# Use of Grower's Secret Pro on Chickpea Dry Land Farming

Summary of study sponsored by Grower's Secret Inc.
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## ABSTRACT

Grower's Secret Pro was tested on chickpea, pea, and lentil as foliar sprays and as a seed treatment. Plant growth and yields were similar between GSPro treatments and controls. However, application of a 1:20,000 and 1:40,000 dilutions of GSPro in a solution of 1% hydroxypropylmethyl cellulose on chickpea seed resulted in yield increases ranging from 14% to 21%. This may have occurred through early stimulation of root growth which would give a competitive advantage to treated seedlings. Depending on chickpea market prices, a single GSPro seed treatment has the potential to reverse a negative return on investment into a positive ROI.

## INTRODUCTION

In 2002, Grower's Secret Inc. (then operating as Advanced Biological Research, LLC) sponsored a graduate research study at the University of Idaho in Moscow, ID. Dr. W. Chun was an associate professor of Plant Pathology in the Department of Plant, Soil and Entomological Sciences and had been collaborating with Bryan Hiromoto since 1995 on this novel mushroom technology. Multiple investigation lines were initiated. One was to evaluate use of the first generation of Maui LCF Syrup (now GS Pro) in dry land cropping systems. The second was to examine biological activities. The third was to chemically characterize the activities. This report summarizes the findings from the field study.

The LCF produced at that time was 32-fold less concentrated than the Grower's Secret Pro (GSPro) that is manufactured today by Grower's Secret, Inc. Hence one fluid ounce of GSPro is equivalent to one quart of LCF. All the information presented in this summary has recalculated amounts of GSPro used to reflect current formulation of the concentration.

Dry land farming poses unique challenges to the grower. Crops depend exclusively on precipitation in the form of snow and rain. This can be as low as 9 inches per year. Most of the moisture is delivered as snow and enters the soil profile in the spring and recedes through the growing season. In the Pacific Northwest, no rain falls until late June/early July when up to an inch of rain may fall. Crop seeding must occur once equipment can enter fields and must be completed before water has receded past the planting zone. Plants that can aggressively pursue water deeper in the soil profile will be more productive. Foliar and seed treatments with GSPro were examined in the greenhouse and in the field on dry grain legumes commonly grown in the Pacific Northwest and Upper Midwest. Results of these studies are reported below.

## MATERIALS AND METHODS

For all foliar applications in the greenhouse and in the field, GSPro was diluted 20,000-fold (4 drops/gallon) in water. Leaves were sprayed to wetness (drops almost ready to fall from leaves) either once or twice a month. Green pea, Spanish brown lentil, and Dwelle chickpea were used in these studies. Greenhouse studies recorded emergence and plant growth rate for one month. Field studies recorded emergence, plant height/date, date to 50% flowering, and yields were recorded. The experiment was repeated twice.

For seed treatments, a range of GSPro (1:5,000 to 1:40,000) dilutions in a 1% solution of hydroxypropyl methylcellulose (HPMC, mw 10,000) was used on green pea, Spanish brown lentil, and Dwelle chickpea. One ml of the GSPro + HPMC mix was used to treat 100 gm of seed. Controls received HPMC treatment only. Greenhouse trials recorded emergence only. For field trials, a 1:20,000 and 1:40,000 dilution of GSPro in 1% HPMC was used to treat Dwelle chickpeas. A third treatment used GSPro at a 20,000-fold dilution plus the fungicides Maxim (0.8 oz/cwt) and Captan (0.8 oz/cwt). Since Maxim and Captan utilize stickers, HPMC was not mixed in this treatment. Plots were planted in a CRP plot design with 4 replicates per treatment in Genesee, and in Moscow, ID. Emergence and yield data were recorded.

Separately, Wilbur-Ellis conducted additional field trials with GSPro as a seed treatment in conjunction with George F. Brocke and Sons.

