syngenta

The Plant Biologicals Network Symposium 2022

'Bio-stimulating' Our Future

Classification: PUBLIC

Industry challenges leading to society and nature guided innovation

PAST

NEEDS

- Agronomic needs
- Ease of use
- Operator and public safety
- Resistance
- Economic challenges

PRESENT/FUTURE

NEEDS (in and beyond the field)

- Agronomic needs
- Ease of use
- Operator and public safety
- Resistance
- Economic challenges
- Registerability

- Soil health
- Biodiversity
- Green house gas emissions
- Extreme weather events



Industry challenges leading to society and nature guided innovation

PAST

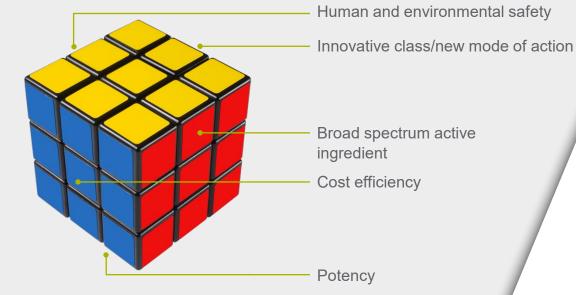
NEEDS

- Agronomic needs
- Ease of use
- Operator and public safety

RESEARCH DRIVERS

- Resistance

Economic challenges



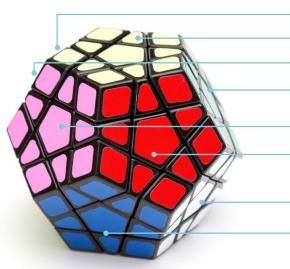
PRESENT/FUTURE

NEEDS (in and beyond the field)

- Agronomic needs
- Ease of use
- Operator and public safety
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- Economic challenges
- Registerability

- Soil health
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- Extreme weather events

RESEARCH DRIVERS



Human and environmental safety Innovative class/new mode of action Broad spectrum active ingredient

