

**Effect of Agrimend Application on soil Physical and Chemical Properties and
on the performance of Russet Potato**

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Study Objective

The objective of this study was to evaluate the effect of AgriMend application rate and timing on soil physical and chemical properties and on the performance of Russet potato in the field.

Experimental Procedure

Study Site, Experimental Design, and Treatments

The field study was conducted at Colorado State University San Luis Valley Research Center, during the 2018 potato growing season.

The study was laid out as a randomized complete block design. Treatments included i) AgriMend applied in-furrow at 150 lbs./acre, followed by another 150 lbs./acre applied at hilling (150+150) ii) AgriMend applied in-furrow at 250 lbs./acre, followed by another 250 lbs./acre applied at hilling (250+250) iii) AgriMend applied one time in-furrow at 500 lb/acre. A control treatment was included where no AgriMend was applied. Each treatment was replicated four times.

Soil samples were taken from the experimental site before any fertilizer or AgriMend was applied. Soil samples from the experimental site were composited and analyzed for soil pH, soil organic matter (OM), soil salts, and residual soil nutrients (Table 1) – Pre-plant soil analysis.

Data Collection

Plant samples were collected from each plot during tuber bulking to evaluate the effect of AgriMend (calcium) application rate and timing on plant growth (above ground biomass) and on tuber bulking.

At harvest, tubers from each plot were weighed for total yield. The harvested tubers were separated into various size distribution groups based on weight (> 4 oz., > 6 oz., > 10 oz., 6-16 oz., 4-10 oz., and 10-16 oz.).

Tubers harvested from each plot were evaluated for external (growth cracks, knobs, and misshapes) and internal (hollow heart) defects.

Ten tubers were randomly selected from each plot for tuber specific gravity evaluation. Tuber specific gravity was measured using the weight-in-air/weight-in-water method.

After harvest, soils from each plot were sampled and analyzed to evaluate the effect of AgriMend application on soil physical and chemical properties (Table 1) – Post harvest soil analysis.

Just before potato harvest, thirty tubers were randomly sampled from each plot and run through a simulated harvester chain (fig 1a and b), to evaluate skin set of Russet Norkotah 3 when grown with AgriMend applied at different rates and at different application times.

After running tubers through the simulated harvester chain, the tubers were visually evaluated for skinning. The number of tubers that skinned was calculated as a percentage of the total tubers evaluated for each plot.

Each treatment was replicated four times.



Fig 1a:
Simulated Harvester
chain



Fig 1b:
Potatoes being run
through simulated
harvester chain

Table 1 Effect of Agrimend application on soil physical and chemical properties after growing potatoes, 2018

PRE-PLANT SOIL ANALYSIS

TREATMENT	Soluble Salts (mmho/cm)	Organic Matter (%)	Nitrate -N (ppm N)	Phosphorus (ppm P)	Potassium (ppm K)	Calcium (ppm Ca)	Zinc (ppm Zn)	Iron (ppm Fe)	Manganese (ppm Mn)
Before Agrimend Application	0.20	1.3	7.0	143	266	2067	3.6	21.3	11.3
	POST HARVEST SOIL ANALYSIS, 2018								
Control	0.21 b	1.1 c	5.5 b	155 a	216 ab	1963 a	2.9 ab	15.3 a	10.1 a
150+150 lb/A	0.28 a	1.2 b	8 ab	150 a	218 a	2094 a	3.1 a	13.9 ab	9.0 ab
250+250 lb/A	0.28 a	1.3 a	6.5 ab	149 a	204 ab	2059 a	2.8 bc	12.1 ab	7.1 ab
500 lb/A	0.28 a	1.1 c	8.5 a	147 a	175 b	1995 a	2.6 c	11.4 b	6.2 b
CV (%)	3.4	0	24.0	6.0	12	10.0	5.1	17.5	22.0
LSD (0.10)	0.02	0	2.9	14.0	41	332	0.2	3.8	2.9

Results and Discussion

Soil Physical and Chemical Properties

Soil amendment with AgriMend did influence soil characteristics. Soluble salts and available nitrate nitrogen were increased when soil was amended with AgriMend. The increased nitrate nitrogen in the soil after harvest indicates that less nitrogen fertilizer will be needed for the following crop. Conversely, micronutrients such as soil zinc, iron, and manganese concentrations were regulated and reduced with addition of AgriMend to the soil (Table 1) – post harvest soil analysis. This observation is important in potato production because when soil micronutrient concentrations are above a certain minimum, they can be toxic to potato plants. Soil zinc, iron, and manganese concentrations were reduced by 10%, 26%, and 37%, respectively, when 500 lb/A of AgriMend was amended to the soil (Table 1). Split application of AgriMend at before planting and at hilling increased soil organic matter in this study (Table 1).

