

Agnition 系列產品可增加土壤有益菌活性

Agnition Products Increase Beneficial Soil Microbial Activity

RACHEL RATHS, AGNITION
BALATON, MN

INTRODUCTION

- Crop productivity is vastly dependent on soil health.
作物的生產力和土壤健康有極大的關聯性。
- Besides sunlight and air, plants can receive everything they need from the soil environment. 除了陽光和空氣，植物可以從土壤環境中獲得所需的一切。
- Within the last few decades, there have been many tools and tests created that claim to measure soil health, however the soil health industry is still creating and bettering techniques.
在過去的幾十年中，已經有許多工具和測試方法用於測量土壤健康，但這些技術及方法仍在改進中。
- The Haney Soil Health Test is used to look at the chemical and biological aspects of soil health.
Haney土壤健康測試用於檢測土壤健康領域中的化學和生物層面。
- Chemically it measures the water extractable nutrients as well as using an extractant which mimics the organic acids produced by live roots which increase nutrient availability through pH changes.¹
化學層面，此方法檢測水可溶的營養物質，並用一種提取物來模擬由植物根所產生的有機酸，了解藉由pH值變化所增加營養物質的可利用性。
- Biologically it measures microbial activity through CO₂ readings using the Solvita test.¹
在生物學層面，使用Solvita方法檢測二氧化碳產量以評估微生物活性。
- The test also combines five different biochemical values and runs a calculation to produce a final Soil Health Calculation Value.¹
該方法還結合了五種不同的生化值測定，經過計算後呈現土壤健康值。

MATERIALS AND METHODS 材料與方法

- Plants were grown in the greenhouse under controlled ideal conditions.
植物種植於可控制條件的溫室中。
- Four Haney Soil Health trials were conducted, with replicated check and Agnition treated pots.
針對不同產品及處理進行四次Haney測試，並進行重複試驗。
- All pots were handled and cared for exactly the same with the only exception of the Agnition product application.
除了所使用的Agnition產品不同，其他所有種植條件及處理均相同。
- Soil samples were taken by placing a 3.5-inch long probe over the plant and inserting into the soil.
使用3.5英寸長的採樣針來採集土壤樣品。
- All samples were analyzed by Ward Laboratories, Inc. in Kearney, NE.
所有樣品委託位在Kearney, NE的Ward Laboratories公司進行分析。

Trial Number	Trial Start Date	Agnition Product Tested	Crop	# of Replications /Treatment
1	12/19/2013	Generate® (In-Furrow)	Corn	3
2	1/2/2014	Commence® for Wheat	Wheat	5
3	4/2/2014	Generate® (In-Furrow)	Alfalfa	3
4	4/27/2015	Generate® (In-Furrow)	Corn	5

試驗1. 菁大讚施用於玉米葉面，共使用3次

試驗2. Commence施用於小麥，共使用5次

試驗3. 菁大讚施用於苜蓿葉面，共使用3次

試驗4. 菁大讚施用於玉米葉面，共使用5次

RESULTS 結果

Table 1. Haney Soil Health Results from Ward Laboratories, Inc. from the average of Trials 1-4. 表1. 試驗1-4平均值與對照組之差異

Haney Values	Descriptions	Total Average Check	Total Average Treated	% Change from Check	P value (*p≤0.1)
Water Extractable Organic Carbon 水溶性有機碳	Driving energy source for microbes (ppm C) 提供微生物能源 (ppm C)	318.23	337.03	5.91	0.53
Water Extractable Organic Nitrogen 水溶性有機氮	Easily broken down by microbes to inorganic and made available to plants (ppm N) 微生物可輕易分解後提供植物利用 (ppm N)	21.16	22.77	7.57	0.43
Water Extractable Organic Carbon:Nitrogen 水溶性有機碳:氮比	8:1 to 15:1 is a good ratio for N uptake for plants; 20:1 or above N is tied up 8:1到15:1為對植物的良好比例，若達到過高於20:1表示氮被累積在土壤	15.35	15.51	1.00	0.90
Solvita 1-day CO ₂ -C Test Solvita一日二氧化碳測試	The amount of CO ₂ -C released in 24hrs from the microbial population (ppm) 微生物在24小時內釋放的二氧化碳含量	61.91	75.48	21.92	0.26
Soil Health Calculation Scale (0-50) 土壤健康評分(0-50)	Balance of soil carbon and nitrogen and their relationship to microbial activity 土壤碳氮平衡及與微生物活性的關係	9.46	10.70	13.13	0.31

Table 2. Haney Soil Health Results from Ward Laboratories, Inc. from Trial 1 using Generate® in-furrow on corn. **表2. 試驗1菁大讚施用於玉米葉面之結果 (施用3次)**

