

Aquagrain Sweetcorn Variety Trial Report

2023/24 Growing Season



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June 2024

Aquagrain Sweetcorn Variety Trial Report

From: March To June 2024

Introduction

Aquagrain is a unique, organic-based, biodegradable soil improver that allows crops to be grown in sandy, free-draining soils with a fraction of the water ordinarily required, providing more crops with less water. This innovative product involved the conversion of organic food industry waste into a soil improver that also absorbs water. The Innovation Oasis at Silal in collaboration Aquagrain sought to investigate the effectiveness of Aquagrain in improving productivity and resource-use efficiency in sweetcorn.

Objectives

- To assess the effect of aquagrain on the productivity of the sweetcorn variety in terms of yield and quality
- To evaluate the performance of the sweetcorn variety under sensor driven irrigation and 100% irrigation based on standard water requirement for the crop.
- To investigate the benefit-cost analysis when comparing production using aquagrain with the control

Methodology

- Sweetcorn variety(Sentinel) was tested under two treatments; aquagrain and the standard (control) during the 2023/24 growing season.
- These two treatment were tested under sensor driven and standard irrigation method.
- The two treatment were replicated four times each under sensor driven and standard irrigation method
- Each plot was 32m in length and 1.2m in width. Spacing within the plot was 0.3m x 0.3m. The distance between one bed and another was 1.5m. Total population density/ha was
- Fertigation was based on the standard nutrient requirement for sweetcorn.
- The varieties received recommended dosage of fertilizers and irrigation during the period under review to optimize the growth and development.
- Insects were managed using standard Integrated Pest Management using eco-friendly approaches.
- Data was collected on yield, produce quality, flowering, and disease resistance, among others, for the 2023/24 growing season evaluation.



Irrigation schedules for sweet corn trials under sensor-driven and 100% irrigation

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Variety	Week	From	To	Control (100% Irrigation)	Aqua grain (Sensor-driven)
Sentinel	1	22-Mar-24	23-Mar-24	14 m2	14 m2
Sentinel	2	24-Mar-24	30-Mar-24	50 m2	50 m2
Sentinel	3	31-Mar-24	6-Apr-24	50 m2	50 m2
Sentinel	4	7-Apr-24	13-Apr-24	50 m2	50 m2
Sentinel	5	14-Apr-24	20-Apr-24	50 m2	50 m2
Sentinel	6	21-Apr-24	27-Apr-24	70 m3	56 m3
Sentinel	7	28-Apr-24	4-May-24	70 m3	56 m3
Sentinel	8	5-May-24	11-May-24	70 m3	56 m3
Sentinel	9	12-May-24	18-May-24	70 m3	56 m3
Sentinel	10	19-May-24	25-May-24	90 m3	72 m3
Sentinel	11	26-May-24	1-Jun-24	90 m3	72 m3
Sentinel	12	2-Jun-24	8-Jun-24	38.5 m3	30.8 m3
Total				712.5 m3	612.8 m3

PS: There was heavy rain on 16 April 2024

Irrigation converted to CBM/ha/cycle		
	Control	Aqua grain
Sensor-driven	7,125	6,128
100% Irrigation	7,125	7,125



Fertigation schedule for sweet corn trials across experimental field under sensor-driven and 100% irrigation

