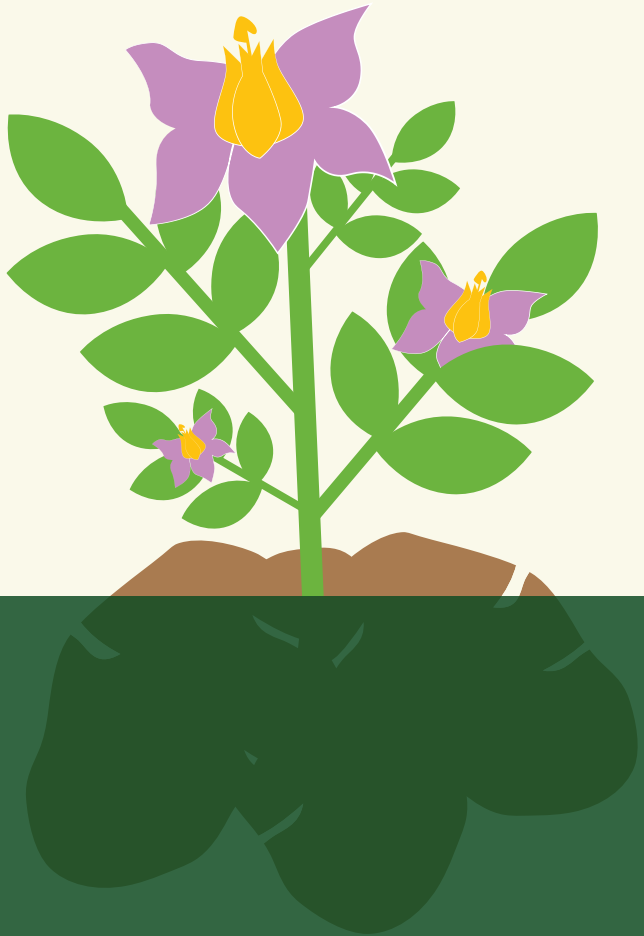
FŪSN™

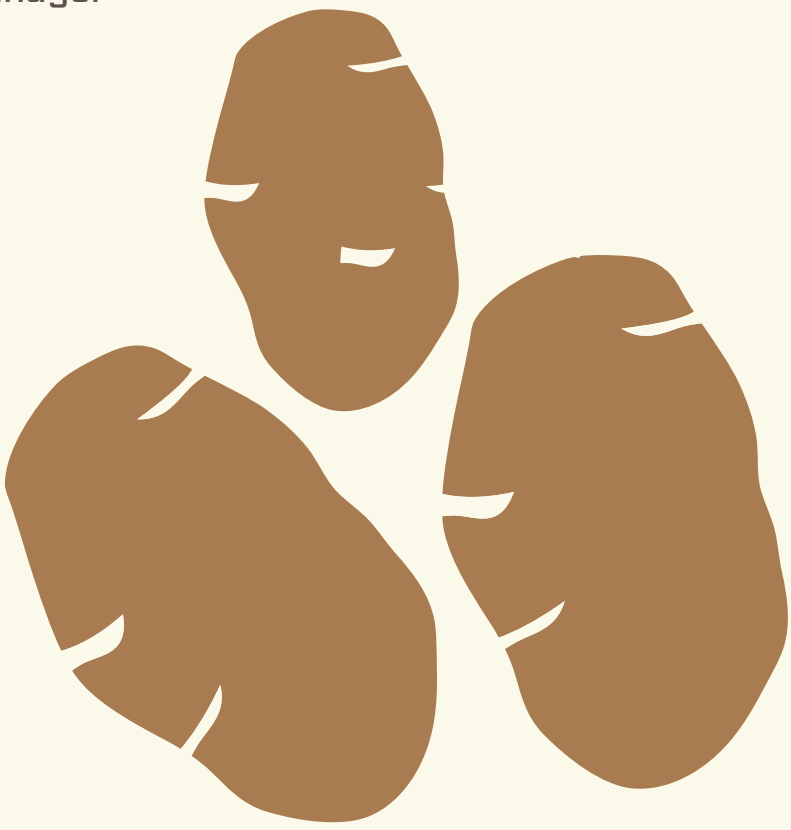
Fused-Safe Nutrients™

FŪSN™ Technical Bulletin—Potato Evaluation

Terry A. Tindall, Ph.D., Director of Agronomy,
and Galen Mooso, Ph.D., Agronomy Manager

Arena Valley, Idaho, 2014–2015





Simplot

Bringing Earth's Resources to Life

Potato crops require both nitrogen (N) and sulfur (S) in adequate amounts and at the right time to help maximize yield, quality, and economic returns to both growers and processors. Nitrogen management can impact both vine development and tuber growth. Sulfur along with N are required for amino acid synthesis which relate directly to proteins being developed that are essential for all aspects of plant health and tuber development.

