Protecting Soergel's Harvest:
A Smart Solution for Drought Stress

Soergel Orchards: A Legacy Under Stress

Soergel Orchards, located in Wexford, PA is a multifaceted family farm that has become a landmark destination in Western Pennsylvania.

Known for its apples, sweet corn, and vibrant community events, it represents the heart of local agriculture.

But this season, something had changed. The skies had stayed clear. The soil was dry. And the crops—usually lush and vibrant— showed signs of stress. Growers across the region were facing one of the driest growing seasons in recent memory.

The Challenge - Drought and Its Silent Toll

Across Pennsylvania, growers were facing one of the driest seasons in recent memory. Leaves were curling. Fruit set was uneven. Roots were shallow. And beneath the surface, there was a growing sense of concern: Would this harvest survive? Would all the hard work pay off? Because for growers, a harvest is more than a yield—it's a reflection of their dedication, their legacy, and their hope for the season ahead.

Turning Stress into Strength

Under stress, plants need more than water—they need ***resilience****. That's where* ***magnesium silicate*** *comes in. If* ***silicon is absorbable****, this natural mineral strengthens cell walls, improves water-use efficiency, and protects crops from heat and drought stress.* ***4 field trials*** *with absorbable* ***magnesium silicate, 3 Sweet Corn and 1 Green Beans,*** *showed improved root architecture, enhanced foliage health, and consistent fruit set under drought stress.*

Comparable plant size 10 weeks after planting, same plot, same rows

Control

Treated

Description of the field trials, July – Aug 2025

Plot	Name	Total area	Treated area	Crop	Yield/plot	Yield/acre
0	Woodlands 0	40 ft x 1575 ft = 1.44 Acre	0	Sweet Corn	4 bins	2.78 bins
1	Woodlands 1	40 ft x 1575 ft = 1.44 Acre	⅓ acre, 50 Kg	Sweet Corn	9 bins	6.25 bins
2	Welsh 2	40 ft x 705 ft = 0.65 Acre	⅓ acre. 50 Kg	Sweet Corn	14 bins	21.54 bins
3	Welsh 3	30 ft x 705 ft = 0.48 Acre	⅓ acre, 50 Kg	Sweet Corn	7 bins	14.58 bins
4	Welsh 4	80 ft x 1000 ft = 1.83 Acre	⅓ acre, 50 Kg	Green Beans	8 bins	4.37 bins

Remarkable results, even under intensive **drought** stress:

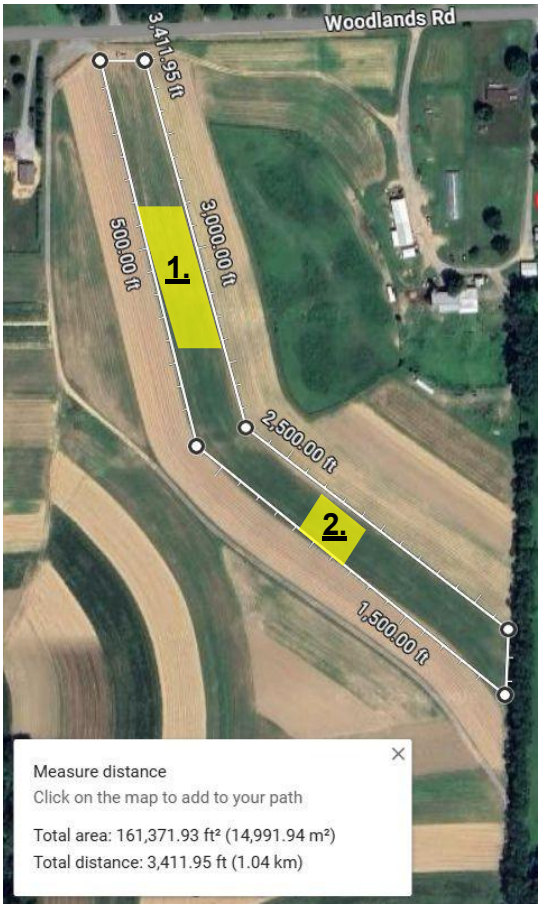
Sweet Corn

1. Quicker grain filling, bigger size cobs, higher weight (up to 8.6%) in the treated area.
2. Greener lower leaves, more photosynthesis, higher plants, thicker stems, all of that as consequence of evident increased root structure.
3. Evident adsorption of Mg, up to 24% more in 2 weeks from treated, per tissue analysis.
4. Increased Ca (+50%) and Mg (+100%) saturation, which influences CEC and soil fertility.

Green Beans

5. 80% of plants with marketable quality one week before planned harvest time, in the treated area, vs 10% in the control, over the same row.

Plot 1 - Woodland Sweet Corn



1. Treated Area
2. Control Area

- 300 Kg per hectare, or 120 Kg per acre
- 1x50 Kg bag for the treated area (1.) 0.41 acres, 18,150 sq ft, 360 ft x 50 ft
- The grey powder generated a cloud that reached out further in the plot and surroundings. For this reason, the control was set to be 100 m away (2.).
- Product was applied on soil where corn plants on the 5th week of development were already planted, on July 31st 8:15 AM.
- No phytotoxicity was shown, and there was no rain after 2 weeks after application.

Comparable plant density and color

Control ***Treated***

- Despite challenging drought and water stress conditions, the treated plot shows **greater plant density and a deeper green coloration** compared to the control. This suggests that absorbable **magnesium silicate may enhance vegetative development**, likely by improving nutrient uptake, root resilience, and physiological efficiency under stress. The treatment appears to support healthier growth even when environmental conditions are limiting.

Comparable plant size, same plot, same rows, 10 weeks after planting

- Insights:

Visible height differences between treated and control plants indicate enhanced growth response under treatment with magnesium silicate. Studies indicate silicon displace phosphorus, making it available in the soil solution, improving nutrient availability and fevorable soil conditions for roots to thrive.

Control

Treated

Greener lower leaves, reflecting water retention and plant resilience under drought

- Magnesium silicate applied to the treated plot promotes higher water retention, photosynthetic activity which results in more durable, long-lasting leaves.

  In these plots, plants also show increased nutrient intake, supporting stronger growth and greater resilience under drought stress.

Treated **<u>Lower Leaves, 10 weeks after planting</u>**

Control **<u>Same plot, same rows</u>**

Better nutrient intake, heavier cobs, larger foliage, more vigorous growth

Treated

Control

10 cobs
2,447 g
6.4% more

10 cobs
2,299 g

🌾 **Random** sampling shows consistently 6 – 7% heavier cobs, and improved grain fill especially at the tip of the cob, in the treated area than the control area of the same plot.

