prep	Liq.	2.5×10^{11}	1.0 ml*	$2.91	(4 hours)	1
Mega-Prep	Dry	2×10^{9}	4.4 oz	$4.83	7	7
HiStick	Dry	4×10^{9}	2.8 oz.	$3-3.50	1	1
HiCoat	Dry, Liq.	4×10^{9}	5.6 oz.	$3-4.00	30	30
Cell-Tech 2000	Liq.	2×10^{9}	4.2 oz.	$2.00	(4-24 hrs.)	4
NitraStik S	Dry	2.5×10^{8}	8.0 oz.	$1.34	(4 hours)	1
Nitro-Fix	Liq.	2×10^{9}	4.2 oz	$1.83	(4-24 hrs.)	4
SowFast	Dry	2×10^{9}	4.0 oz.	$3.12	(12 hours)	(12 hours)
Initiate/Signal	Liq.	———	1.0 oz.	$6.69	14	14
PulseR	Dry	2×10^{9}	7.6 oz.	$2.65	(4 hours)	(4 hours)
Power-Pack	Dry, Liq.	1×10^{9}	See Label	$1.98	(4 hours)	(4 hours)

* Must be diluted before application.

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