Fused Safe Nutrients (FŪSN) is a new N fertilizer formulation that provides both N and S in immediate, plant-available forms. This is a dry granule that is made up of both ammonium and nitrate N sources as well as S in the sulfate form. This fertilizer product is made by chemically fusing the ammonium sulfate and ammonium nitrate to produce a fertilizer that is similar in nutrient value to ammonium nitrate, but with very low risk of detonation, which has severely limited traditional ammonium nitrate throughout much of the U.S. The FŪSN™ fertilizer is compatible with other fertilizer materials in creating prescription blends and is safe to transport.

Objective

Compare the differences of FŪSN with traditional ammonium sulfate fertilizers in irrigated potato production for improving N use efficiency, yield, potato quality, and economic returns.

Procedures

Field trials were conducted in 2014 and 2015 in the Arena Valley area of SW Idaho on grower fields being irrigated by sprinklers. Soils were sandy loam coarse textured and neither field had potatoes being produced in the rotation for several years. Ranger Russet potatoes were produced in 2014 and Umatilla potatoes produced in 2015. The 2015 treatments included a preplant application of ammonium sulfate of 25 lbs/ac, 100 lbs/ac S, 20 lbs/ac potassium magnesium sulfate (KMag), and 4 lbs/ac Mn. Planter band liquid included: 10 gal/ac 11-37-0 + 3 gal/ac thiosulfate, 2 gal/ac humic acid (Golden Bio®), 1 qt/ac EDTA Zn, 1 qt/ac EDTA Mn, and 1 qt PHT BioMax (biological plant growth stimulator). Mean soil test analysis before sampling indicated: soil pH = 7.7, cation exchange capacity (CEC) = 13.1, organic matter = 1.65, soil test phosphorus = 81 (Very High), soil test potassium = 591. 2014 soils and fertilizer applications were similar to 2015.

In 2015 the field was divided into four 160 acre sections with Fūsn being applied to two alternating sections of the field and a similar blend of AMS being applied to the remaining portions of the field. These nutrients were applied at a rate of 100 lbs N/ac topdressed after planting, but prior to emergence. All fertilizer materials were then incorporated with the final tillage operation. The remaining N was applied during the season as urea ammonium nitrate 32-0-0 (UAN) solution with the irrigation water as needed based on tissue analysis (plant petioles).