One Week before Harvest Sweet Corn root and plant lower stem

Treated *Control*

Control *Treated*

- Strengthens the root system significantly, allowing for better nutrient absorption and stability.

- Node to Node: 6.8 vs 8.7 cm **28 % longer**
- Node Diameter: 2.65 vs 3.3 cm **25% Thicker**
- 5.52 vs 8.55 cm **65% more area**

Harvest

- **Outstanding performance under drought conditions**
- AgriMatrix was applied to one-third of the plot on the 36th day of development, yet the treated area yielded **9 bins** of maize cobs, compared to **4 bins** from the adjacent untreated plot of equal size.
- The surface required to collect one bin in the control area was **97%** longer than in the treated one – 340 m **C** vs 172 m **T**. The same harvesting in **50.5%** less surface.

***Control**: 1,113ft to fill the bin in 4 rows picked*

***Treated**: 562ft to fill the bin in 4 rows picked*

Initial Field pH test, probe calibrated at higher pH, one week from treatment

SOERGELS											AVG
Plot 1 TREATED	8.1	8.1	8.2	8.8	7.9	8.1	7.9	7.9	8.6	8	8.16
Humidity 12 - 17%											
Plot 1 CONTROL	8.7	8	8.8	8.8	8.5	8.4	8.7	7.8	7.8	8	8.35
Plot 2 TREATED	7.5	8	7.8	7.8	7.9	7.9	7.6	8	8	8.6	7.91
∫Humidity 25 - 33%											
Plot 2 CONTROL	7.8	8.3	8	8.4	7.6	7.8	8.5	7.6	8.2	8	8.02
Plot 2 TREATED	7.5	7.8	7.8	8.5	7.4	7.6	7.4				7.71
Humidity 25 - 30%											
Plot 2 CONTROL	7.5	7.6	6.9	7.4	6.7	7.5	7.6				7.31

Field pH test, 8 weeks after treatment, Jinmic Probe contrasted with analog

Date	EC mS/cm	SALT(TDS) mg/L	pH	Humidity(%)	MOIST	LIGHT	RH	Fertility	Temperature(°F)	Notes
2025-09-25 16:02:50	0.01	6	6.25	52	0	99	52	0.5	69.6	6.3 analog P1 **Control**
2025-09-25 16:01:28	0.37	186	5.75	52	100	99	52	21.33	68.9	5.2 analog untreated **Control** P1
2025-09-25 15:54:44	0.06	31	6.89	53	52	99	53	3	70.2	6.5 analog **Control** Plot 1
2025-09-25 15:52:50	0.24	121	6.53	52	88	98	52	12.66	68.7	6.2 analog **Control** P1
2025-09-25 15:51:27	0.12	64	**6.34**	53	62	99	53	6	71.1	6.5 analog **Treated** P1
2025-09-25 15:49:37	0.3	152	**5.68**	53	100	99	53	16.66	70.3	5.7 analog **Treated** plot 1
2025-09-25 15:45:30	0.49	245	5.39	52	90	99	52	29.33	70.2	4.8 - 3.1 analog **Control** P1
2025-09-25 15:43:22	0.16	81	6.06	54	90	99	54	8	69.1	5.6 - 6.2 analog **Control** P1
2025-09-25 15:41:57	0.11	55	6.69	53	60	99	53	5.5	69.4	4,8 - 5.1 analog **Control** P1
2025-09-25 15:39:53	0.08	43	6.39	53	59	99	53	4	70.3	P1 **Control**

- For application after planting stage, AgriMatrix helped buffer pH to prevent increasing it further, as would a liming agent.
- pH has changed from as low as **5.39** to a range of **5.68 – 6.34**, in two weeks, with humidity below 55%, after some rain. More acid soils tend to react better with the product and increase the buffering effect.
- The crops underwent the worst drought stress in 5 years. The precipitation was on 2-3 days between Jul 31st - Sep 15th.
- Soil and tissue samples were taken, to set the starting point of the treatment and compare a few weeks later.

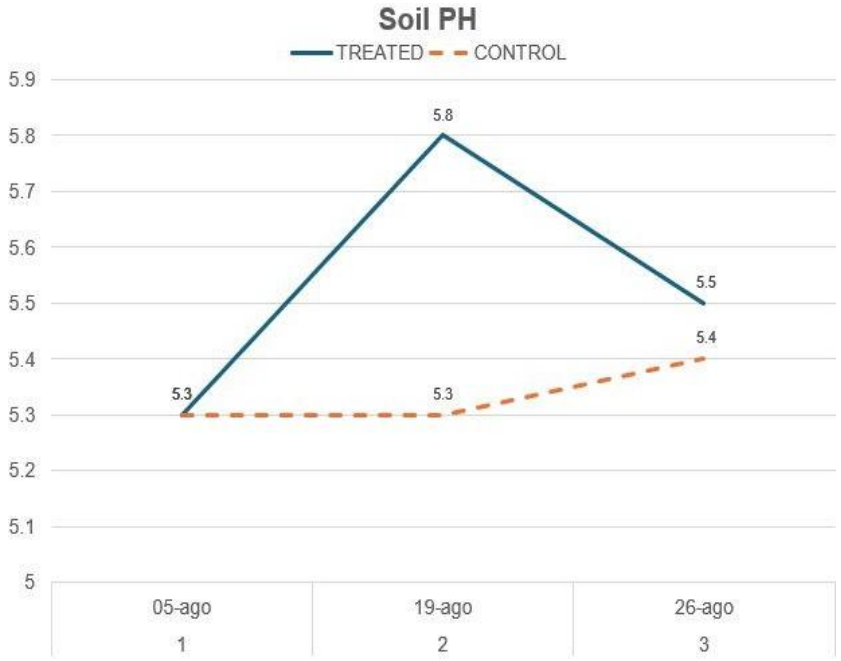
Soil Analysis Report Plot 1

Insights:

- AgriMatrix increased ½ point in pH in only 2 weeks
- In more acid soils pH can increase up to 2 points with 264 lb (120 Kg) per acre in 2 weeks.
- Soil sample considers a deeper measurement, usually lower than in the surface.
- According to the reaction

