

Fertoz Rock Phosphate (0-20-0) is a natural sedimentary phosphate fertilizer that improves soil nutrient content. **Potash (0-0-50-17)** is also an effective natural fertilizer containing high levels of potassium and sulphur. Both fertilizers provide immediate and extended crop nutrition.

Soilworks LLC has been working closely with a farmer in Nebraska to monitor the soil benefits of applying Fertoz Rock Phosphate (0-20-0) with Sulphate of Potash (0-0-50-17) in a blend, plus some of their liquid starters and foliars as summarized in the table below.

Soil analysis results indicate that both rock phosphate and potash fertilizers are increasing the nutrient content in the soil and availability of 3 important plant nutrients; phosphorus, potassium and sulphur. Soilworks will continue to monitor soil nutritional status in 2021.

Organic corn yields (2020) were satisfactory (~150 bu/ac) despite the limited precipitation in the fall of 2020, exceeding organic corn yield averages of ~110 bu/ac. The irrigated organic field yielded (~180 bu/ac) which is close to average conventional corn yield in the region.

METHODS

A total of 500 acres were treated and tested. Fields 1, 2 and 3 were seeded to oats or beans in 2019. Cereal rye was then planted in the fall after harvest and grazed over the winter. A granular blend of 40% Fertoz rock phosphate and 60% sulphate of potash was broadcast and incorporated twice at an application rate of 300-400 lbs/ac in March 2020. A foliar soil conditioner with GSR calcium was applied around that time. Corn was seeded in spring of 2020. Throughout the growing season, a liquid starter and 2 foliars were applied to improve soil biology and enhance fertilizer breakdown to increase crop availability. Soil samples were taken in the fall of 2019 after harvest, at planting in the spring of 2020, and again after harvest in the fall of 2020.

Summary of Treatments Applied

TIMING	PRODUCT	APPLICATION RATE
Soil Conditioner	GSR Dormant Calcium	180 g/ac
	Organic Sugar	2 lbs per ac
	Bio-5 Extract	5 gal per ac
Dry Spread	Fertoz-Phos (0-20-0)	160 lbs/ac
	Protassium (0-0-50-17%S)	240 lbs/ac
Starter	Organic Sugar	4 lbs per ac
	Fish	6 gal per ac
	Bio-5 Extract	5 gal per ac
	0-12-0 MSR	4 lbs per ac
Foliar 1 20 gal/acre V3 Timing	Organic Sugar	5 lbs per ac
	Fish	10 gal per ac
	Bio-5 Extract	5 gal per ac
Foliar 2 20 gal/acre Pre tassel	Organic Sugar	2 lbs per ac
	Fish	5 gal per ac
	Bio-5 Extract	5 gal per ac

FIELD 1. Soil Analysis Results

Parameter	Fall 2019	Spring 2020	Fall 2020
pH	8.1	7.4, 7	7.6
Nitrate-N	7	5, 8	10
Ammoniacal-N	2	2, 2	2
Calcium	2023 (org), 3768 (inorg)	313 (org), 2664 (inorg), 287 (org), 2490 (inorg)	250 (org), 4133 (inorg)
Orthophosphate	2.2 (org), 1 (inorg)	7.4 (org), 22 (inorg), 3.4 (org), 7 (inorg)	3.7 (org), 7 (org)
Phosphorus	3 (org), 9 (inorg)	9 (org), 48 (inorg), 5 (org), 33 (inorg)	5 (org), 20 (inorg)
Bicarb-P	5	18,0	5
Potassium	18 (org), 81 (inorg)	106 (org), 359 (inorg), 44 (org), 151 (inorg)	81 (org), 230 (inorg)
Sulphur	16	42, 40	12
Sodium	8 (org), 12 (inorg)	5 (org), 15 (inorg), 7 (org), 12 (inorg)	11 (org), 16 (inorg)

2 samples were taken in the spring of 2020

Unlike conventional fertilizers, organic fertilizers such as rock phosphate and potassium contain minimal salts. Soil salinity was not increased as a result of the application of the rock phosphate and potash blend. Soil pH was lower in the spring after fertilizer application. Slightly acidic to neutral soil pH favors the solubility and availability of phosphorus in the soil.