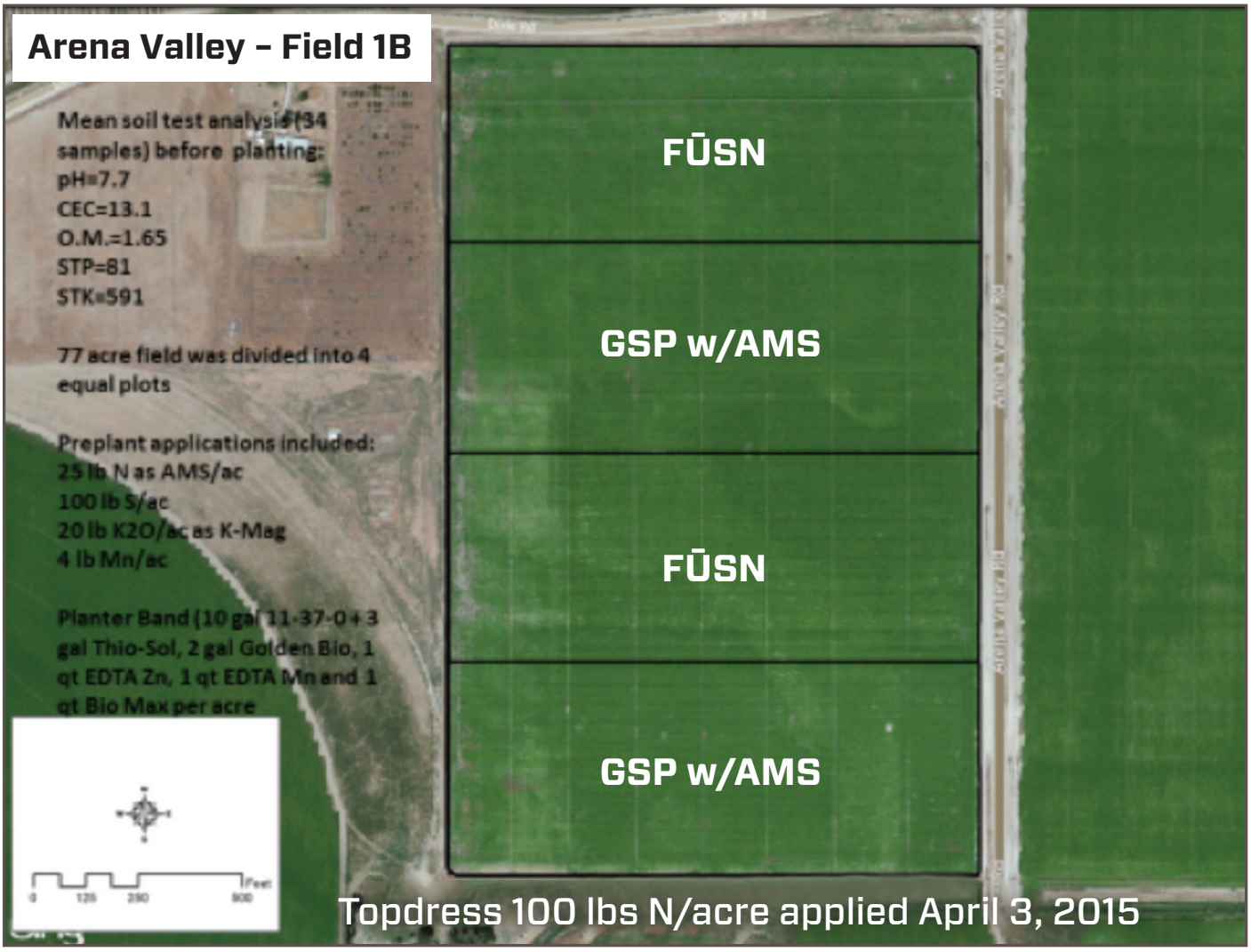


Figure 1. Plot plan and fertilizer applications for 2015 FŪSN evaluation on Umatilla potatoes produced near Wilder, Idaho.

Potatoes were planted on May 20, 2015, on 32-inch rows with 12 inches between each seed piece. All crop protectants were applied according to Simplot Grower Solutions crop advisor recommendations. The field was irrigated with a liner sprinkler irrigation system and water delivered based on the recommendation of maintaining water content of 65–70% within the soil to avoid stress. Petiole samples were taken about every 10 days beginning 6/15 and ending 8/14.