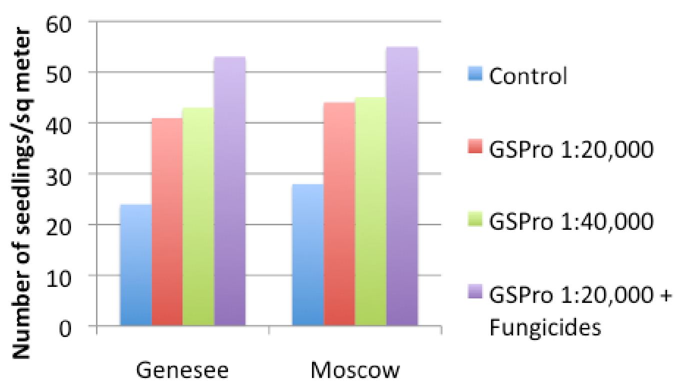
**RESULTS AND DISCUSSION**

No significant differences were observed with foliar applications on peas, and lentils grown in the greenhouse and field trials. Data is not reported. There are two reasons for this result. In greenhouse trials, results often do not correspond to what occurs in the field since growing conditions are artificial. The watering of plants daily in the greenhouse provides all the water the plant needs. Second, leaves of peas, chickpeas, and lentils have a significant waxy layer that would impede leaf penetration by GSPro.

Slight differences in emergence were observed with seed treatments. There was a slight decrease in seedling emergence with the 1:5,000 and 1:10,000 dilutions of GSPro in HPMC while there was no decrease in HPMC treated seed compared to non-treated seed (data not shown). GSPro in HPMC treatments of 1:20,000 were slightly higher. To evaluate whether this would translate to significant yield increases, field trials were conducted. Chickpeas were selected as it was gaining in popularity in the area and field plots were limited in size.

Two years of field trials using GSPro mixes with HPMC were conducted. Data from the second year is presented in this summary. Original report can be found in Appendix I.

Figure 1. Emergence of GSPro treated Dwelly chickpea is significantly higher than non-treated controls.



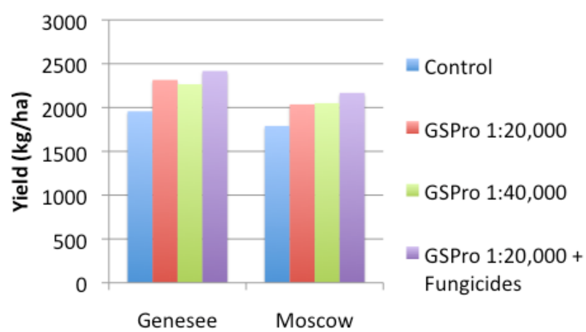

Seed treatment with Grower's Secret Pro significantly increased seedling emergence counts (Figure 1) by 70%, 79%, and 121% for the GSPro at 1:20,000, 1:40,000, and 1:20,000+fungicides treatments respectively at the Genesee test site. Similar increases in emergence of 60%, 61%, and 96% were observed at the Moscow test site. These results demonstrate that a single GSPro treatment applied to the seed can have drastically improved plant growth. The HPMC was used as a sticker to localize GSPro near the seed. In addition, HPMC is hydroscopic and helps draw water to the germinating seed. The additions of fungicides improve emergence numbers because of the resident population of phytopathogenic fungi in the test sites (*Aphanomyces* and *Pythium*).

These results are significant since organic chickpea growers have no option for *Aphanomyces* and *Pythium* management. GSPro is OMRI listed and can be used for organic chickpeas.

The increase in emergence resulted in significant increases in yield (Figure 2). Treatments with GSPro at dilutions of 20,000-fold, 40,000-fold, and 20,000-fold+Fungicides increased yields at Genesee by 18%, 16%, and 24%, and 14%, 15%, and 21% at Moscow compared to the control respectively.

