Applying Humic Acid In-Furrow: Is It Profitable?

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Introduction

Potatoes are an important crop, with about 6,833 acres grown in PA (NASS 2022). Many soil treatment products are marketed towards potato farmers, including those containing humic acids. Humic acid is a mix of large organic molecules that is industrially made from lignite or leonardite brown coal (Mikkelsen 2005). This mixture is soluble and can contain Humic Acid, Fulvic Acid, and trace nutrients (Mikkelsen 2005).

There are many proposed benefits to using humic acid during the season: improving nutrient uptake, increasing soil health, growing more vigorous plants, and achieving higher yields. Previous studies have shown mixed results of these claims. Hopkins and Stark (2003) found a positive yield increase to using humic acid, whereas Suh et al. (2014) found little benefit to yield.

While application time can vary, many of these products can be applied in-furrow on or around the potato seed piece. In 2023, an experiment was conducted to evaluate the claims of using humic acid in-furrow at planting.

Materials and Methods

The varieties Lehigh and Waneta were chosen for this experiment. Lehigh is a popular yellow table variety in Pennsylvania, and Waneta is a popular white variety used for both fresh and processing markets. The trial was conducted at two field sites: a Leck Kill soil type under center pivot irrigation, and a Calvin-Leck Kill soil type under no irrigation. The following products were evaluated: Black Label Zn, Duo Maxx, Fertiactyl, Humi-Flex FA, Hydra-Hume, and Monty's Carbon.

A split block design was utilized. Potato seed was hand cut and planted via a mechanical planter in May 2023; each treatment was applied prior to row closure over the seed piece. Treatments were applied at label rates for each product. Plot management including hilling, fertilization, pest management, and vine kill was conducted according to commercial practices. Plots were harvested in October and subsequently graded via Gejo's Smart Grader Reader for size and weight. Soil treatments were evaluated for effect on emergence, yield, tuber appearance/defects, and tuber disease.

Visual observations were taken for tuber disease and appearance. Tuber disease and appearance were scored on a 1-7 scale with 1 being no observed disease or blemishes and 7 being 100 percent incidence.

References

Hopkins, B., & Stark, J. (2003). Humic Acid Effects on Potato Response to Phosphorus. Idaho Potato Conference, 87–91.

Mikkelsen, R. L. (2005). Humic Materials for Agriculture. Better Crops, 89(3).

National Agricultural Statistics Service. (2022). United States Department of Agriculture.

Suh, H. Y., Yoo, K. S., & Suh, S. G. (2014). Tuber growth and quality of potato (Solanum tuberosum L.) as affected by foliar or soil application of fulvic and humic acids. Horticulture Environment and Biotechnology, 55(3), 183–189.

Results

Dryland Field Site Emergence

Variety	Treatment	Percent Emergence	
Lehigh	Black Label	96	A
Lehigh	Duo Maxx	93.5	A
Lehigh	Fertiactyl	87.5	A
Lehigh	Humi-flex FA	91.75	A
Lehigh	Hydra-Hume	84.75	A
Lehigh	Monty's Carbon	85	A
Lehigh	Control	89.75	A
Waneta	Black Label	94.25	A
Waneta	Duo Maxx	93.5	A
Waneta	Fertiactyl	86.5	A
Waneta	Humi-flex FA	93.25	A
Waneta	Hydra-Hume	88.25	A
Waneta	Monty's Carbon	88.25	A
Waneta	Control	93.5	A

Dryland Field Site Yield

Variety	Treatment	Yield (lbs)	
Lehigh	Black Label	66.6±3.14	A
Lehigh	Duo Maxx	69.7±3.14	A
Lehigh	Fertiactyl	69±3.14	A
Lehigh	Humi-Flex FA	67.8±3.14	A
Lehigh	Hydra-Hume	68.2±3.14	A
Lehigh	Monty's Carbon	61.8±3.14	A
Lehigh	Control	73±3.14	A
Waneta	Black Label	54.9±3.14	B
Waneta	Duo Maxx	53.1±3.14	B
Waneta	Fertiactyl	54.2±3.14	B
Waneta	Humi-Flex FA	51.6±3.14	B
Waneta	Hydra-Hume	54.5±3.14	B
Waneta	Monty's Carbon	52.5±3.14	B
Waneta	Control	55.1±3.14	B

Discussion

Preliminary data show no statistically significant difference between yield for any treatment and the control for both field sites. Some treatments had higher yield than the control, but this trend was not consistent between field sites. Plot emergence between treatments was not significant either, nor displayed any trends for both field sites. During grading, black scurf severity appeared to differ between plots; however, this too had no significance when compared to the control for both trial sites. All other tuber observations were non-significant.

These preliminary data add to the debate on whether the proposed benefits of using humic acid can be realized commercially. Field sites can differ dramatically between soil health, organic matter, and parent material, further complicating attempts to elucidate trends in the data.

Overall, these preliminary data show that there is no return on investment for PA farmers to utilize humic acid products while planting potatoes. Further research is needed to see if there is a benefit on other soil types in PA and across the United States.

In 2023, the price of humic acid soil treatments ranged from $6 - $35 per acre. At the high end of this range, a typical potato farm of 50 acres can subsequently save an average of $1,750 by not applying any treatment. In addition to material costs, a farmer can save on labor and logistics: label use rate is high and the material stains and clogs application equipment.

Next Steps

This experiment will be repeated in 2024 and 2025 over 4 new field sites. In 2024, rate of emergence will be documented as well as any chemical changes to the soil around the seed piece. pH and EC will be some of the chemical indicators analyzed.