$Mg_3Si_2O_5(OH)_4 + 6H^+ => 3Mg^{2+} + 2H_4SiO_4$

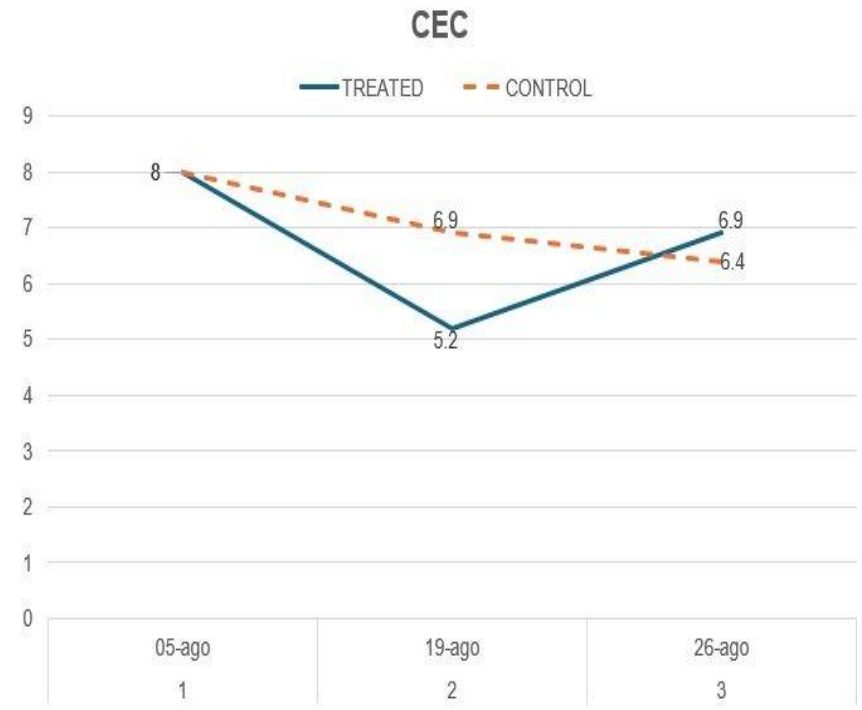
AgriMatrix consumes acidity only when acid is already present (low pH soil). If CO_2 levels, moisture, organics acids, or root exudates increase, AgriMatrix can release Mg while releasing H^+, buffering soil toward acidity temporarily.



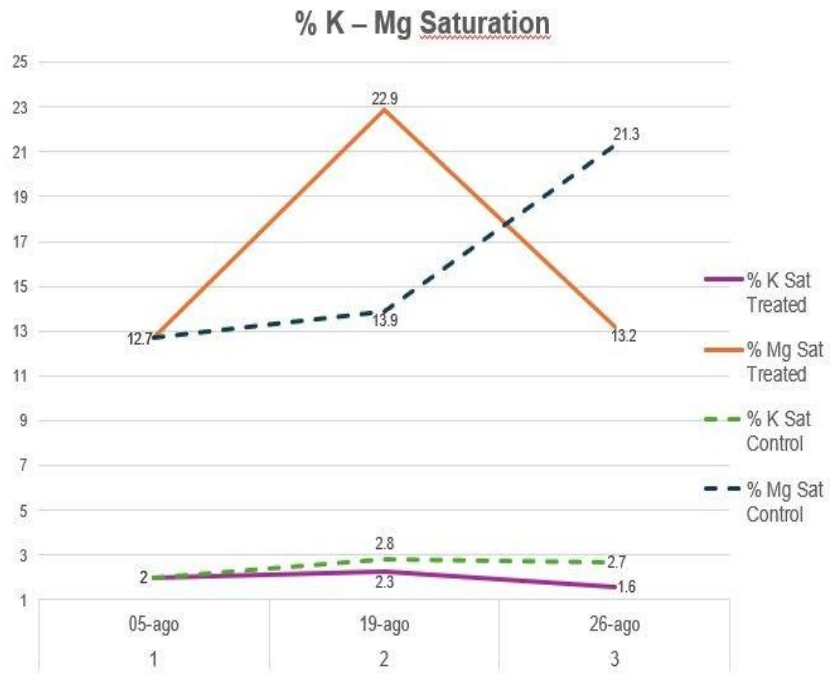
Soil Analysis Report Plot 1

Insights:

- CEC or Cation Exchange Capacity values showed a notable recovery in the treated area, surpassing the control area. This suggests positive effect of AgriMatrix on soil nutrient and water retention capacity.



Soil Analysis Report Plot 1

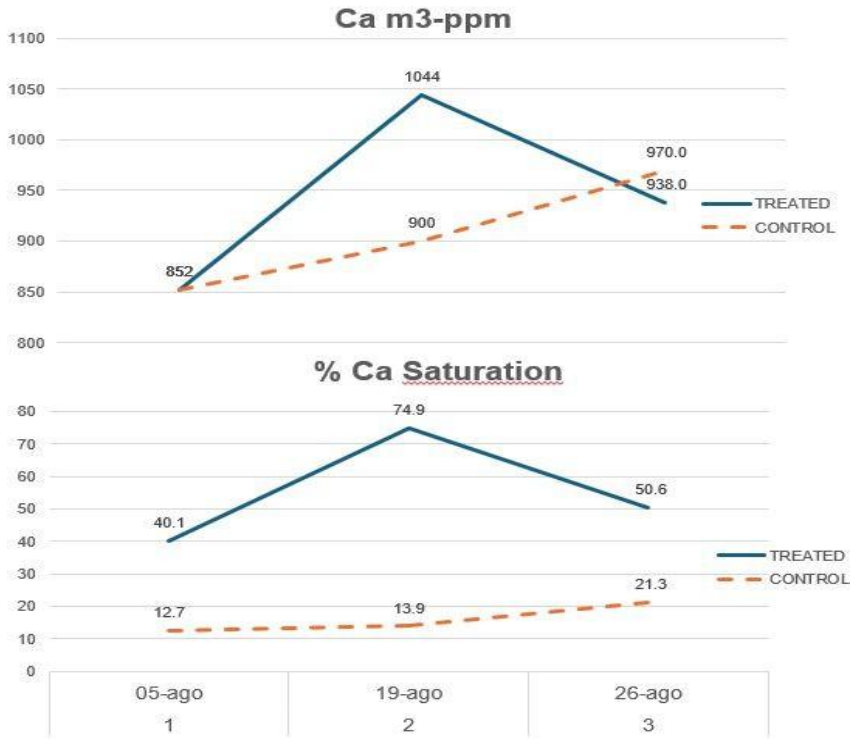


Insights:

- These results suggest that **AgriMatrix treatment enhances cation exchange and nutrient availability**, especially under stress conditions, supporting better root access to essential elements like K and Mg.

- The variation other than sampling changes could be seen as increasing significantly the Mg saturation, but balancing out over time with other cations like Ca and K.