Cost efficiency

Potency

Integrated pest management

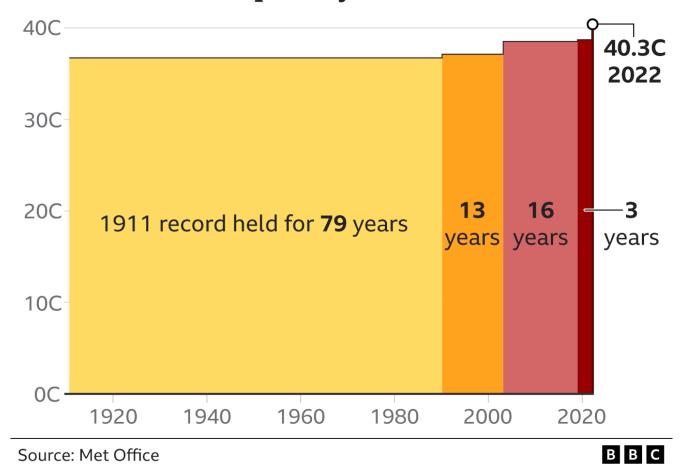
Climate resilience and soil health

Fit for specific farmer, consumers and food value chain needs



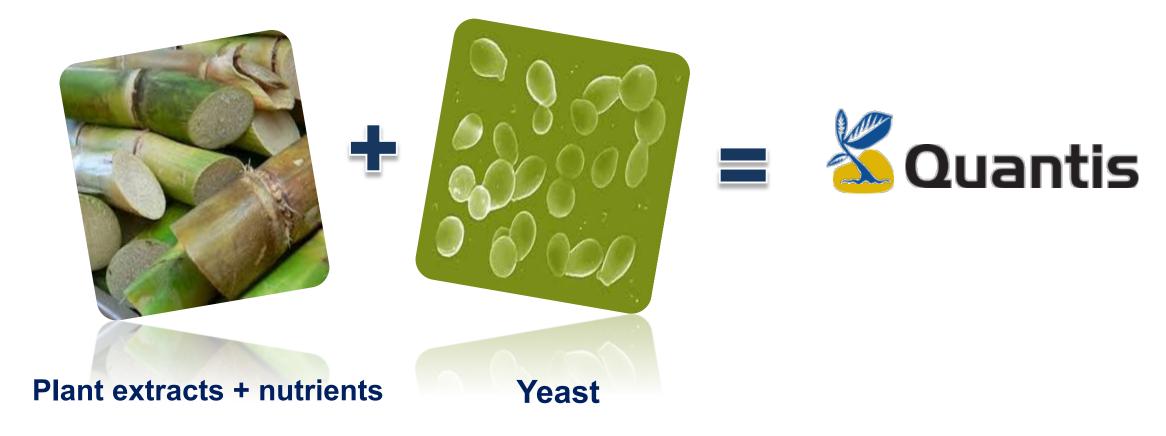
It's hot and getting hotter

UK's national temperature record is being broken more frequently





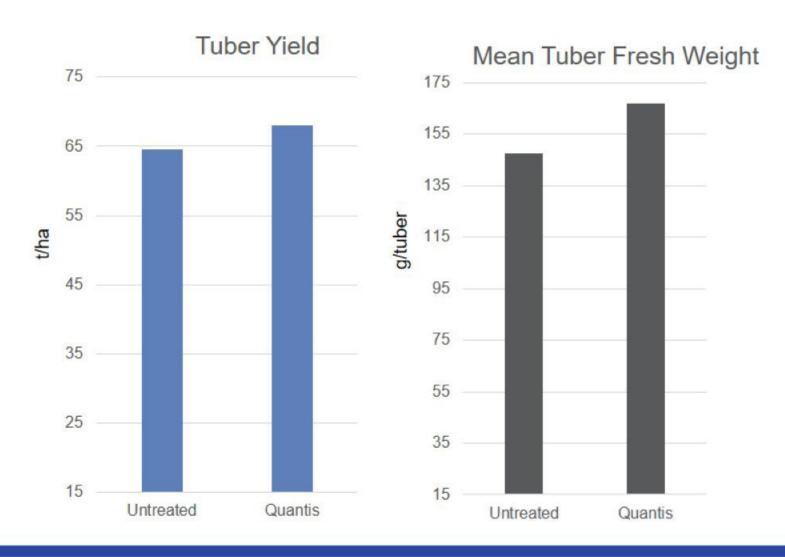
- QUANTIS is a biostimulant derived from extracts of sugar cane & yeast production process.
- Combination of organic carbons, potassium, calcium & energy source carbohydrates, in the form of sugars and some amino acids
- QUANTIS enhances plant performance and reduces yield loss caused by abiotic stresses