<i>Haney Values</i>	<i>Descriptions</i>	<i>Total Average Check</i>	<i>Total Average Treated</i>	<i>% Change from Check</i>	<i>P value (*p≤0.1)</i>
Water Extractable Organic Carbon	Driving energy source for microbes (ppm C)	289.33	332.67	14.98	0.11
Water Extractable Organic Nitrogen	Easily broken down by microbes to inorganic and made available to plants (ppm N)	21.63	24.13	11.54	0.33
Water Extractable Organic Carbon:Nitrogen	8:1 to 15:1 is a good ratio for N uptake for plants; 20:1 or above N is tied up	13.45	13.83	2.81	0.65
Solvita 1-day CO ₂ -C Test	The amount of CO ₂ -C released in 24hrs from the microbial population (ppm)	60.70	84.73	39.59	0.24
Soil Health Calculation Scale (0-50)	Balance of soil carbon and nitrogen and their relationship to microbial activity	9.64	11.86	22.93	0.28

Table 3. Haney Soil Health Results from Ward Laboratories, Inc. from Trial 2 using Commence® for Wheat. **表3. 試驗2 Commence施用於小麥之結果 (施用5次)**

<i>Haney Values</i>	<i>Descriptions</i>	<i>Total Average Check</i>	<i>Total Average Treated</i>	<i>% Change from Check</i>	<i>P value (*p≤0.1)</i>
Water Extractable Organic Carbon	Driving energy source for microbes (ppm C)	263.40	268.60	1.97	0.74
Water Extractable Organic Nitrogen	Easily broken down by microbes to inorganic and made available to plants (ppm N)	13.98	14.41	3.09	0.71
Water Extractable Organic Carbon:Nitrogen	8:1 to 15:1 is a good ratio for N uptake for plants; 20:1 or above N is tied up	18.93	19.99	5.62	0.37
Solvita 1-day CO ₂ -C Test	The amount of CO ₂ -C released in 24hrs from the microbial population (ppm)	30.22	44.68	47.85	0.27
Soil Health Calculation Scale (0-50)	Balance of soil carbon and nitrogen and their relationship to microbial activity	5.64	6.29	11.65	0.46

Table 4. Haney Soil Health Results from Ward Laboratories, Inc. from Trial 3 using Generate® in-furrow on alfalfa. 表4. 試驗3菁大讚施用於苜蓿葉面之結果 (施用3次)

<i>Haney Values</i>	<i>Descriptions</i>	<i>Total Average Check</i>	<i>Total Average Treated</i>	<i>% Change from Check</i>	<i>P value (*p≤0.1)</i>
Water Extractable Organic Carbon	Driving energy source for microbes (ppm C)	440.00	456.67	3.79	0.35
Water Extractable Organic Nitrogen	Easily broken down by microbes to inorganic and made available to plants (ppm N)	26.67	27.87	4.5	0.46
Water Extractable Organic Carbon:Nitrogen	8:1 to 15:1 is a good ratio for N uptake for plants; 20:1 or above N is tied up	16.47	16.40	-0.40	0.91
Solvita 1-day CO ₂ -C Test	The amount of CO ₂ -C released in 24hrs from the microbial population (ppm)	106.00	115.00	8.49	0.51
Soil Health Calculation Scale (0-50)	Balance of soil carbon and nitrogen and their relationship to microbial activity	13.50	14.37	6.47	0.47

Table 5. Haney Soil Health Results from Ward Laboratories, Inc. from Trial 4 using Generate® in-furrow on corn. 表5. 試驗4菁大讚施用於玉米葉面之結果 (施用5次)

<i>Haney Values</i>	<i>Descriptions</i>	<i>Total Average Check</i>	<i>Total Average Treated</i>	<i>% Change from Check</i>	<i>P value (*p≤0.1)</i>
Water Extractable Organic Carbon	Driving energy source for microbes (ppm C)	280.20	290.20	3.57	0.23
Water Extractable Organic Nitrogen	Easily broken down by microbes to inorganic and made available to plants (ppm N)	22.38	24.66	10.19	0.08*
Water Extractable Organic Carbon:Nitrogen	8:1 to 15:1 is a good ratio for N uptake for plants; 20:1 or above N is tied up	12.58	11.82	-6.04	0.25
Solvita 1-day CO ₂ -C Test	The amount of CO ₂ -C released in 24hrs from the microbial population (ppm)	50.72	57.50	13.37	0.53
Soil Health Calculation Scale (0-50)	Balance of soil carbon and nitrogen and their relationship to microbial activity	9.05	10.28	13.55	0.21

CONCLUSION 結論

- When comparing untreated soils to the Agnition treated soils there was **將未經處理的土壤與Agnition系列產品處理的土壤進行比較時，** an overall trend of increasing beneficial soil chemical and biological **總體趨勢可看到土壤的化學和微生物活力參數均改善。** parameters.
- All values in Table 1 showed a beneficial increase, with the Solvita test **表1結果顯示Agnition系列產品可改善Haney測試中的所有數值，** showing a 21.92% increase over the check, representing an increase in **Solvita測試結果顯示土壤微生物所產生的二氧化碳增加21.92%，顯示微生物活性增加。** overall microbial activity.
- Soil equilibrium is a vital aspect of soil health and the beneficial increases **土壤平衡是土壤健康的一個重要指數，** shown in Table 1 demonstrate that the biochemical balance of the **表1顯示使用Agnition系列產品可改善土壤的生化平衡。** rhizosphere was enhanced.

Works Cited

1. "Haney/Soil Health Test Information." Ward Laboratories Inc. Lance Gunderson. Web. 22 July 2016.