

Nutrient Use Efficiency Research Data Summary

EcoTea[™] Trials

EcoTea[™] has conducted 4 years of 3rd party replicated plot trials and a variety of on-farm field scale trials to determine the effects of broad-spectrum biology on crop nutrient efficiency, yields and quality. Granular fertilizer was used for all plots trials, and both granular and liquid fertilizers were used in the field/farm sites.

Standard rates of EcoTea[™] Liquid and Dry Seed Dressings, EcoTea[™] MycoPak, In-Furrow HDI and Residue Digester products were compared against conventional grower's standard for each site. Conventional treated seed or bare seed were used depending on seed availability or most common conventional practice for that crop.

The following is a summary of the observations and deductions for each crop type. Specific trial results and protocols are available through EcoTea[™] dealers upon request. Supplemental on farm trial results are available as well upon request.

Oats

Three separate replicated trial sets with oats were conducted at both the Swan River and Winnipeg sites in 2021 and 2022, for a total of over 80 comparative plots. EcoTea[™] Seed Dressings were used while reducing both applied N and P in varying amounts. Across all our trials oats has shown the most consistent positive yield response with EcoTea[™], relative to other crops we have been trialing.

- When N was reduced by 20% and P reduced by 10%. Even with the reduced fertility EcoTea[™] treated oats saw an average yield increase of 7.05% in comparison to the conventional grower's standard (full fertility).
- When N+P were reduced by 47% and 30% respectively (Swan River Site Only), EcoTea[™] treated oats saw an average yield reduction of 6.2%. Despite the significant reduction, the savings in fertility resulted in calculated net earnings increase of \$30.00/acre at spring 2022 fertilizer and fall 2022 crop value prices.

NOTE: The significant reduction of fertility is for research purposes and is not recommended as a commercial practice.

Conclusions:

EcoTeaTM treated oats saw a statistically significant yield increase over conventional grower's standard even whilst reducing N+P by 20% and 10% respectively, significantly increasing net/acre profits. EcoTeaTM treated oats saw a slight yield reduction when N+P were reduced by 47% and 30% respectively, however net acre profits still increase at current fertilizer and crop prices. 3rd party farm trials in 2019, as well as 1000's of seeded acres the past 3 years have reinforced these findings.

Spring Wheat

Three replicated trial sets with wheat over three years were conducted at both the Winnipeg, MB. All EcoTeaTM Seed Dressings were trialed reducing both N + P in varying amounts. All three trials saw no statistically significant yield differences when compared with the conventional grower's standard.

- When N was reduced by 20% and P by 10%, there was a yield variance of less than 1.66% of EcoTea[™] treated plots compared to the grower's standard 100% rate fertility. This average was represented by 39 field plots over 3 trials, in 3 different crop years (2020, 2021 (Drought), 2022).
- Two 3rd party farm scale trials were conducted with full fertility in Southern MB (Arnaud and Oakville, MB) showing an average of a 3bu/ acre increase over grower's standard. These results have not been replicated in small plot trials to date.

Conclusion: With various ranges of reduced fertility EcoTea[™] treated wheat yielded within a 2% statistical variance compared to the conventional grower's standard at full fertility. When full rates of fertility were used with EcoTea[™] there has been no statistical difference in yield when compared to the conventional grower's standard full rate fertility. Net profits per acre are consistently higher when EcoTea[™] is used while reducing spring fertility between 10-20%. Clearly net profits increase as fertility prices increase relative to the commodity prices. When prices are >\$1.10/lb of applied N and >\$1.70/lb of applied P, EcoTea[™] treated wheat can increase per acre profits significantly over the conventional grower's standard.

Discovery Farm Wheat Plots Note:

In crop year 2022 EcoTea[™] undertook a field scale comparative plot trial at a 10-acre site managed by Discovery Farm, Langham, SK.

The first year of this project trialed EcoTea[™] Seed Dressings, In-Furrow, and Residue Digester in conjunction with 5 different conventional programs using various rates and types of fertility, and standard herbicide program. These 5 plots were compared against a conventional grower's standard with full rate fertility. Six plots of 1.5 acres each were seeded in late May into extremely dry soil conditions, a timely rain in early June ensured a crop came up, but for the remainder of the year the site only saw a total of 2.5 inches of rain, essentially drought conditions.

Although, we don't want to draw too firm of conclusions from this first year on a site that had a lot of compaction and saline conditions, the top yielding plot (2 bushels higher than grower's standard) was where EcoTea[™] Residue Digester and Liquid Seed Dressing were applied with 50% less applied Nitrogen and 20% less Phosphorus (Alpine) than the full rate applied MAP grower's standard. The main reason for this result was the drought conditions, in that the biology enabled the wheat to access moisture longer, kept maturing 2 weeks longer than the plot that had no EcoTea[™], resulting in a higher yield. Average yield for the entire site was 20bu/acre, so drought was a huge issue.