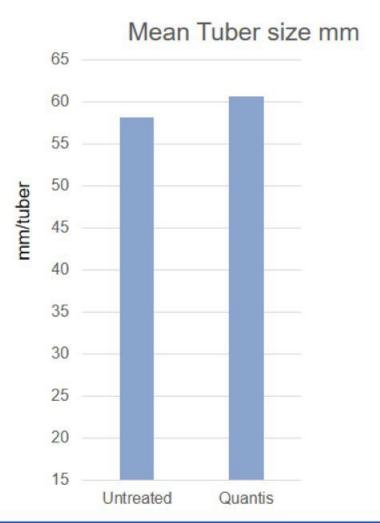






2017 QUANTIS Trial: 'hmm- Interesting'





Source CMI 2017

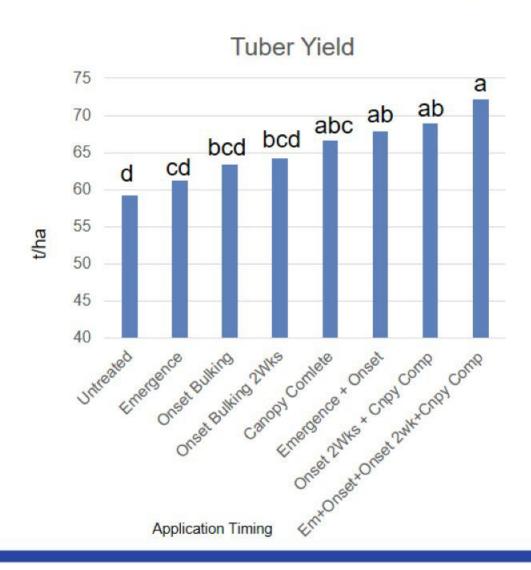
Applied 3 times:

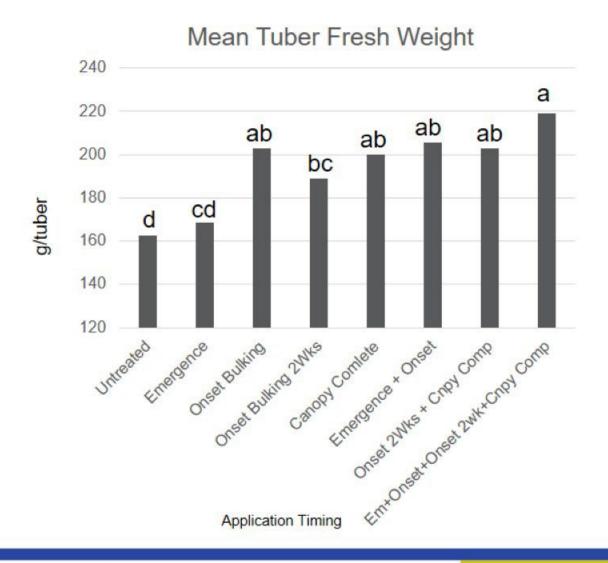
- Stolon @ hook
- 34g mean tuber
- 54g mean tuber





2018 QUANTIS Trial: 'Gaining more interest'

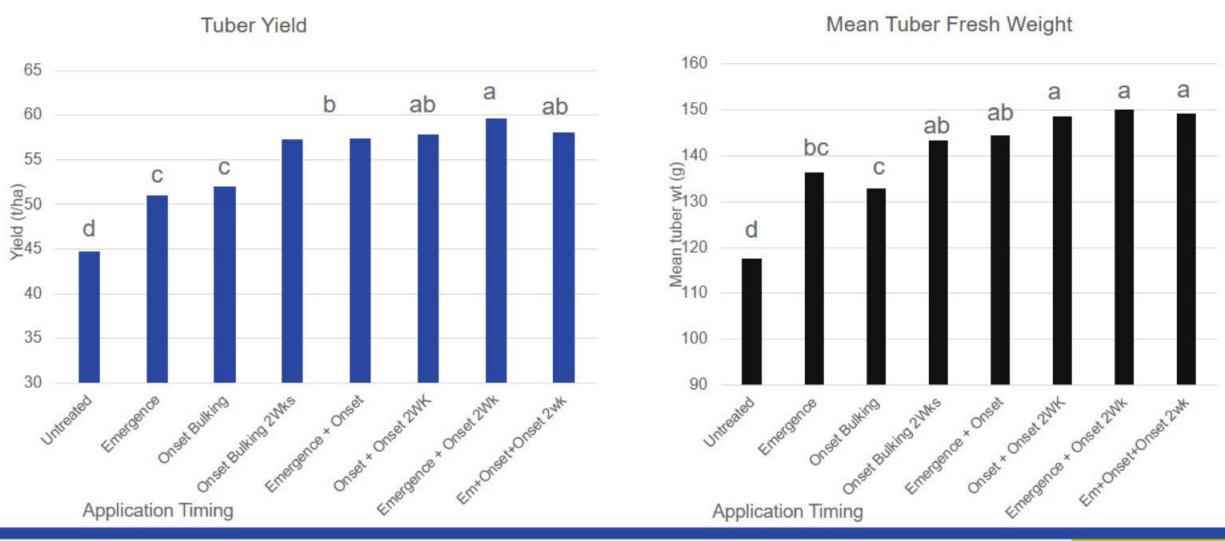








2019 QUANTIS Trial: 'We really should take this further!'



Source: CMI 2019





2022 - Go for it!