Week	From	To	NPK 28:14:14 (kg)	Urea (kg)	Potassium Nitrate (kg)	Magnesium Nitrate (kg)	Potassium Sulphate (kg)	Magnesium Sulphate (kg)	Calcium Nitrate (kg)	MKP (kg)	Chelated mix (g)	Iron (g)	Decis (ml)	Karate Zeon (ml)	Dupont Coragen (ml)
1	22-Mar-24	23-Mar-24	0	0	0	0	0	0	0	0	0	0	0	0	0
2	24-Mar-24	30-Mar-24	0	0	0	0	0	0	0	0	0	0	0	0	0
3	31-Mar-24	6-Apr-24	0	0	0	0	0	0	0	0	0	0	0	0	0
4	7-Apr-24	13-Apr-24	2	2	0	0	0	0	0	0	0	0	100	0	0
5	14-Apr-24	20-Apr-24	12	12	0	0	0	0	0	0	400	400	100	0	50
6	21-Apr-24	27-Apr-24	12	8	4	2	0	0	0	0	0	0	0	0	0
7	28-Apr-24	4-May-24	10	0	12	5	0	0	0	0	400	400	230	0	0
8	5-May-24	11-May-24	12	0	12	6	0	0	0	0	400	400	350	0	0
9	12-May-24	18-May-24	6	0	6	1	10	8	6	6	0	0	500	0	0
10	19-May-24	25-May-24	0	0	0	0	12	11	10	10	400	400	0	500	0
11	26-May-24	1-Jun-24	0	0	0	0	2	2	0	0	0	0	0	0	0
Total			54	22	34	14	24	21	16	16	1600	1600	1280	500	50
Total (requirement per ha)			387	158	244	100	172	150	115	115	11467	11467	9173	3583	358

Mean squares and separation for treatments evaluated using sensor-driven irrigation

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Sources of variation	DF	Mean squares									
		Yield/plot (kg)	Yield (kg/ha)	No of cobs/plot	Ear weight (g)	Ear length (cm)	Ear diameter (mm)	Brix	Plant height (cm)	Ear height (cm)	Plant Aspect
Rep	3	496ns	6517141ns	5056ns	1760ns	0.50ns	1.61ns	1.34**	40.4ns	0.14ns	0.13ns
Treatment	1	242ns	3181873ns	6962ns	42ns	0.19ns	0.15ns	0.05ns	6.8ns	6.85ns	0.13ns
Error	3	163	2143162	2511	380	0.39	3.29	0.04	25.1	22.83	0.46
Mean		134	15365	449	285	19.06	49.88	14.98	200.0	55.68	3.63
SE		6.4	732	25	9.75	0.31	0.91	0.10	2.5	2.4	0.34
CV		9.53	9.53	11.16	6.84	3.29	3.64	1.28	2.50	8.58	0.27
R-square		0.78	0.78	0.75	0.82	0.59	0.34	0.97	0.63	0.10	18.68

* - significant at 5% probability level; ** - significant at 1% probability level, ns – not significant at 1% and 5% probability levels



Mean squares and separation for treatments evaluated using sensor-driven irrigation