Potato Preliminary Data (2023)

Principal Investigators: Darin Gibson and Debbie Jones, Gaia Consulting Ltd.
Objective: To evaluate the effect of EcoTea[™] HDI on potato yield and quality in potatoes grown for fresh market production in Manitoba.
Plot size: 4 rows by 10 m (Assessments conducted on 2 centre rows)
Trial design: RCB 4 replicates
Plot location: Morden, MB
Crop: Potatoes
Variety: Sangre
Row spacing: 38"
In-row spacing: 10"

List of Treatments

Treatment	Recommended Fertilizer	IF Fung
1. Grower Standard ¹ 100% Fertility	100%	Yes
2. GS + EcoTea In-Furrow (4 Gal/Acre Rate)	100%	Yes
3 GS + EcoTea In-Furrow (10 Gal/Acre Rate)	100%	Yes
4. GS + (352 mL/ac)	100%	Yes
5. GS + (352 mL/ac) + EcoTea In-Furrow (4 Gal/Ac Rate)	100%	Yes
6 80% GS Fertility	80%	Yes
7. 80% Fert + EcoTea In-Furrow (4 Gal/Acre Rate)	80%	Yes
8. 80% Fert + EcoTea In-Furrow (10 Gal/Acre Rate)	80%	Yes
9. 80% GS Fertility	80%	No
10. 80% Fert + EcoTea (10 Gal/Acre Rate)	80%	No
11. 80% Fert + EcoTea (10 Gal + Amino Acids)	80%	No
12. 60% GS Fertility	60%	No
13. 60% Fert + EcoTea In-Furrow (10 Gal/Acre Rate)	60%	No
14. 60% Fert + EcoTea In-Furrow (10 Gal/Acre + Amino Acids)	60%	No

¹GS - Grower Standard Fertility – Treatments 1-5, Match the fertility of **States** (starter, NPKS rates and timings), in-furrow fungicide. EcoTea rates as listed. Amino Acid rate 5 lb/ac.

Emergence Data

		In Furrow			Plants	Stems	Stems	
Trt.	Fungicide	EcoTea		A.Acids	Fertility	(20 Row-m)	(20 Row-m)	(Plant)
1	Yes				100%	64.3 a	141.8 a	2.21 a
2	Yes	4 gal/ac			100%	64.8 a	152.8 a	2.36 a
3	Yes	10 gal/ac			100%	63.8 a	153.0 a	2.39 a
4	Yes		Yes		100%	62.5 a	144.5 a	2.32 a
5	Yes	4 gal/ac	Yes		100%	63.5 a	142.3 a	2.25 a
6	Yes				80%	61.3 a	131.8 a	2.17 a
7	Yes	4 gal/ac			80%	66.3 a	154.3 a	2.33 a
8	Yes	10 gal/ac			80%	64.3 a	139.8 a	2.18 a
9					80%	63.5 a	142.8 a	2.25 a
10		10 gal/ac			80%	65.3 a	151.3 a	2.32 a
11		10 gal/ac		Yes	80%	63.0 a	148.5 a	2.37 a
12					60%	64.0 a	149.5 a	2.34 a
13		10 gal/ac			60%	62.5 a	159.0 a	2.55 a
14		10 gal/ac		Yes	60%	63.8 a	149.8 a	2.36 a
LSD P=. CV Treatme	05 nt Prob(F)					ns 5.5 0.9021	ns 8.6 0.2685	ns 8.5 0.4373

Stem and Stolon Canker Data

In Furrow			Stem Canker	Stem Canker	Stolon Canker	Stolon Canker				
Trt.	Fungicide	EcoTea		A.Acids	Fertility	Severity (0-100 index)	Severity (%)	Severity (0-100 index)	Severity (%)	
1	Yes				100%	1.7bcd	1.7bcd 6.8 b-f		7.6a	
2	Yes	4 gal/ac			100%	0.7d	2.2ef	0.0a	0.0a	
3	Yes	10 gal/ac			100%	1.2cd	4.6c-f	1.3a	3.2a	
4	Yes		Yes		100%	0.8cd	2.9def	0.5a	1.1a	
5	Yes	4 gal/ac	Yes		100%	0.6d	2.0f	0.8a	1.4a	
6	Yes				80%	1.9bcd	7.5b-e	2.4a	7.6a	
7	Yes	4 gal/ac			80%	0.9cd	3.1def	0.5a	1.1a	
8	Yes	10 gal/ac			80%	1.9bcd	7.7bcd	0.0a	0.0a	
9					80%	2.3abc	9.3abc	1.3a	3.2a	
10		10 gal/ac			80%	3.3ab	13.3ab	2.4a	4.0a	
11		10 gal/ac		Yes	80%	1.9bcd	7.6b-e	1.6a	4.0a	
12					60%	4.1a	16.3a	2.9a	5.5a	
13		10 gal/ac			60%	3.0ab	3.0ab 10.8abc		0.0a	
14		10 gal/ac		Yes	60%	3.2ab	12.8ab	0.5a	1.1a	
LSD P=. CV Treatme	05 nt Prob(F)					t 24.98t 0.0017	t 30.85t 0.0009	ns 136.0t 0.3607	ns 133.28t 0.3787	