After observing these results, Doug Floch (Wilbur-Ellis field representative) and Bert Brocke (George F. Brocke and Sons) ran independent field tests with peas and chickpea. A consistent observation with GSPro treatments were roots that penetrated deeper into the soil profile (Figure 3). This provides a selective advantage for dry land cropping as faster, deeper growing roots will be better able to chase after water. Currently, George F. Brocke offers GSPro treatment as a premium service supplemental to their seed treatment nutrient package.

Figure 2. Yields of GSPro treated Dwelly chickpea is significantly higher than non-treated controls.




In the first year offered, 40,000 pounds of chickpea were treated. In the second year of offering, 376,000 pounds of chickpea were treated. Farmers are reporting an average of 400 pounds per acre increase.

## ECONOMIC ANALYSIS

In 2010, US chickpea prices were near $600 per ton ($30/100 pounds). Average yield of chickpea ranges from 600 to 1200 pounds per acre with a production cost of $200 per acre. Hence, each acre earns $20 to $160. The average yield increase of 400 pounds per acre estimated by farmers who use the GSPro treatment would see an increase between 30% and 60% with a single seed treatment. Seed treatment cost was $1 per hundred pounds (average seeding rate for one acre). Hence at a 30% increase on a low yielding field of 600 pounds/acre would yield 780 pounds earning a gross of $234 per acre. Subtracting production cost ($200) and seed treatment cost ($1) nets a $33 dollar return on investment as opposed to a $20 loss without the GSPro treatment. It is reasonable to assume that GSPro can make a difference between profit and loss in a low cash value crop.

## CONCLUSIONS

Dry land crops such as corn, grain, and dry grain legumes are important agricultural commodities for a majority of the cultivated agricultural lands. Profitability depends on low inputs, and small positive returns multiplied over large acreages. In this study, we were able to demonstrate that at less than a 0.5% input cost for GSPro, that a significant return could be realized. Based on reports from George F. Brocke and Sons, farmers are experiencing a $120 return per acre for the $1/acre premium charged for GSPro seed treatment. While our results with foliar applications were not successful, it is possible that the addition of a sticker or foliar penetrant may yield positive results. This would be significant since dry land crops do receive foliar applications of fertilizer (if increased protein content is needed) or chemicals (insecticides or fungicides) and GSPro could easily be combined with such treatments.

GSPro seed treatment data clearly demonstrates that it can be successfully used in dry land farming. GSPro is one of the few organic products that can function well under a wide range of agricultural growing conditions.

LCF Effect on Chickpea germination, growth, and yield.
From: W. Chun. University of Idaho.
Date: 1/28/2003

2002 Field plots in Genesee and Moscow Idaho.

Experimental treatments
Seed treatment effect (1:64 and 1:128 dilutions with water, 1 ml/100 gm seed)
Foliar application X 3 rates X Application date
Application dates 06/27/02
Application rates 1:500, 1:1000 and 1:5000 with water.

There were no significant interactions with foliar applications. Data is available if needed. These were replicated plots (4) at each site, 6'X20', randomized complete block. Significance level at p=0.05, Tukeys HSD.

Significant increases in plant density (stand establishment) and yield were observed with LCF, and LCF + fungicide treatments at both test sites.

| | Genesee | | | Moscow | |
|---|---|---|---|---|---|
| Treatment | Yield (kg/ha) | Plants/sq meter | | Yield (kg/ha) | Plants/sq meter |
| None | 1957 c | 24 c | | 1790 c | 28 c |
| LCF 1:64 | 2315 ab | 41 b | | 2036 a | 44 b |
| LCF 1:128 | 2266 b | 43 b | | 2050 b | 45 b |
| LCF + fungicides | 2417 a | 53 a | | 2167 a | 55 a |

Fungicides included Maxim at 0.8 oz/cwt and Captan at 0.8 oz/cwt.

Summary:

1. Treatment with LCF can significantly increase germination and establishment of chickpea. This is the likely reason for the increase in yields since no significant differences were observed in plant height, or plant fresh weights (data not shown).
2. LCF can be combined with fungicide treatments to increase stand establishment.