Soil Analysis Report Plot 1



Insights:

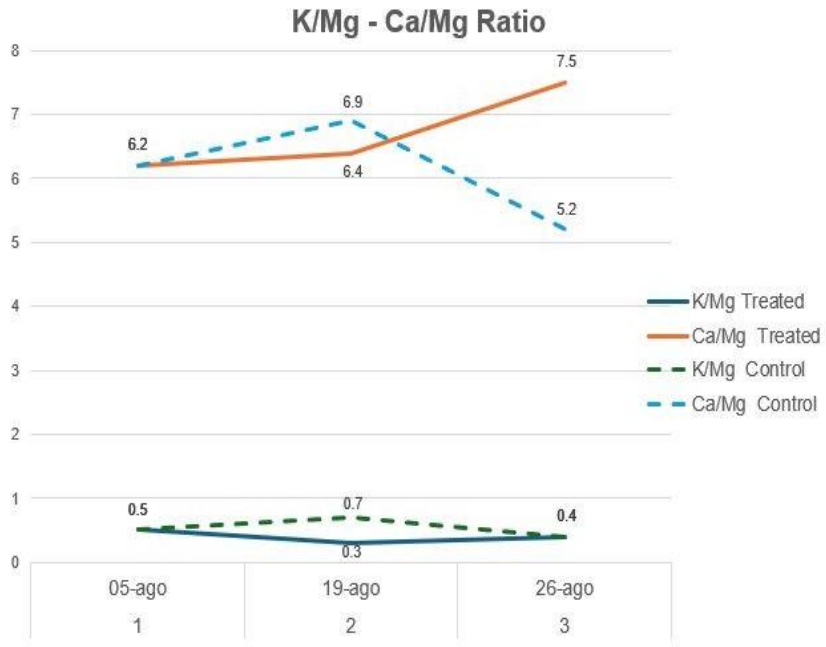
- The treated plot shows a dramatic increase in calcium saturation, In contrast, the control plot remains significantly lower (2.5 to 6 times gap).

- This suggests that the treatment **enhances calcium availability and retention in the soil**, which may contribute to improved root development, cell wall integrity, and stress resilience in plants.

Soil Analysis Report Plot 1

Insights:

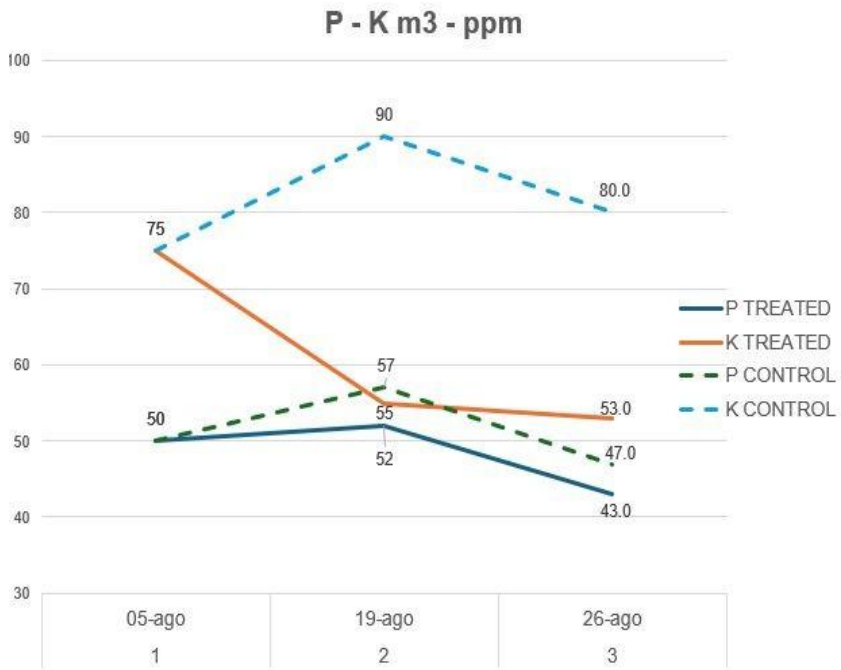
- The treated soil showed a progressive increase in the K/Mg ratio, while the control declined.
- This suggests that AgriMatrix may have enhanced K and Ca availability and uptake efficiency, and Mg releases slowly.
- Based on historic lime treatment, it is expected for Calcium Carbonate to accumulate over time. The application of Magnesium Silicate balances out the ratios improving the nutrient intake.



Soil Analysis Report Plot 1

Insights:

- Magnesium silicate appears to enhance the mobilization and uptake of phosphorus, while in the case of potassium, it may be modulating its availability or accelerating its consumption.
- These preliminary results indicate that magnesium silicate has an active effect on the nutritional dynamics of maize, especially during stages of high demand.

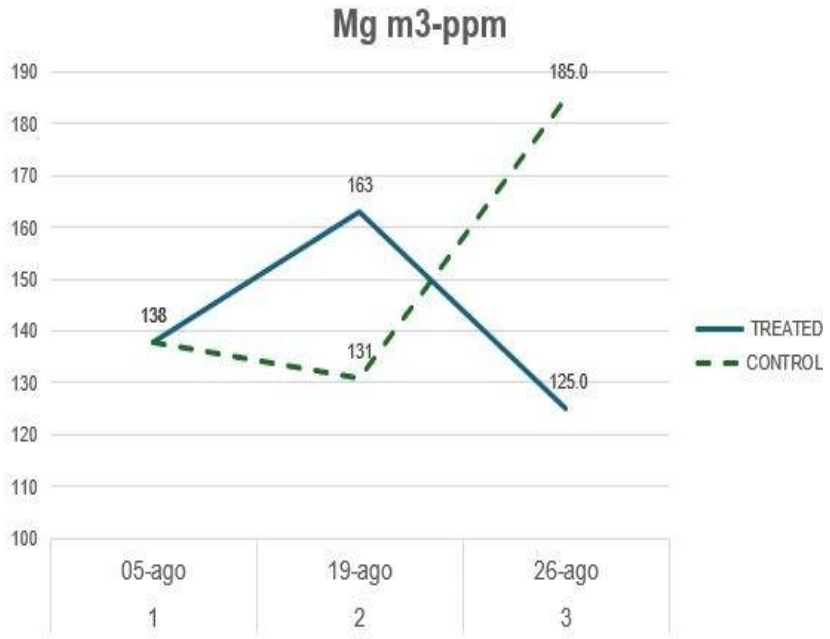


Soil Analysis Report Plot 1

Insights:

- This graph suggests that magnesium silicate treatment may be enhancing Mg uptake by the crop, leading to lower residual Mg in the soil. In contrast, the control plot shows accumulation, possibly due to reduced absorption or mobility.