EcoTea[™] Applied Nutrient Use Efficiency Trials 2019-2022

Tuber Yield

		In-Furrow				Yield(cwt/ac)								
Trt.	Fungicide	EcoTea		A. Acids	Feritlity	<2"	2-2.25"	2.25-3.0"	3-3.5"	>3.5"	Total	2.25-3.0oz (%)		
1	Yes				100%	18.0 a	27.3 a	171.2 d	46.6 a	4.4 a	267.4 d	63.815 a		
2	Yes	4 gal/ac			100%	19.7 a	31.5 a	180.8 cd	43.9 a	0.9 a	276.8 cd	64.78 a		
3	Yes	10 gal/ac			100%	19.4 a	30.9 a	186.8 cd	33.8 a	11.1 a	281.9 cd	66.248 a		
4	Yes		Yes		100%	23.5 a	22.6 a	186.9 cd	56.7 a	5.8 a	295.5 a-d	63.32 a		
5	Yes	4 gal/ac	Yes		100%	15.3 a	24.8 a	187.9 bcd	54.0 a	6.2 a	288.2 bcd	65.565 a		
6	Yes				80%	15.4 a	22.8 a	174.6 d	56.5 a	4.5 a	273.8 cd	63.895 a		
7	Yes	4 gal/ac			80%	20.9 a	33.8 a	183.4 cd	44.4 a	5.4 a	287.9 bcd	63.705 a		
8	Yes	10 gal/ac			80%	17.1 a	28.7 a	89.8 bcd	37.6 a	3.4 a	276.5 cd	68.845 a		
9	No				80%	19.1 a	24.4 a	217.2 ab	43.1 a	1.4 a	305.1 abc	71.123 a		
10	No	10 gal/ac			80%	16.8 a	29.4 a	206.7 abc	49.1 a	2.9 a	304.9 abc	67.843 a		
11	No	10 gal/ac		Yes	80%	19.5 a	23.6 a	190.2 bcd	58.4 a	4.3 a	295.8 a-d	64.34 a		
12	No				60%	13.8 a	23.7 a	205.6 abc	60.6 a	5.5 a	309.3 abc	66.553 a		
13	No	10 gal/ac			60%	20.8 a	27.0 a	205.9 abc	66.7 a	6.9 a	327.3 a	63.083 a		
14	No	10 gal/ac		Yes	60%	17.5 a	32.3 a	226.2 a	41.9 a	0.0 a	317.9 ab	71.12 a		
Image: Solution Image: Sol								27.2 9.7 0.0130	ns 27.8 0.0692	ns 114.9 0.2986	33.5 7.9 0.0347	ns 7.25 0.3115		

Tuber Specific Gravity, Number and Average Weight

		In Furrow			F . 499	Specific	Tuber Num <u>ber</u>	Avg. tuber	
Trt.	Fungicide	EcoTea		A.Acids	Fertility	Gravity	(plant)	(oz)	
1	Yes				100%	1.0636cd	5.96a	5.10b-e	
2	Yes	4 gal/ac			100%	1.0624d	6.56a	4.78e	
3	Yes	10 gal/ac			100%	1.0641cd	6.54a	5.02cde	
4	Yes		Yes		100%	1.0619d	7.02a	5.03b-e	
5	Yes	4 gal/ac	Yes		100%	1.0619d	6.31a	5.35abc	
6	Yes				80%	1.0633cd	6.24a	5.49ab	
7	Yes	4 gal/ac			80%	1.0638cd	6.54a	4.89de	
8	Yes	10 gal/ac			80%	1.0643bcd	6.13a	5.20a-d	
9					80%	1.0627d	6.91a	5.13b-e	
10		10 gal/ac			80%	1.0640cd	6.69a	5.16b-e	
11		10 gal/ac		Yes	80%	1.0627d	6.47a	5.37abc	
12					60%	1.0656abc	6.42a	5.58a	
13		10 gal/ac			60%	1.0678a	7.25a	5.38abc	
14		10 gal/ac		Yes	60%	1.0668ab	7.24a	5.11b-e	
LSD P=.	.05					0.0025	ns	0.42	
CV						0.17	9.44	5.56	
Ireatme	nt Prob(F)					0.0009	0.1838	0.0308	

Agronomics and Yield on Norkota Russet Potatoes

Lethbridge, AB - Hamman Ag Research 2023

Objective: Compare EcoTea[™] Biostimulant for yield and quality with reduced fertilizer rate and observations on incidence of disease including various potato diseases

Materials and Methods:

Whole seed piece Norkota Russet 3 Seed Pieces per m row - Planted May 20 - Center pivot irrigated with approx. 14 inches water.