Above Ground Biomass (Canopy Development)

Above ground biomass production increased as AgriMend application rate was increased (Fig 1). It is important to note that split application of AgriMend at 250 lb/A pre-plant and 250 lb/A at hilling increased above ground biomass production by 18%, when compared to the control treatment.

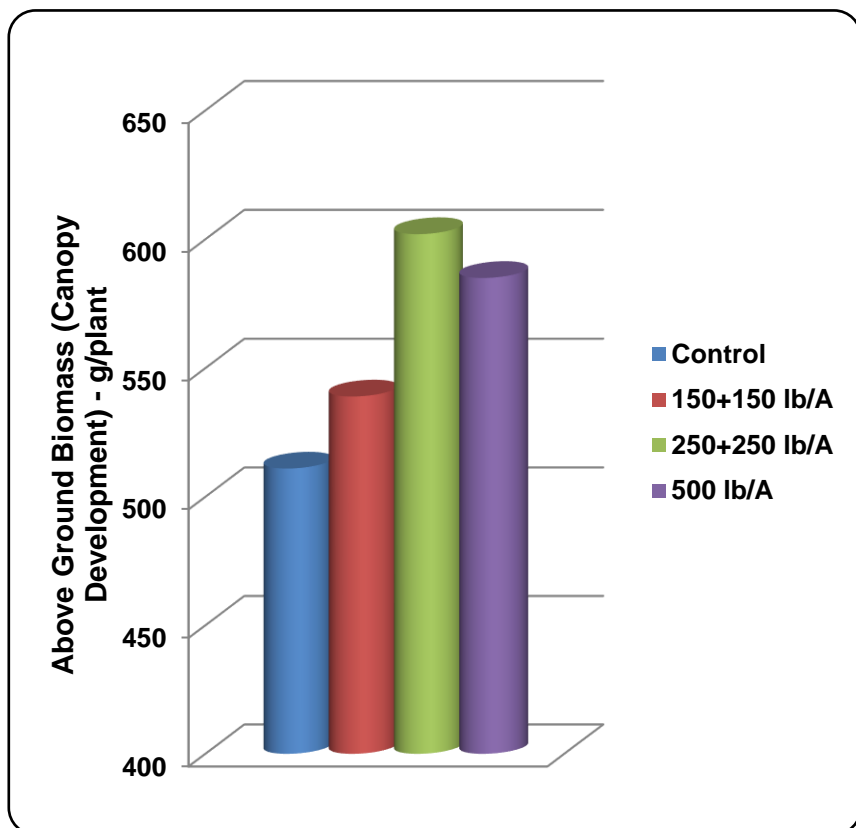


Fig 1 Effect of AgriMend application rate and Timing on above ground biomass production (canopy development) of Russet Norkotah 3

Tuber Bulking

Application of AgriMend did accelerate tuber bulking of Russet Norkotah 3 in this study (fig 2). Split application of AgriMend did accelerate tuber bulking during mid tuber bulking stage, when compared to a one time application of AgriMend pre-plant (Fig 2).