- **Large number of split field trials 50 Trials**
- Deeply understand the M.O.A. Study with **Nottingham University**





2022 - Go for it!

- Large number of split field trials 50 Trials
- Deeply understand the M.O.A. Study with Nottingham University







Development of the split field protocol

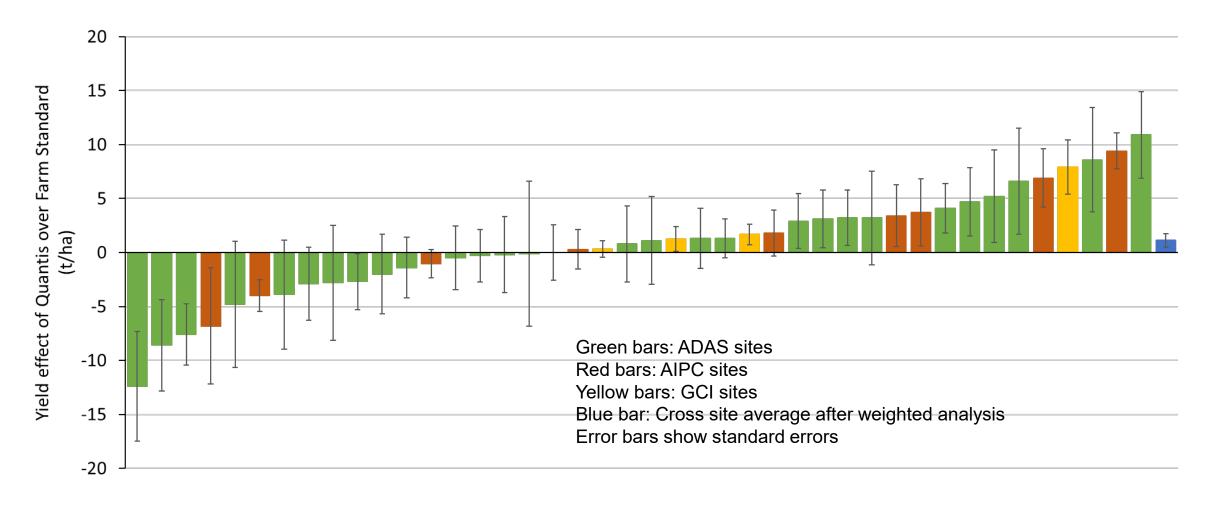
- Mark out harvest plots pair QUANTIS & Untreated.
 Four pairs each of 3 m of row
- Spray timing for QUANTIS (each time 2.0 l/ha)
 - 1st application tuber initiation
 - 2nd application tuber initiation + 2 weeks
 - 3rd application +2 weeks