Phosphorus is absorbed by plants in the orthophosphate form. Orthophosphate levels were increased (approx. 5-22 ppm) shortly after the application of rock phosphate, in time for seed germination and early growth. Organic available forms of soil phosphorus increased 2-4 ppm after application. The inorganic form of soil phosphorus increased by 24-39 ppm shortly after rock phosphate application. Soil phosphorus levels remained high after harvest.

Organic and inorganic forms of potassium were increased in the spring after the application of Potash, these levels remained high after harvest. Sulphur was also increased after fertilization of potash.

FIELD 2: Soil Analysis Results

Parameter	Fall 2019	Spring 2020	Fall 2020
pH	7.9	8.1, 7.2	8
Nitrate-N	12	14, 6	10
Ammoniacal-N	1	2, 2	1
Calcium	1755 (org), 4220 (inorg)	2920 (org), 4565 (inorg), 300 (org), 2848 (inorg)	3796 (org), 5386 (inorg)
Orthophosphate	2.7 (org), 3 (inorg)	1.8 (org), 3 (inorg), 2.9 (org), 8 (inorg)	2.4 (org), 15 (inorg)
Phosphorus	4 (org), 12 (inorg)	4 (org), 5 (inorg), 5 (org), 32 (inorg)	4 (org), 21 (inorg)
Bicarb-P	8	11, 0	9
Potassium	23 (org), 119 (inorg)	34 (org), 198 (inorg), 58 (org), 180 Inorg)	39 (org), 220 (inorg)
Sulphur	4	18, 16	7
Sodium	6 (org), 8 (inorg)	5 (org), 9 (inorg), 6 (org), 9 (inorg)	6 (org), 8 (inorg)

2 samples were taken in the spring of 2020

Soil salinity was not affected by the application of the fertilizer blend. Slightly increased phosphorus levels were measured after spring fertilizer application and following harvest. Inorganic orthophosphate levels were higher in the fall after harvest. Soil sulphur levels increased after application and were maintained after harvest. Potash increased soil potassium levels after application and maintained higher potassium in the soil after harvest.

FIELD 3. Soil analysis Results

Parameter	Fall 2019	Spring 2020	Fall 2020
pH	7.1	6.6 (org), 6.7 (inorg)	7.9
Nitrate-N	6	12 (org), 14 (inorg)	22
Ammoniacal-N	2	3 (org), 5 (inorg)	1
Calcium	436 (org), 3335 (inorg)	338 (org), 3151 (inorg), 375 (org), 3153 (inorg)	3569 (org), 5191 (inorg)
Orthophosphate	2.7 (org), 5 (inorg)	13.4 (org), 34 (inorg), 16.2 (org), 44 (inorg)	2.7 (org), 5 (inorg)
Phosphorus	4 (org), 30 (inorg)	16 (org), 89 (inorg), 19 (org), 100 (inorg)	5 (org), 24 (inorg)
Bicarb-P	4	0, 0	10
Potassium	26 (org), 117 (inorg)	100 (org), 464 (inorg), 120 (org), 559 (inorg)	5 (org), 24 (inorg)
Sulphur	2	9 (org), 9 (inorg)	16
Sodium	6 (org), 8 (inorg)	5 (org), 10 (inorg), 5 (org), 10 (inorg)	7 (org), 10 (inorg)

2 samples were taken in the spring of 2020

Soil pH was lower in the spring after the application of the fertilizer blend. Orthophosphate (organic and inorganic) levels increased (11-39 ppm) in the spring after application. Organic and inorganic phosphate levels also increased by 12-15 ppm (organic P) and 59-70 ppm (inorganic P) in the spring. The application of potash increased soil organic and inorganic potassium levels by 74-94 ppm (organic) and 347-442 ppm (inorganic). Organic sulphur increased by 7 ppm in the spring after application and remained high after fall harvest.

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