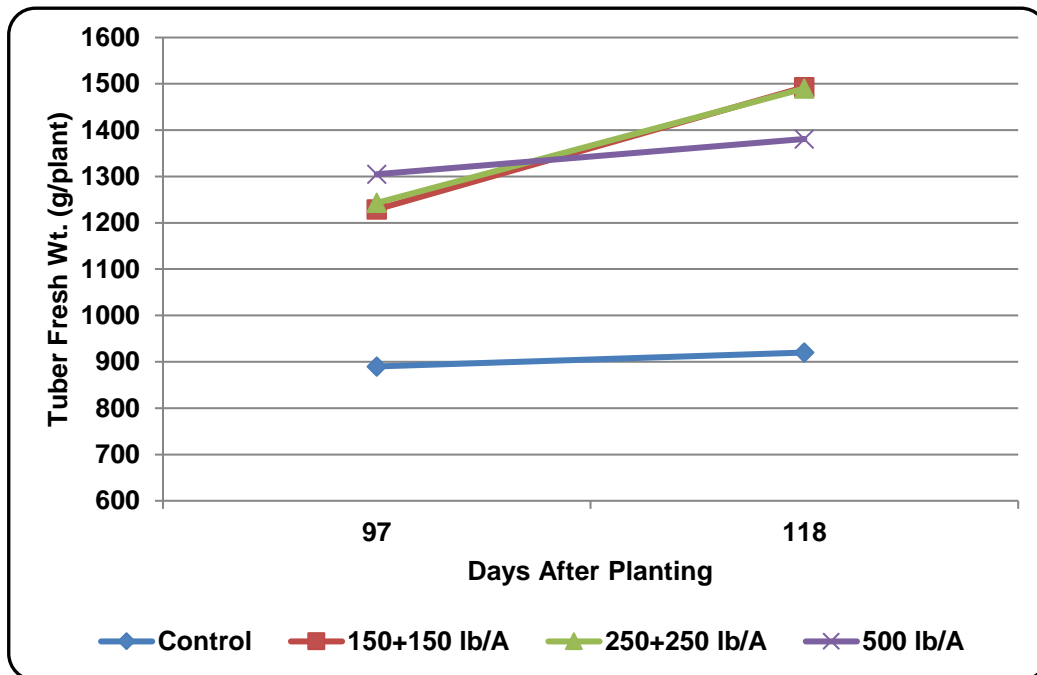


Fig 2 Effect of AgriMend Application Rate and Timing on Tuber Bulking of Russet Norkotah3

Tuber Yield and Tuber Size Distribution

Tuber yield and tuber size distribution did respond to AgriMend application rate and application timing. Split application of AgriMend at rates of 250 lb/A pre-plant and 250 lb/A at hilling increased marketable (> 4 oz.) and premium size (> 10 oz.) tuber yield by 11% and 75%, respectively, when compared to the control treatment (Table 2). When compared to application of AgriMend at rate of 500 lb/A pre-plant, the yield increase was observed to be 3% and 34%, for > 4 oz. and > 10 oz. tubers, respectively (Table 2).

Tuber Quality

Application of AgriMend did reduce hollow heart development in Russet Norkotah 3 (Table 3). Tuber specific gravity increased from 1.077 to 1.090 when AgriMend was applied as soil amendment (Table 3).

Table 2 Effect of AgriMend application on tuber yield and tuber size distribution of Russet Norkotah 3

AgriMend Application Rate (lb./Ac.)	Total	> 4 oz.	> 6 oz.	> 10 oz.	4-16 oz.	4-10 oz.	10-16 oz.
	Yield (cwt/Acre)						
Control (0)	471 a ^x	410 c	346 b	130 c	400 a	250 ab	130 b
150+150	477 a	420 bc	350 b	135 c	403 a	249 ab	131 b
250+250	488 a	453 a	402 a	228 a	389 a	225 b	164 a
500	485 a	439 abc	350 b	170 b	410 a	269 a	141 ab

^x Figures in the same column and bearing the same letters are not significantly different at 0.05 level of probability

Table 3 Effect of AgriMend application on tuber quality of Russet Norkotah 3

AgriMend Application Rate (lb/A)	Tuber External Defects (%) ¹	Hollow Heart (%)	Tuber Specific Gravity
Control (0)	0.2	6.0	1.077
150+150	0.5	1.4	1.088
250+250	0.7	3.8	1.090
500	0.2	3.0	1.090

¹ Includes growth cracks, knobs, and misshapes

Tuber Skinning

The effect of AgriMend application on tuber skin set was evaluated in this study. Application of AgriMend did increase tuber skin set and reduced tuber skinning (Table 4). Split application of AgriMend at rates of 250 lb/A pre-plant and 250 lb/A at hilling did reduce tuber skinning by 13.3% when compared to the control treatment.

Table 4 Effect of Agrimend application on tuber skinning of Norkotah 3, 2018

Agrimend Application Rate (lb/A)	Tubers Skinned (%)
Control (No Agrimend)	58.3
150+150	46.7
250+250	45.0
500	55.8

Summary and Conclusion

The objective of this study was to evaluate the effect of AgriMend application rate and timing on soil characteristics, tuber yield, and tuber quality of Russet potato. Data from the study indicate that amending soil with AgriMend helps regulate micronutrient concentration in the soil, as well as improve soil organic matter. More nitrate nitrogen was retained in the soil after potato harvest when AgriMend was applied to the soil. This observation indicates that less nitrogen fertilizer will be needed for the following crop after potato. Marketable tuber yield and premium size tuber yield was significantly increased when AgriMend was applied in split applications of 250 lb/A pre-plant and 250 lb/A at hilling. AgriMend application reduced hollow heart development in Russet potato, and increased tuber specific gravity. Tuber skinning was reduced when AgriMend was applied in split applications of 250 lb/A pre-plant and 250 lb/A at hilling.