Overview of effect on yield

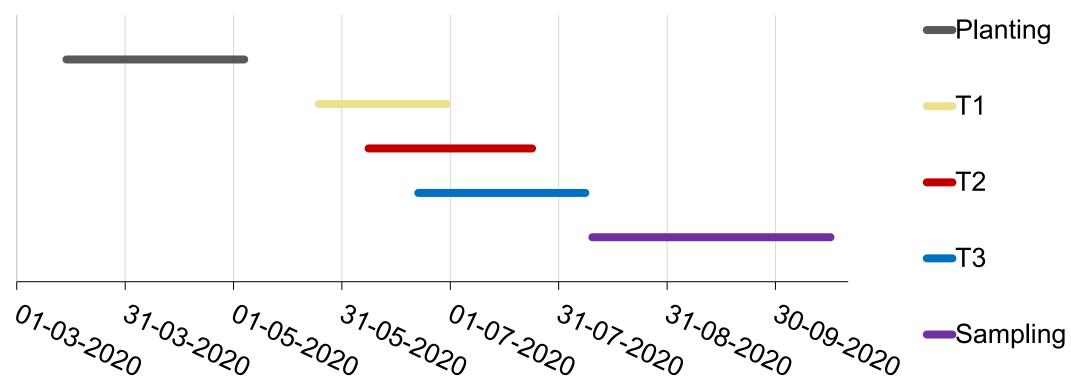






Overview of activities at QUANTIS sites over the season





Timing windows for: sowing, QUANTIS applications 1, 2 and 3, and sampling for all samples (ADAS, SRUC and AIPC)



Potatoes are sensitive to heat stress

temperatures.	Is (12 and 24h) and a	different
Light	12 h	24 h
temperature (°C)		
12	321	446
16	433	755
20	460	559
24	289	15
28	1	0

Responses of the Potato Plant to Temperature

Paul C. Struik

Crop and Weed Ecology, Plant Sciences Group, Wageningen University, Haarweg 333, 6709 RZ Wageningen, The Netherlands

Potato Biology and Biotechnology: Advances and Perspectives

"Temperature has a pronounced effect on the formation of potato tubers: when temperature is too high, potato plants form less or no tubers, which can greatly decrease yields"