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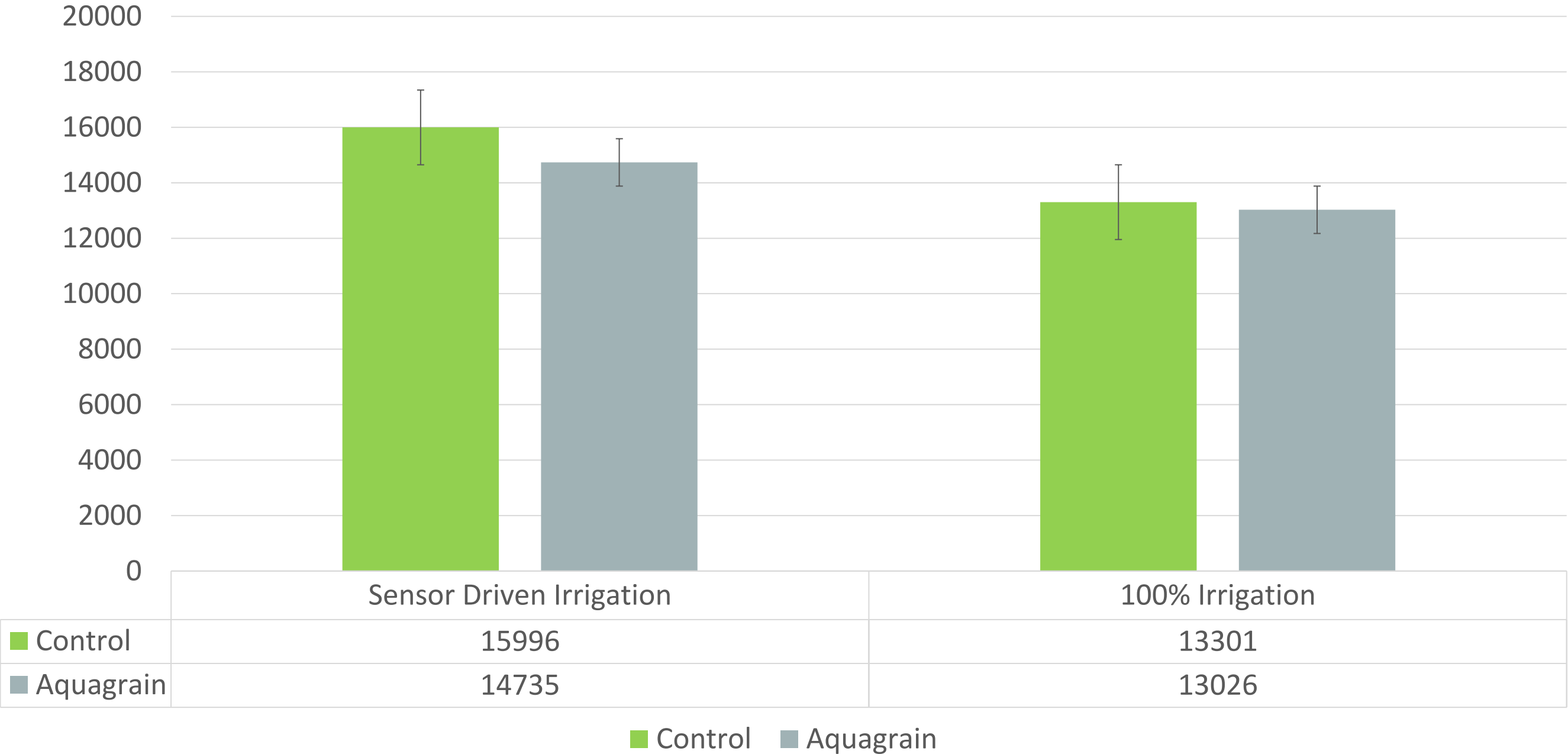


Sources of variation		Mean squares									
		Yield/plot (kg)	Yield (kg/ha)	No of cobs/plot	Ear weight (g)	Ear length (cm)	Ear diameter (mm)	Brix	Plant height (cm)	Ear height (cm)	Plant Aspect
Rep	3	11ns	150591ns	24ns	1975ns	3.42ns	4.31ns	1.09ns	13.4ns	22.85ns	0.33ns
Treatment	1	12ns	151468ns	450ns	452ns	0.22ns	5.06ns	0.28ns	5.4ns	19.22ns	0.01ns
Error	3	82	1081486	221	623	1.54	2.55	0.30	12.4	17.46	1.00
Mean		115	13164	419	280	19.74	49.38	15.01	204.4	60.55	4.00
SE		4.5	520	7.4	12.5	0.6	0.8	0.3	1.8	2.1	0.5
CV		7.90	0.16	3.55	8.92	6.28	3.23	3.62	1.72	6.90	25.00
R-square		0.16	0.16	0.44	0.77	0.69	0.70	0.80	0.55	0.63	0.25