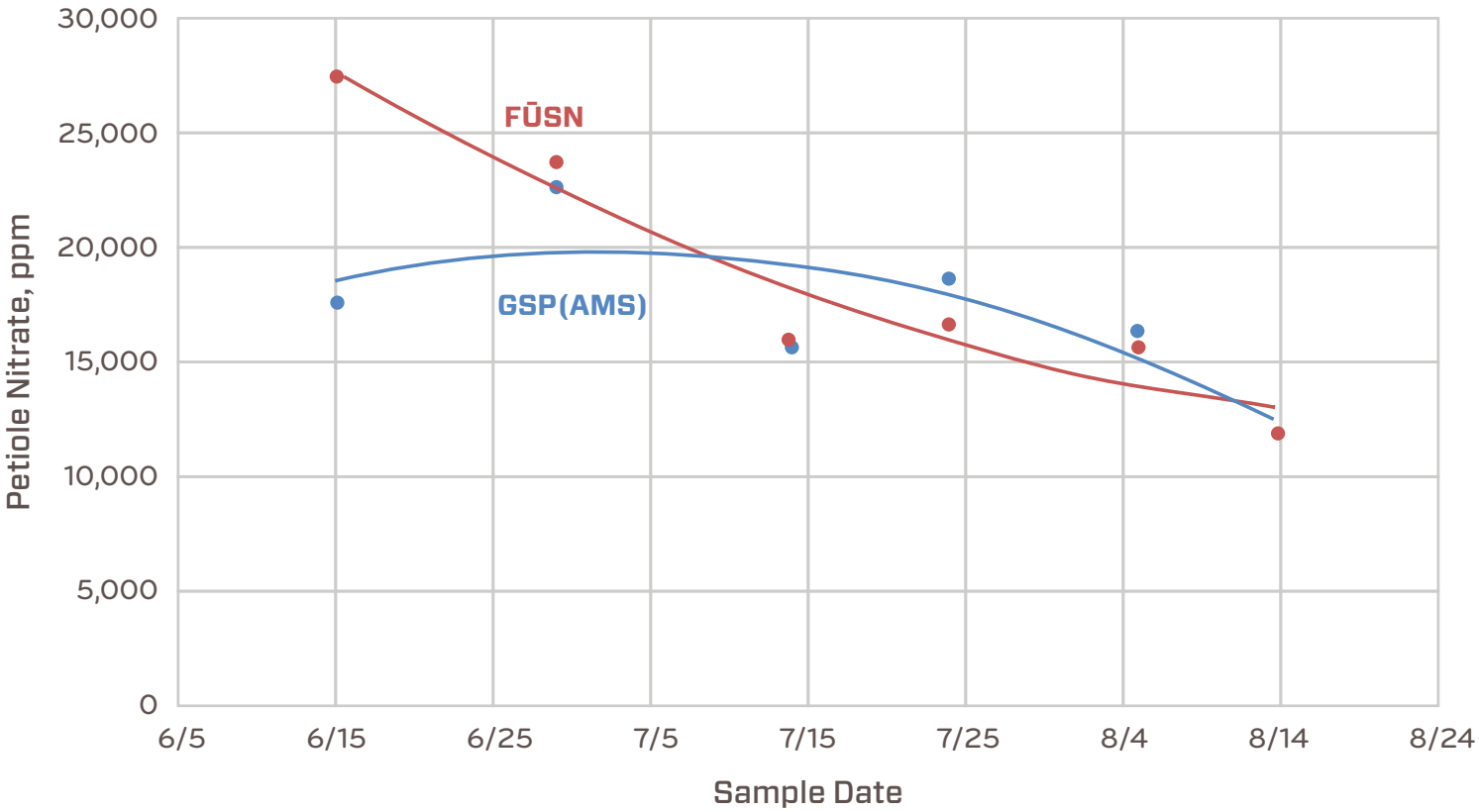
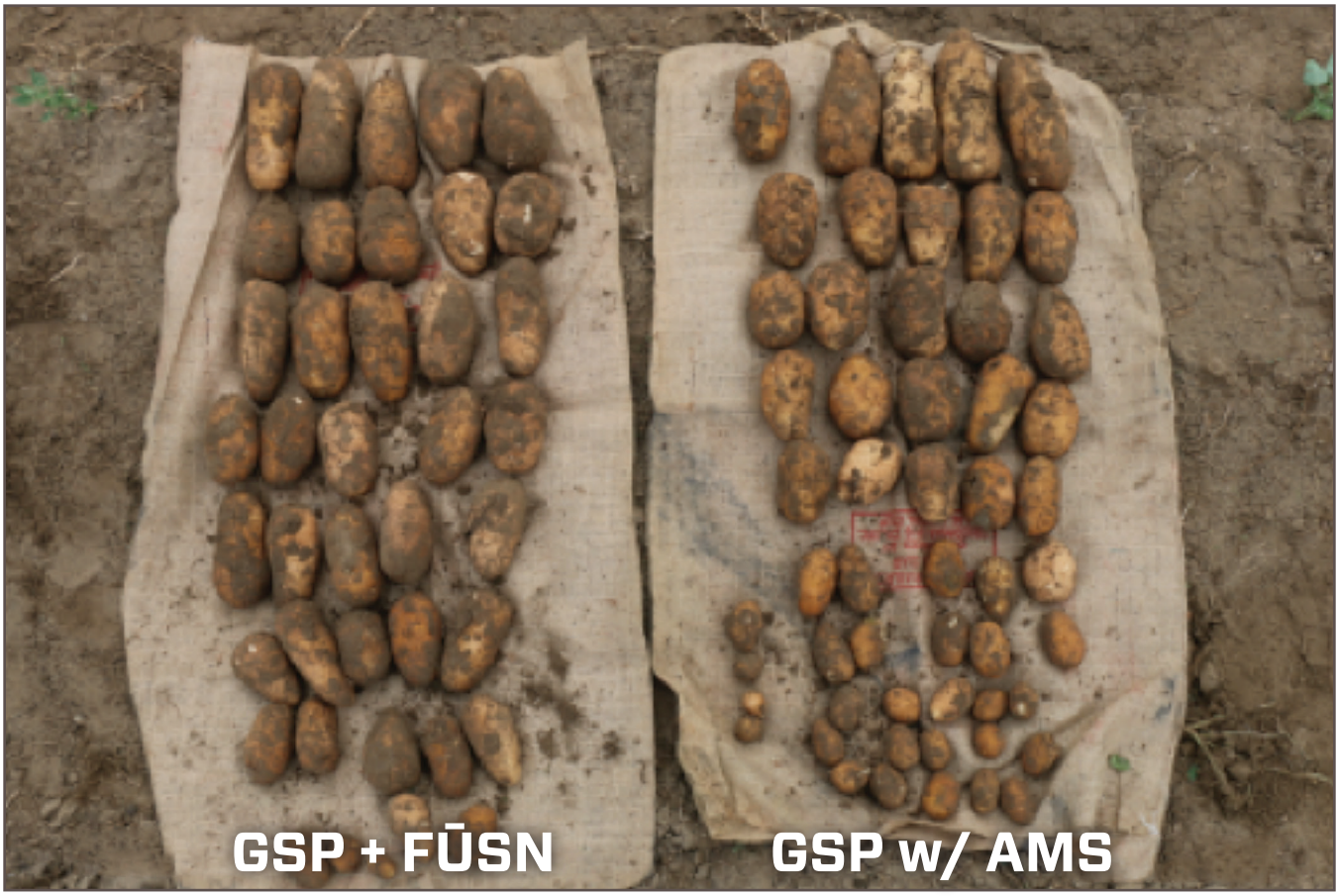