The James Hutton Institute



Effects of heat stress on the performance of QUANTIS

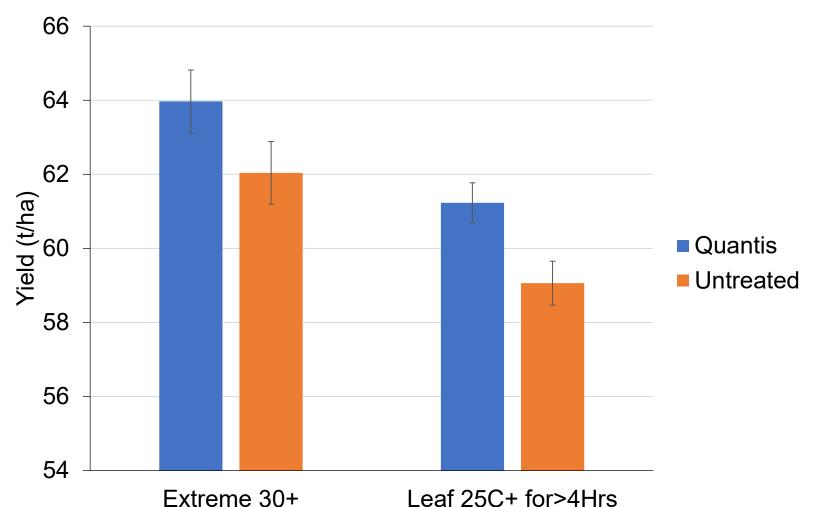
Source Plante ADAS ADAS AIPC AIPC	04-May 04-May 17-Apr 17-Apr		2nd Treatmer ▼ 23/06/2020	3rd Treatmer ▼	Vaniata V				Total D	ays Heat	events	T4 34et	untreated			0/
ADAS ADAS AIPC AIPC	04-May 04-May 17-Apr	08/06/2020		i reatmei				Total T1+T2 ▼		- ▼				o		% yield
ADAS AIPC AIPC	04-May 17-Apr		23/00/2020	07/07/2020		Irrigatio(*	Heat events Extreme 30+	lotal l1+12	Events		Aug	21	yield t/ha 60.8	Quantis yie 71.7	diff 10.9	Difference 118%
AIPC AIPC	17-Apr	00/00/2020	23/06/2020	07/07/2020			Leaf 25C+ for>4Hrs	15		28		53	60.8	71.7	10.9	118%
AIPC		16/06/2020	30/06/2020		Russett Burbank	N	Extreme 30+	3		20		13	37.42	43.07	5.65	115%
		16/06/2020	30/06/2020		Russett Burbank	N	Leaf 25C+ for>4Hrs			16		27	37.42	43.07	5.65	115%
AIPC	06-Apr	17/06/2020	01/07/2020	16/07/2020		Y	Leaf 25C+ for>4Hrs			14		29	47,401	54.26	6.859	114%
AIPC	06-Apr	17/06/2020	01/07/2020	16/07/2020		Υ	Extreme 30+	■ 3		5		13	47.401	54.26	6.859	114%
AIPC	01-Apr	02/06/2020	16/06/2020	08/07/2020	Taurus	Υ	Leaf 25C+ for>4Hrs	10		13		28	49.9	56.26	6.36	113%
AIPC	01-Apr	02/06/2020	16/06/2020	08/07/2020	Taurus	Υ	Extreme 30+	<u> </u>		3		10	49.9	56.26	6.36	113%
ADAS	23-Apr	30/06/2020	15/07/2020	03/08/2020	Saxon		Leaf 25C+ for>4Hrs	2		7	1	7	67.6	76.2	8.6	113%
ADAS	23-Apr	30/06/2020	15/07/2020		Saxon		Extreme 30+	0		0		0	67.6	76.2	8.6	113%
ADAS	11-Apr	20/06/2020	02/07/2020	15/07/2020	Nectar	Υ	Extreme 30+	5		11		23	70.83	77.4	6.57	109%
ADAS	11-Apr	20/06/2020	02/07/2020	15/07/2020	Nectar	Υ	Leaf 25C+ for>4Hrs	16		32		49	70.83	77.4	6.57	109%
ADAS	15-Apr	11/06/2020	26/06/2020	10/07/2020	Russett Burbank		Extreme 30+	3		3		10	58.14	63.31	5.17	109%
ADAS	15-Apr	11/06/2020	26/06/2020	10/07/2020	Russett Burbank		Leaf 25C+ for>4Hrs	<u> </u>		10		23	58.14	63.31	5.17	109%
ADAS	04-Apr	01/06/2020	15/06/2020	06/07/2020	Maris Piper		Extreme 30+	<u> </u>		10		33	56.33	60.37	4.04	107%
ADAS	04-Apr	01/06/2020	15/06/2020	06/07/2020	Maris Piper		Leaf 25C+ for>4Hrs	8		16		30	56.33	60.37	4.04	107%
ADAS	01-Apr	27/05/2020	10/06/2020	24/06/2020	Monte Carlo		Extreme 30+	0		3		18	62.01	65.89	3.88	106%
ADAS	01-Apr	27/05/2020	10/06/2020	24/06/2020	Monte Carlo		Leaf 25C+ for>4Hrs			22		55	62.01	65.89	3.88	106%
AIPC	07-Apr	24/06/2020	06/07/2020	20/07/2020	M.piper	Υ	Extreme 30+	3		9		13	63.48	67.25	3.77	106%
AIPC	07-Apr	24/06/2020	06/07/2020	20/07/2020		Y	Leaf 25C+ for>4Hrs	9		20		29	63.48	67.25	3.77	106%
ADAS	11-Apr	25/06/2020	30/06/2020	06/07/2020			Extreme 30+	2		4		19	58.2	61.4	3.2	105%
ADAS	11-Apr	25/06/2020	30/06/2020	06/07/2020	Arsenal		Leaf 25C+ for>4Hrs			16		38	58.2	61.4	3.2	105%
AIPC	24-Apr	15/06/2020	29/06/2020	13/07/2020	Agria	N	Leaf 25C+ for>4Hrs			18		30	62.7	66.08	3.38	105%
AIPC	24-Apr	15/06/2020	29/06/2020	13/07/2020	_	N	Extreme 30+	4		8		14	62.7	66.08	3.38	105%
AIPC	21-Apr	20/06/2020	04/07/2020	20/07/2020	_	N	Leaf 25C+ for>4Hrs	17		17		40	63.978	65.787	1.809	103%
AIPC	21-Apr	20/06/2020	04/07/2020	20/07/2020	Melody	N	Extreme 30+	5		5		16	63.978	65.787	1.809	103%
AIPC	11-Apr	09/06/2020	22/06/2020	10/07/2020	Royal	Υ	Leaf 25C+ for>4Hrs	9		14		26	59.01	60.28	1.27	102%
AIPC	11-Apr	09/06/2020	22/06/2020	10/07/2020	Royal	Υ	Extreme 30+	3		4		14	59.01	60.28	1.27	102%
ADAS	04-Apr	31/05/2020	12/06/2020	30/06/2020	Melody	N	Extreme 30+	4		5		13	60.33	61.57	1.24	102%
ADAS	04-Apr	31/05/2020	12/06/2020	30/06/2020	Melody	N	Leaf 25C+ for>4Hrs			18		42	60.33	61.57	1.24	102%
ADAS	18-Apr	17/06/2020	30/06/2020	09/07/2020		N	Leaf 25C+ for>4Hrs	<u> </u>		10		23	72.96	73.8	0.84	101%
ADAS	18-Apr	17/06/2020	30/06/2020	09/07/2020	Ultra	N	Extreme 30+	3		3		10	72.96	73.8	0.84	101%
AIPC	24-Apr	22/06/2020	06/07/2020	20/07/2020	Melody	Υ	Extreme 30+	■ 3		8		12	52.86	53.22	0.36	101%
AIPC	24-Apr	22/06/2020	06/07/2020	20/07/2020	Melody	Υ	Leaf 25C+ for>4Hrs	10		24		32	52.86	53.22	0.36	101%
AIPC	04-Apr	05/06/2020	24/06/2020	13/07/2020		Υ	Extreme 30+	■ 3		12		24	70.57	70.56	-0.01	100%
AIPC	04-Apr	05/06/2020	24/06/2020	13/07/2020	Harry	Υ	Leaf 25C+ for>4Hrs	20		36		54	70.57	70.56	-0.01	100%
ADAS	02-May	24/06/2020	10/07/2020	22/07/2020			Extreme 30+	12		24		28	66.9	66.8	-0.1	100%
ADAS ADAS	02-May	24/06/2020	10/07/2020	22/07/2020	Deatland Dall	N	Leaf 25C+ for>4Hrs			37 19		43 25	66.9 47.3	66.8 47.2	-0.1 -0.1	100% 100%
ADAS	08-Apr 08-Apr	09/06/2020 09/06/2020	26/06/2020 26/06/2020		Pentland Dell Pentland Dell	N N	Leaf 25C+ for>4Hrs Extreme 30+	2				11	47.3 47.3	47.2 47.2	-0.1 -0.1	100%
ADAS	07-Apr	03/06/2020	16/06/2020	02/07/2020		IN	Leaf 25C+ for>4Hrs			12		32	63.64	63.33	-0.1	100%
ADAS	07-Apr	03/06/2020	16/06/2020	02/07/2020			Extreme 30+	4		5		12		63.33	-0.31	100%