Weed control with early Premergent application of Low label rate Flumioxazin over entire trial, and in crop with metribuzin and Clethodim.

Fertilizer blend drilled in before planting with band application at rates as indicated in treatment list.

EcoTea[™] was formulated with 1 liter A jug mixed with 22 l EcoTea B pail

10 gpa Concentrate diluted 1:2 with non-chlorine water and applied at planting in-furrow application.

4 gpa Concentrate diluted 1:5 with non-chlorine water and applied at planting in-furrow application.

Ті	reatment	Fert Rate N-P-K-S			Vigour	Total Yield Mean Size Distribution - 1 Row Sample			Severity Rhizoctonia 1= No Disease, 10=100% Disease		
Trt.	Seed Trt.	Standard Fertilizer 150-100-80-50	In-Furrow EcoTea Potato	Vigour 7 DAE & Observe Sdl Disease	Vigour 28 DAE & Observe Foliar Disease	Yield For 12m Plot (Total Kg)	Yield >200g	Yield 100-200g	Yield 50-100g	Specific Gravity	Avg Rate Rhizoc.
1		100% Farmer Standard	0 Gpa	5.5	6.5	34.1a	6443a	6179a	1843a	1.095	2.2
				No Disease Noted	% Of Sample	44%	42%	13%			
2		100% Farmer Standard	4 Gpa	5.75	6.5	30.1a	5227a	6254a	2470a	1.088	1.9
				No Disease Noted	% Of Sample	37%	45%	18%			
3		80% Farmer Standard	4gpa	5.5	7	35.5a	6393a	6835a	3219a	1.087	1.2
			No Disease Noted	% Of Sample	39%	42%	20%				
4		80% Farmer Standard	10gpa	6.5	7.5	38.5a	7939a	5302a	2391a	1.086	1.1
					No Disease Noted	% Of Sample	51%	34%	15%		
5	Bare Seed	80% Farmer Standard	10gpa	6	7.5	36.0a	4449a	5763a	2480a	1.097	2.2
			No Disease Noted	% Of Sample	35%	45%	20%				
										-	
6	Bare Seed	60% Farmer Standard	10gpa	6	6.5	34.3a	7815a	6079a	2334a	1.102	2.1
					No Disease Noted	% Of Sample	48%	37%	14%		

Conclusions:

There was NSD in total yield of 2 center rows from each plot among treatments.

Treatment 4 (**Lease** treated seed + 10 gpa EcoTea & 80 % farmer fertilzer rate) tended to yield highest followed by:

Treatment 5 (untreated seed + 10 gpa EcoTea & 80% farmer fertilizer rate)

Treatment 3 was 3rd highest yield followed by Trt 1 & 6 (trt 2 appeared as an anomoly as yields were quite low in rep 3 & 4 due to some weed control issues.

There was NSD in size distribution of potatoes among treatments although Treatment 4 & 6 Tended to have about 50% of potatoes over 200 g.

Other treatments were not much different in % of potatoes over 200 g as they were all in about 35% (trt 5) up to 44% (trt 1)

EcoTea treatments tended to have excellent yield equal to 100% fertilizer with high percent of large potatoes (ie. no indication of biostimulation of extra tubers.)

DAE is Days After Emergence. Slightly better emergence and vigour in reps 1 and 2 compared to rep 3 & 4.

No Disease was observed in early observations- Only low levels of black scurf (rhizoctonia) at harvest. Rhizoctonia assessed on 10 mature potatoes.

Other Crops

EcoTea[™] products have full functional microbial diversity and have shown commercially positive affects on all crops and plants. We have dedicated multi-year customers using a variety of our products on Potatoes, Cereals, Oils Seeds, Legumes, Cranberries and Vineyards, based on their own trials. As we, grow our capabilities we hope to direct research efforts into these areas as well.

All plot trials were conducted through 3rd party research facilities:

- Sir William Stephenson Research Center; Winnipeg, MB. (Peas, Wheat, Oats, Corn, Soybeans) 2020-2022
- New Era Ag Research; Swan River, MB: 2021-2022 (Peas, Oats, Canola)
- Peace Country Forage and Grain Association; Fairview, AB: 2019-2022 (Wheat and Canola).
- Multi-Year field scale trials and farm evaluations have been conducted at sites in: Cardale, MB; Tilley, AB; Radville, SK; Reinland, MB; Elie, MB; Southern Ontario (multiple sites).
- A ten-acre EcoTea[™] soil health research site was initiated in 2022 at Discovery Farm in Langham, SK.