- These trends reflect active nutrient utilization in treated soils, especially under drought stress.

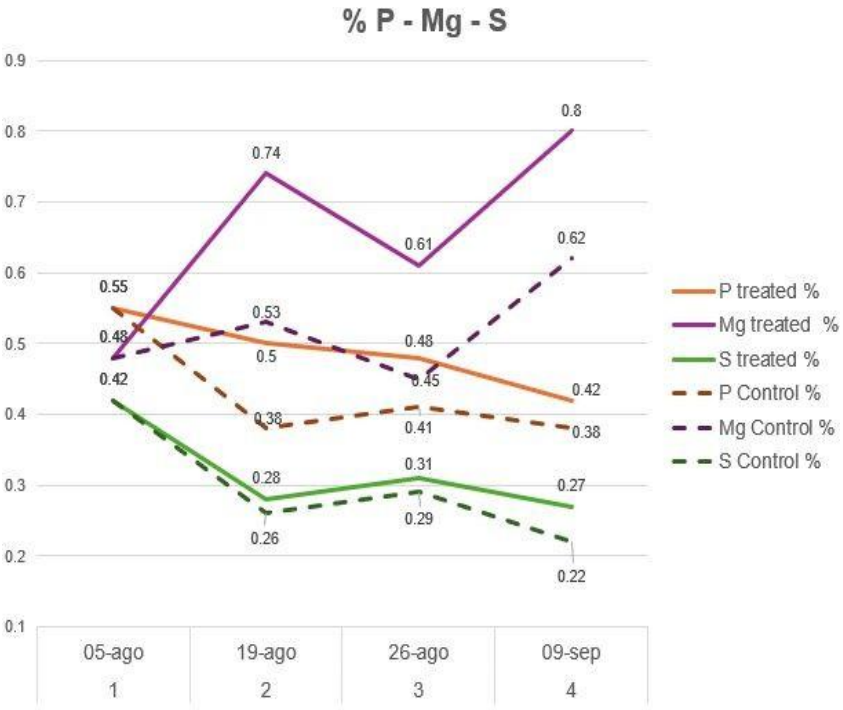


Tissue Analysis Report Plot 1

Insights:

- The treated plot shows a consistent increase in foliar magnesium levels. This suggests that magnesium silicate significantly improves Mg availability and uptake under field conditions

- While sulfur levels declined in both plots, the treated plants maintained higher concentrations throughout the evaluation period. This may reflect improved nutrient efficiency or stress resilience linked to the silicate application.

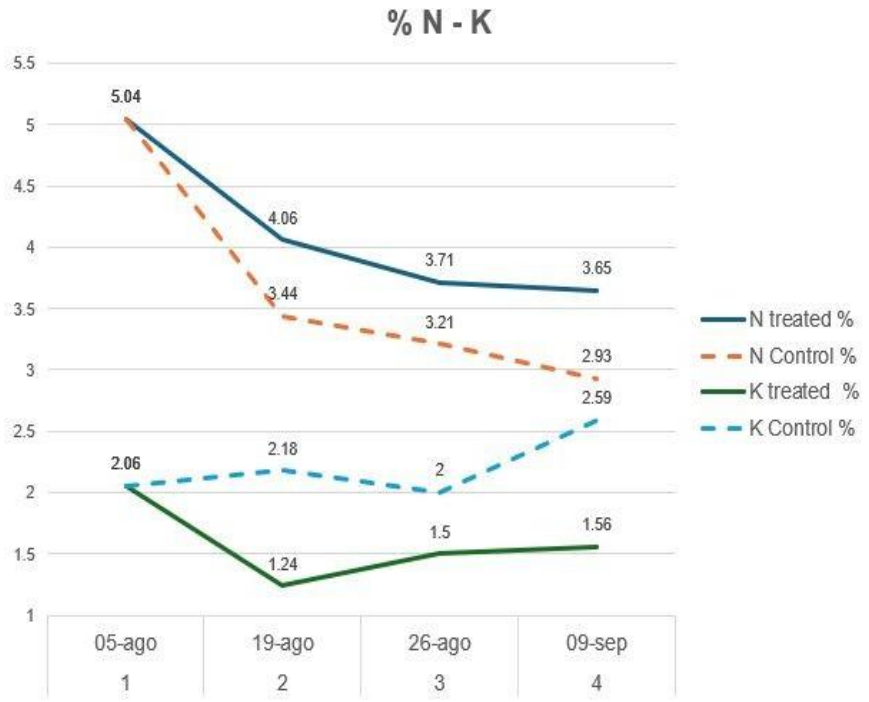


Tissue Analysis Report Plot 1

Insights:

- Under drought stress conditions, the treated plot maintained higher nitrogen levels throughout the evaluation period, Meanwhile, potassium levels in the control plot increased steadily, reaching nearly 70% higher than the control, suggesting the intake of Mg increased while limiting K.

- These trends suggest that magnesium silicate treatment supports nutrient retention and uptake, especially potassium, which is critical for water regulation and stress tolerance.

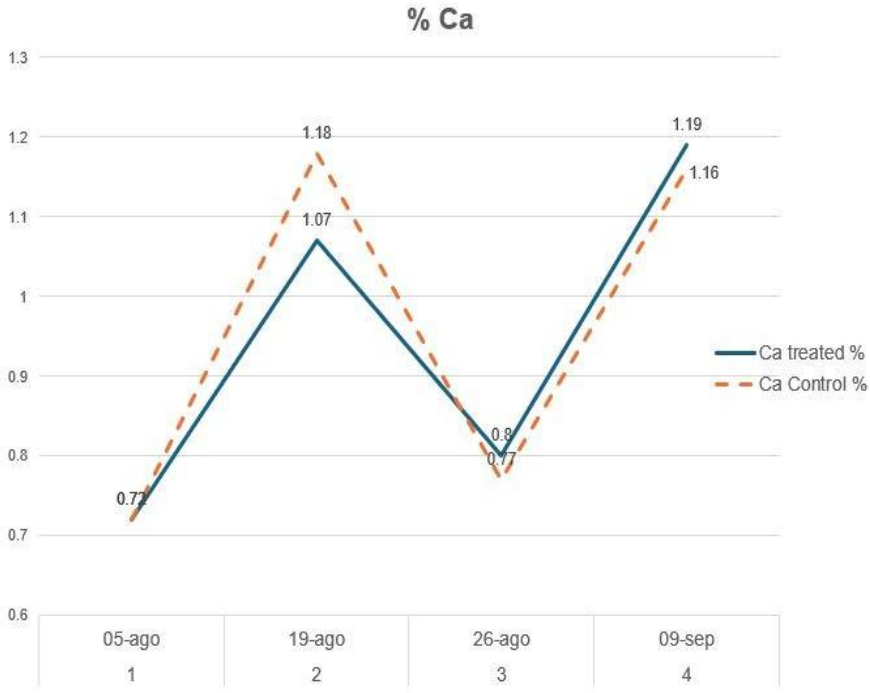


Tissue Analysis Report Plot 1

Insights:

- Calcium is essential for cell structure and stress resistance.