ADAS 2020 - Under heat stress, QUANTIS significantly increased yield

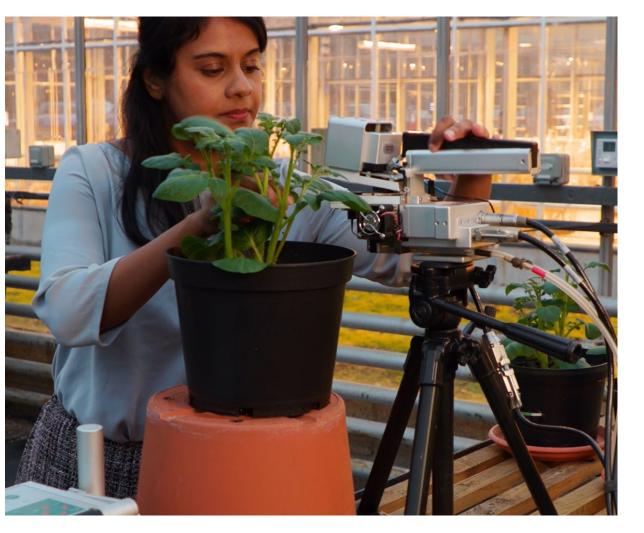




- Leaf temperature >25°C, for at least 4 hours
- Significant difference (P=0.016) where QUANTIS treated samples showed a significantly higher yield than untreated samples
- Air temperatures >30°C, at any time (n=14)
- Leaf temperature >25°C, for at least 4 hours (n=32)







