

EFFECTS OF PHOSPHORUS SOLUBILIZING SEED INNOCULANT PENNICILLIUM BILAIAE (JUMPSTART™) ON YIELD OF WHEAT, PEA AND LENTIL

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Intro

Phosphorus nutrition is key to strong stand establishment and yield, but phosphorus can be difficult to deliver because much of the applied P is quickly immobilized in the soil. Microbial activity is an important part of the P cycle that transfers phosphorus from tightly bound soil forms to plant available forms.

Novozymes has been testing phosphorus solubilizing organisms at the farm scale (20+ acres) for commercialization since 1988 leading to the commercialization of Jumpstart™ in 1997. Over that time we have conducted 171 wheat trials, 186 pea trials and 37 lentil trials. These on-farm trials allow farmers to see products tested by farmers on farm land with commercial farm equipment. The statistical resolution then comes from swamping the variability between sites with large numbers of sites.

Methods

In these trials, each site is treated as a replicate and analyzed using a paired comparison test comparing bushels per acre yield in inoculated plots vs. uninoculated plots. Normality of the data was tested using the Shapiro Wilkes normality test. The wheat and pea data were not normally distributed so they were analyzed with a two sample non-parametric test (Wilcoxin Sign-Rank). Data was then plotted with histograms (Figures 1-3) indicating the frequency of yield differences between the inoculated and uninoculated plots for each crop. Mean yield change was calculated and average percent change in yield (Figure 4) was calculated from the means. 95% confidence intervals were calculated around the mean yield differences.

Sites

Trials were conducted on farm fields primarily in the northern plains. All participating farmers recorded yields with weigh wagons or gps yield monitors.

Location	Lentil	Pea	Wheat	Total
Alberta	2	40	43	85
Idaho		4	3	7
Kansas		1	3	4
Manitoba	2	19	23	44
Minnesota			5	5
North Dakota	6	24	17	47
Nebraska			3	3
Ontario			1	1
South Dakota			3	3
Saskatchewan	29	96	70	195
Washington		5		5
Total	39	189	171	

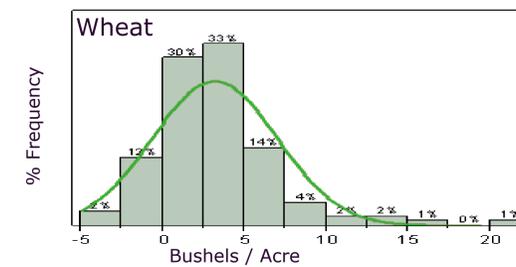


Figure 1. Histogram indicating the frequency of wheat sites with yield differences between plots inoculated with *Penicillium bilaiae* and uninoculated plots. Mean yield in uninoculated plots was 45.9 bushels/acre.

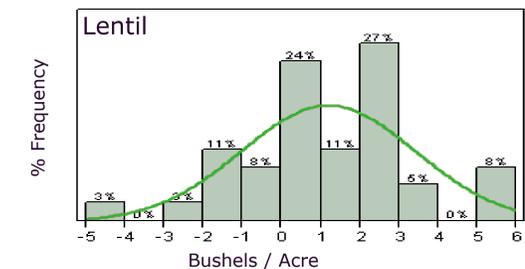


Figure 3. Histogram indicating the frequency of pea sites with yield differences between plots inoculated with *Penicillium bilaiae* and uninoculated plots. Mean yield in uninoculated plots was 24.6 bushels/acre.

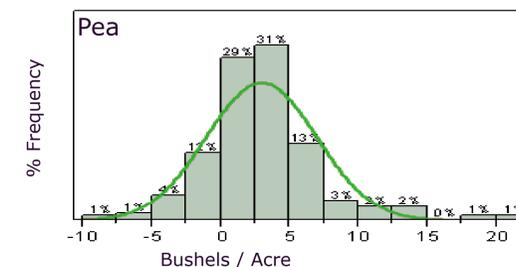


Figure 2. Histogram indicating the frequency of pea sites with yield differences between plots inoculated with *Penicillium bilaiae* and uninoculated plots. Mean yield in uninoculated plots was 40.3 bushels/acre.

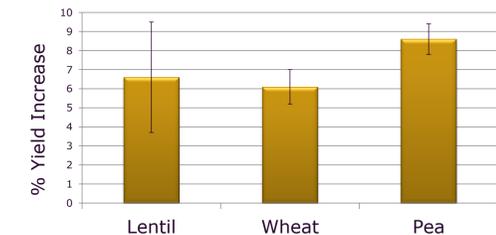


Figure 4. Mean percent yield increase for *Penicillium bilaiae* inoculated plots of lentil, wheat and pea compared to uninoculated plots ± standard error of the mean. N = 39 for lentil, 171 for wheat, and 189 for pea.

CONCLUSIONS

These on farm research trials provide a farms eye view of how Jumpstart works in commercial operations. Small plot trial work has higher statistical resolution, but lower practical applicability. When done in large numbers of sites adequate statistics can be applied to give an accurate portrayal of the range of efficacy of this *Penicillium bilaiae* based product.

These trials represent nearly 400 farms in 11 states/provinces. Positive yield responses were recorded in 77% of the wheat trials averaging 5.3 % yield increase, 82% of the Pea trials averaging an 8.3% yield increase, and 76% of the lentil trials averaging a 5.5% yield increase.