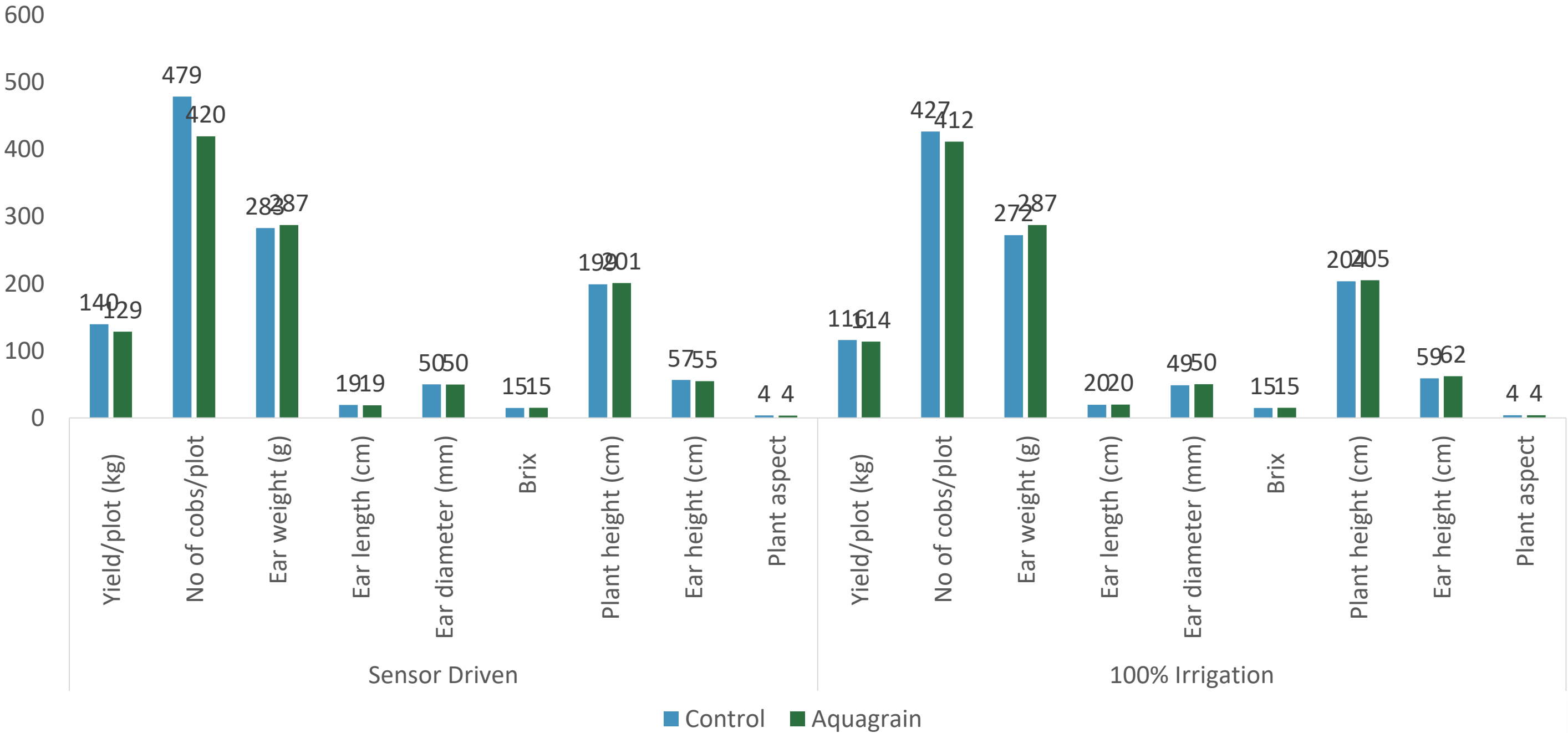
ns – not significant at 1% and 5% probability levels



Comparison between average yield of sweetcorn under the two treatments evaluated using sensor-driven irrigation and standard irrigation methods



Comparison among agronomic traits of sweetcorn under the two treatments evaluated using sensor-driven irrigation and standard irrigation methods



Sweetcorn production cost on one hectare of land using aquagrain compared with control