- The increase in foliar calcium concentration suggests that magnesium silicate may be enhancing the plant's structural health, especially under drought stress conditions.



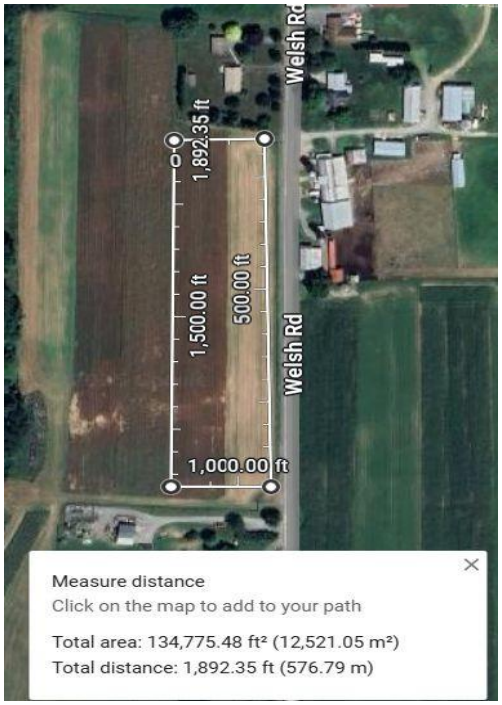
Plot 2 Sweet Corn

1. Treated Area P2 Walsh

- AgriMatrix was applied on the 4th week of development. Sweet corn here is a different species and younger compared to Plot 1.

- This smaller plot (plot 2, number **1.** in the picture) seems to be greener, more robust, and healthier than plots 1 and 3 throughout the cycle.

- **Plot 2 was also the highest productivity with 21.54 bins/acre harvested**.



Plot 2 Sweet Corn, 8 weeks from AgriMatrix application

Date	EC ms/cm	SALT(TDS) mg/L	pH	Humidity(%)	MOIST	LIGHT	RH	Fertility	Temperature(°F)	Notes
2025-09-25 15:22:01	0.12	64	**5.88**	54	59	99	54	6	71.1	P2 R8 **Treated** middle point
2025-09-25 15:17:40	0.15	76	7.28	54	90	99	54	7.5	70	P2 R1 Control
2025-09-25 15:15:23	0.19	98	6.34	53	100	99	53	9.5	69.1	P2 R8 control
2025-09-25 15:11:21	0.03	19	**5.74**	54	37	99	54	1.5	69.3	P2 R8 **treated**
2025-09-25 15:10:17	0.11	59	**5.64**	52	90	99	52	5.5	70.7	P2 R7 **treated**
2025-09-25 14:08:53	0.05	25	6.67	52	43	99	52	2.5	68.7	6 m from P2 R1 control section

- The numbers reflect soil analysis at 5-6 inches deep. pH consistently shows lower level in the treated, indicating a buffering capacity of AgriMatrix.
- The difference in EC is notorious over the plot probably due to the lack of water, lowering the soil solution mobility.

Plot 2 Sweet Corn

Treated *Control*

This is consistent for the three trials in Sweet Corn, greener leaves, thicker stems, increased vigor in the treated vs the control.

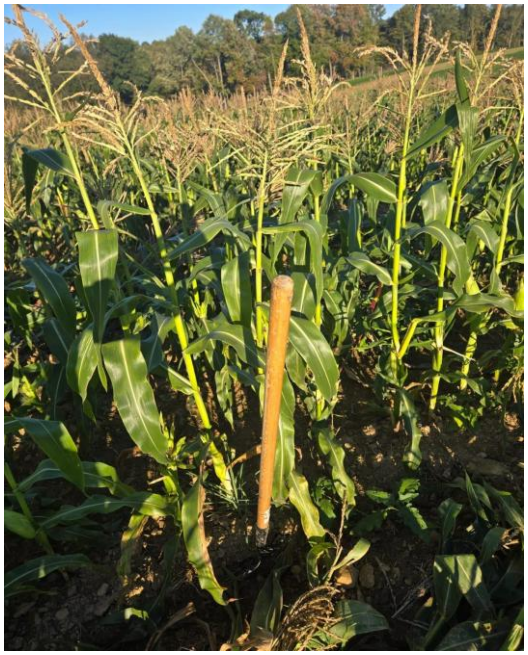
Plot 2 Sweet Corn

Treated *Control*

There is no clear difference around the flag, the powder reached beyond the limits of the treated area, control measurements were done 30-50 m away from the flag limit.

Plot 2 Sweet Corn

Treated



Control

At the moment of harvest treated plants are higher, cobs are bigger, likely due to wider and more robust roots.

Plot 2 Sweet Corn

Treated

Control

704 feet long plot, in the control area 192-200 feet are needed to collect 1 bin, vs 128-140 feet in the treated area.
This is a 28%-36% higher productivity with AgriMatrix.

Plot 2 Sweet Corn

Treated *Control*

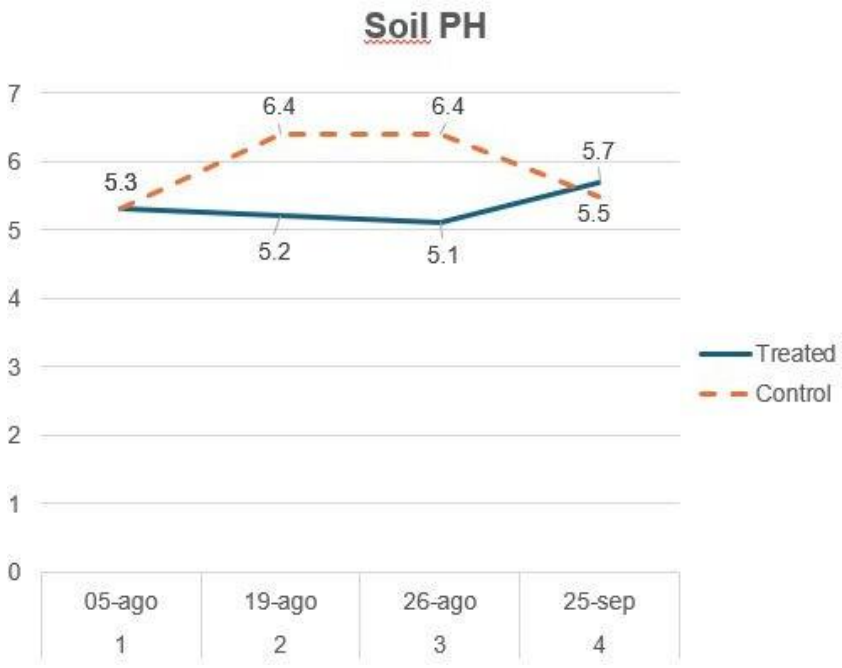
Treated *Control*

75% bigger root structure provides higher nutrient intake, better resilience to stress**.** The absorbable silicon provides cell wall strength, releases phosphorus and immobilizes aluminum.