Figure 2. 2015 potato petiole nitrate values comparing FŪSN N treatments with ammonium sulfate (GSP AMS).

Results

Petiole nitrate concentrations are an indicator of plant-available N during the growing season. FŪSN N treatments tended to have higher plant-available N compared to GSP AMS during early plant development stages (Fig. 2). This would indicate that FŪSN is providing a larger portion of N in plant-available form than just AMS top dressed. Many plants, including potatoes, exhibit a preferential N uptake in the form of ammonium. There appears to be less energy required by a plant in converting ammonium to amino acids than what is required by the plant to convert nitrates to amino acids. Therefore, it would be preferable to deliver a portion of the N as ammonium compared to nitrate-N. Further, it would appear that the molecular structure of FŪSN in a 2:1 double salt allows more early N availability than AMS even though the N rates are similar.



Random, hand-dug Umatilla Russet potatoes (four hills) harvested 9/23/2015 show increased tuber size with FŪSN topdress application over the grower standard practice of topdress AMS application.

Figure 3. Example of a random, hand-dug sample (four hills) comparing visual differences observed between FŪSN and AMS in 2015 near Wilder, ID.

Hand-dug samples indicate a visual difference between FŪSN and AMS. Random potato plants and their tubers were visually larger with fewer under-size and fewer deformed potatoes compared to AMS topdress applied at same N rates (Fig. 3).