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S/N	Input Cost	UOM	Qty/ha_Aquagrain	Qty/ha_Control-100% Irrigation	Price (AED)/unit	Aquagrain Production (AED)/ha	Control- 100% Irrigation Production (AED)/ha
Capital Expenditure							
1	Irrigation facility (5 years @ 2 seasons/year)					9,000	9,000
Total Capital Expenditure						9,000	9,000
Input cost							
Soil amendment							
1	Chicken and cow manure mix	25kg bag	800	800	9.85	7,880	7,880
2	Aquagrain	kg	500	500	323	161,500	0
Soil amendment_Sub-total						169,380	7,880
Seeds							
1	Seeds – Sentinel	kg	20	20	394	7,880	7,880
Seeds_Sub-total						7,880	7,880
Fertilizers							
1	NPK 28:14:14	25kg bag	15	15	125	1875	1875
2	Urea	50kg bag	3	3	83	249	249
3	Potassium Nitrate	25kg bag	10	10	193	1930	1930
4	Potassium Sulphate	25kg bag	7	7	134	938	938
5	Magnesium Sulphate	25kg bag	6	6	65	390	390
6	Magnesium Nitrate	25kg bag	4	4	125	500	500
7	Calcium Nitrate	25kg bag	5	5	137	685	685
8	Mono Potassium Phosphate	25kg bag	5	5	271	1355	1355
9	Iron	1kg packs	11	11	39	429	429
10	Chelate Micronutrient Mix	1kg packs	11	11	33	363	363
Fertilizers_Sub-total						8,714	8,714
Pesticides							
1	Karate Zeon	250ml	14	14	153	2142	2142
2	Decis EC100	250ml	37	37	70	2590	2590
3	Dupont Coragen	50ml	7	7	50	350	350
Pesticide_Sub-total						5,082	5,082
Total Input Cost						191,056	29,556
Operational cost							
1	Energy	KWh	59	69	0.135	7.97	9.315
2	Water usage (subsidized)	CBM	6128	7125	3	18,384	21,375
3	Labour	Mandays	370	370	65	24,050	24,050
Total Operational Cost						42,442	45,434
Miscellaneous (5%)						12,125	4,200
Total Production Cost						254,623	88,190



Revenue Estimates for sweetcorn production using aquagrain versus control

Projected Revenue

Revenue	Unit	Quantity	Cost (AED)/unit	Total Revenue from Aquagrain (AED)/ha	Total Revenue from Control (AED)/ha
Average Yield/ha for Aquagrain	kg	14735	2	29,470	0
Average yield/ha for Control	kg	15996	2	0	31,992
Total revenue				29,470	31,992

Economies of sweetcorn production/season/hectare using aquagrain versus control



S/N	Details	Aquagrain(AED)	Control (AED)
1	Total Revenue	29,470	31,992
2	Capex	9,000	9,000
3	Input cost	191,056	29,556
4	Operation Cost	42,442	45,434
5	Total Production Cost (including 5% miscellaneous)	254,623	88,190
6	Net Profit/Loss	-225,153	-56,198

	Aquagrain (AED)	Nader (AED)
Cost of production/kg	17.3	5.5
Selling price/kg	2	2
Benefit-Cost Ratio	0.12	0.36



Summary



Average yield for sensor-driven irrigation was 14,735kg/ha under aquagrain and 15,996 kg/ha under control (100% irrigation)

Average yield for standard 100% irrigation was 13,026kg/ha for aquagrain and 13,301kg/ha for control

Statistically, no significance differences were observed for all measured traits under aquagrain treatment compared with control

For sensor-driven irrigation, aquagrain plots received 14% lesser water than the control

For sensor-driven irrigation, cost of production/ha under aquagrain was AED 254,623 while that of control was AED 88,190

For sensor-driven irrigation, expected revenue under aquagrain and control were AED29,470 and AED31,992, respectively.

Benefit:cost ratio under sensor-driven irrigation revealed that for every AED1 spent to produce sweetcorn under aquagrain, you will make 12 fills in revenue while under control for every AED1 spent, you will make 36 fills in return.



Conclusion and recommendations



Sweetcorn production appears to be unprofitable from this study given that the cost of production the revenue is far above the revenue



Aquagrain did not significantly improve yield when compared with the control but there were good savings in water consumption to the tune of 14%. However, the cost of aquagrain far outweighs the benefit.



The experiment was conducted off season and some of the results might have been adversely imparted.



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