Soil Analysis Report Plot 2

Insights:

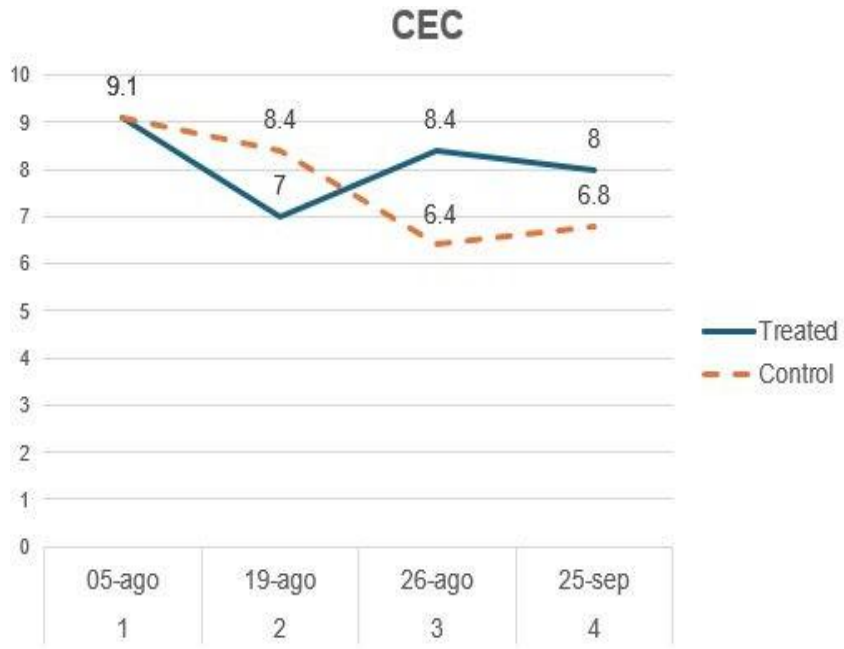
- This graph suggests that **AgriMatrix may help buffer soil pH**, promoting more consistent nutrient availability and root performance under stress conditions.
- The treated plot maintained a **stable and slightly acidic pH,** while the control plot fluctuated significantly.
- This means the first week's initial buffer reaction starts to come back to high pH levels after 2 months.



Soil Analysis Report Plot 2

Insights:

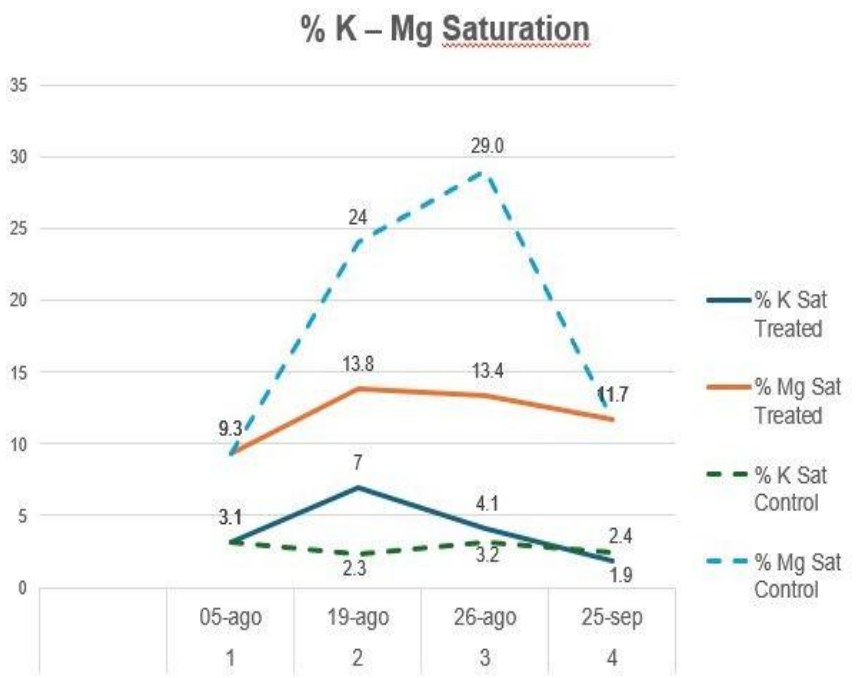
- The treated plot shows greater stability and recovery in **CEC values**. In contrast, the control plot fluctuates and ends lower.
- This suggests that AgriMatrix may help maintain or restore soil cation exchange capacity, which is critical for nutrient retention and root access—especially under drought stress.



Soil Analysis Report Plot 2

Insights:

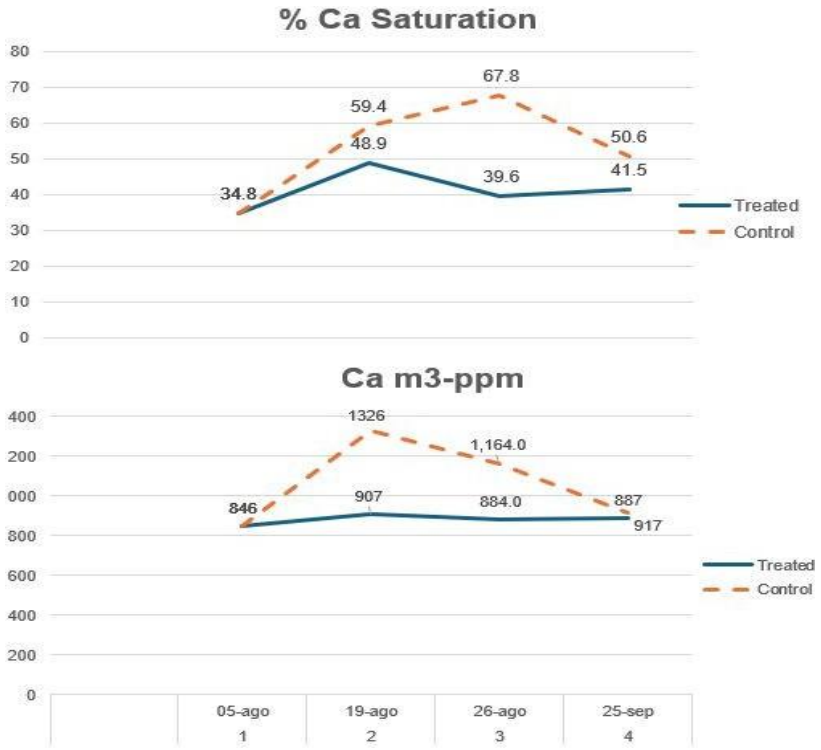
- The treated plot shows a **marked increase in potassium saturation**, compared to the control which remained lower. Magnesium saturation also rose in treated soil, while the control had a peak, maybe related to fertilizer release, it afterwards declined back to lower levels.
- These results suggest that AgriMatrix treatment **enhances cation exchange and nutrient availability**, but also regulates the release of cations, especially potassium, which is vital for water regulation and stress tolerance.
- Furthermore, the fruit filling is more uniform due to the same effect.