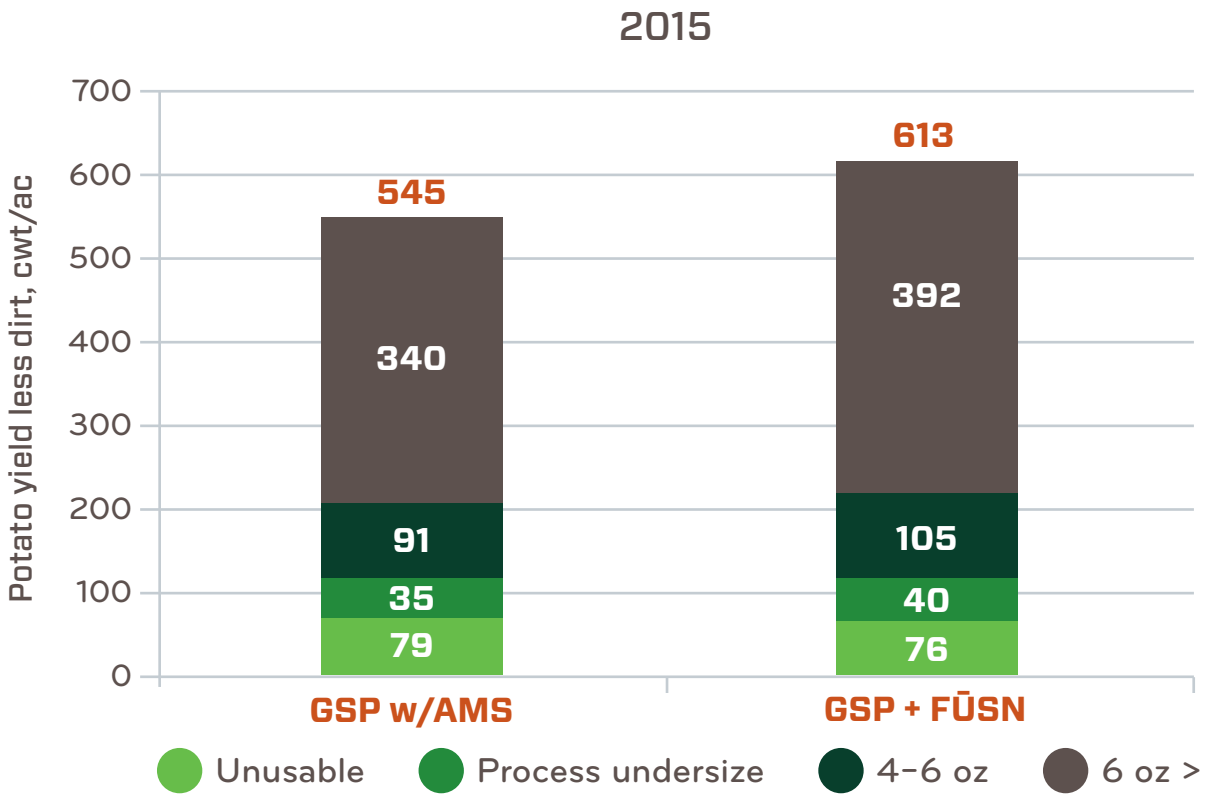


Figure 4. Overall changes in yield and sizing characteristics comparing GSP w/AMS and GSP + FŪSN for 2015 Umatilla potatoes.

Total yield in cwt/ac was 613 versus 545 for FŪSN versus AMS respectively. The greatest change is indicated by improvements in US #1's (Fig. 4).

Potato Quality Traits	GSP	GSP + FŪSN
US #1	24%	41%
6 oz >	73%	73%
Process undersize	7%	7%
Unusable	15%	13%
Bruise free	n/a	n/a
Specific gravity	1.080	1.086
Fry color 0	100%	98%
Sugar ends	0%	0%
JRS Ranger Contract return, $/ac	$2,776	$3,860

Based on random yield samples taken at harvest and then evaluated by the inspection service[1]. FŪSN increased grower returns by $1,084/ac based on 2015 JRS contract pricing.

[1]State of Idaho Federal/State Inspection Service

Figure 5. Umatilla potato quality based on JRS contract as evaluated by USDA inspectors comparing GSP/AMS with GSP + FŪSN and economic returns based on 2015 JRS potato processing contract.

Potato yield and quality were positively impacted by using FŪSN topdressed compared to AMS topdressed (Fig. 5). Increases were observed primarily for US #1 production. This was based on five (4 rows by 10 foot) random sampled areas within each of the respective treated areas. Economic improvements were also determined based on the JRS 2015 potato processing contract, which indicates return increases for GSP w/AMS as $2,776.00 versus $3,860.00 for FŪSN. The approximate price difference for FŪSN versus AMS would be about $13.00/ac. The greater than $1,000.00/ac value increase more than pays for any change in this new fertilizer technology.

Conclusions

FŪSN agronomic support within this study matches up very nicely with the 2014 field study conducted in the same area of Idaho and under similar growing conditions. The 2015 efforts also are supported by previous work conducted by Honeywell with potatoes also being produced in Idaho under irrigated conditions. FŪSN has a unique chemistry that allows early N uptake to be accessed by the growing, developing young potato plant. This early N availability appears to carry over into the growing season from planting to early bulking (July 5). Yield increases are consistent as well as improvements in tuber quality. While additional field trials and grower experiences are needed, recommendations can be made based on these recent field evaluations.

Simplot

Bringing Earth's
Resources to Life

Fūsn
Fused-Safe Nutrients™