Soil Analysis Report Plot 2

Insights:

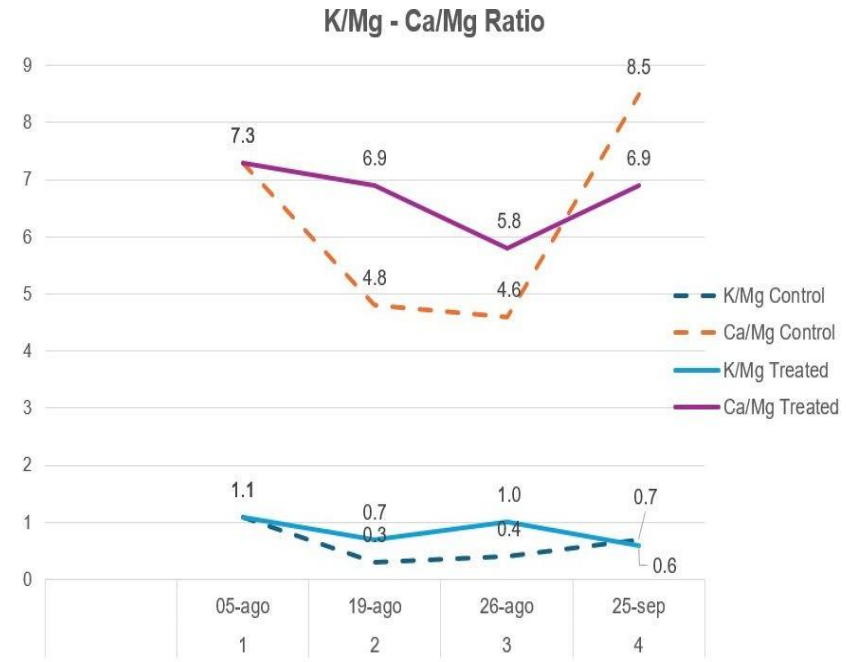
- The treated plot consistently shows **lower calcium concentration (Ca m3-ppm)** than the control.
- This suggests that AgriMatrix modulates calcium content to release it slowly, and **enhances cation exchange efficiency**, allowing better nutrient retention and availability for plant uptake under stress conditions.



Soil Analysis Report Plot 2

Insights:

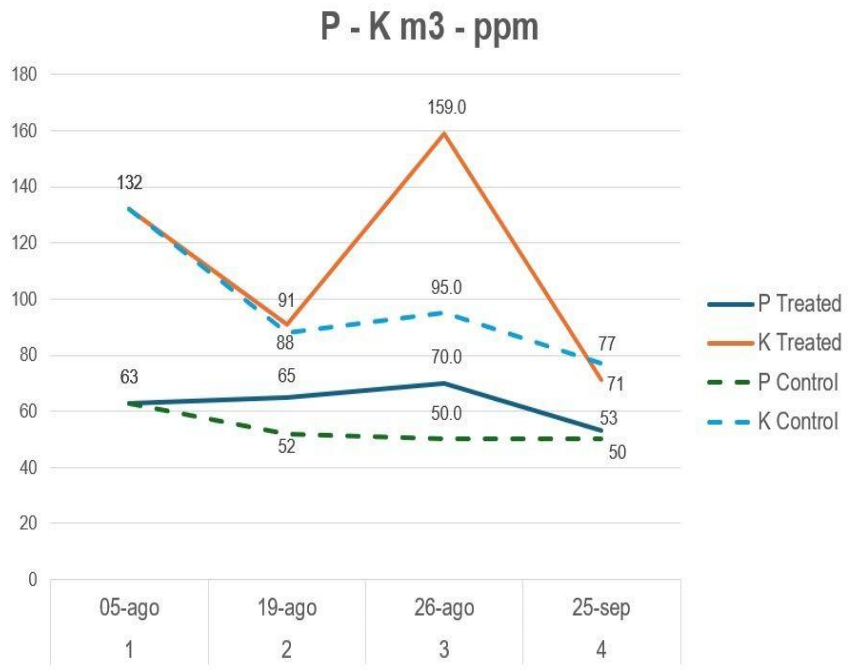
- Treated plot show significantly higher ratios compared to control. Notably, the Ca/Mg ratio in treated plot dropped sharply, then rebounded, indicating a dynamic response to AgriMatrix.
- Similarly, the K/Mg ratio in treated plot dipped but recovered to its initial level. In contrast, control ratios remained consistently low and stable, suggesting much higher intake of Magnesium.
- These trends highlight the impact of the treatment with AgriMatrix providing all the benefits from soluble Mg besides the Si reaction in the soil and the impact in the root structure.



Soil Analysis Report Plot 2

Insights:

- Treated plot show a dynamic nutrient response, with P levels rising, then slightly declining, probably related to plant intake.
- K levels in treated plot fluctuate more sharply, before dropping. In contrast, control samples remain relatively stable declining.
- These trends suggest that AgriMatrix treatment significantly influenced nutrient availability, particularly potassium, which may reflect changes in uptake, mobility, or soil interactions.



Soil Analysis Report Plot 2

Insights:

- Treated and control plot started at the same baseline. However, the control group experienced a sharp spike, before dropping. In contrast, the treated group showed a more gradual and stable increase and settling.
- These contrasting trends suggest that the AgriMatrix treatment may have moderated magnesium availability, related to the buffering effect and potentially contributing to more balanced nutrient dynamics.