Monitored a stressed plant over a 7 day period Photosynthesis
Hormone
Yield

Heat stress applied 24 hours **after** an application of QUANTIS

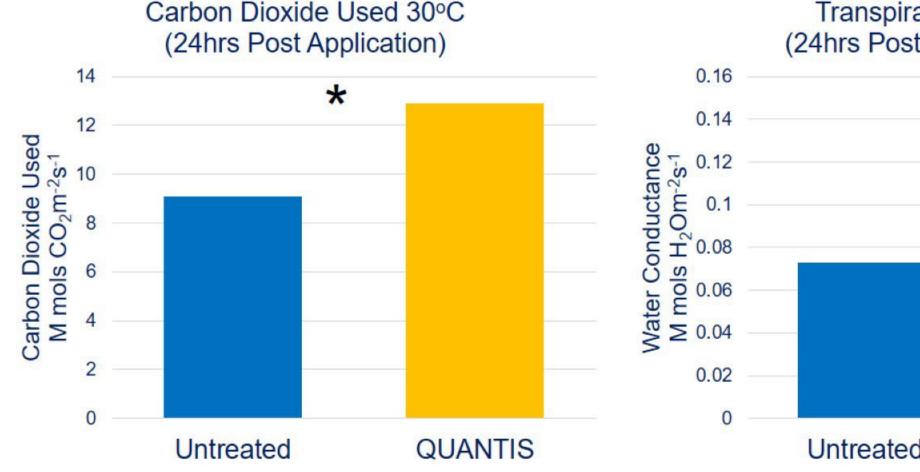
Application tuber initiation

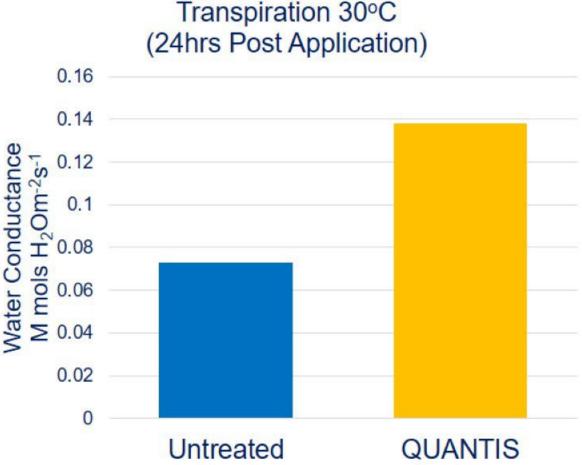


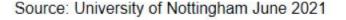


QUANTIS reduces plant stress to maintain photosynthesis (when plants are stressed, they have lower photosynthetic efficiency)









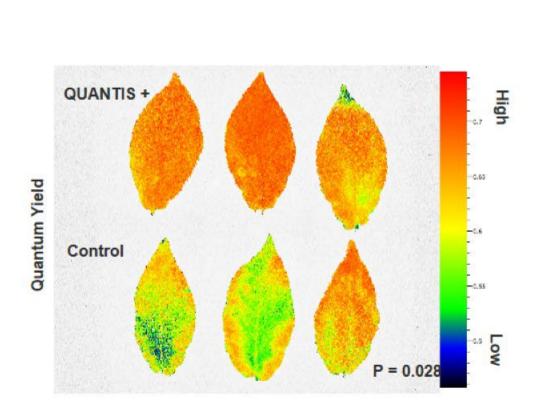


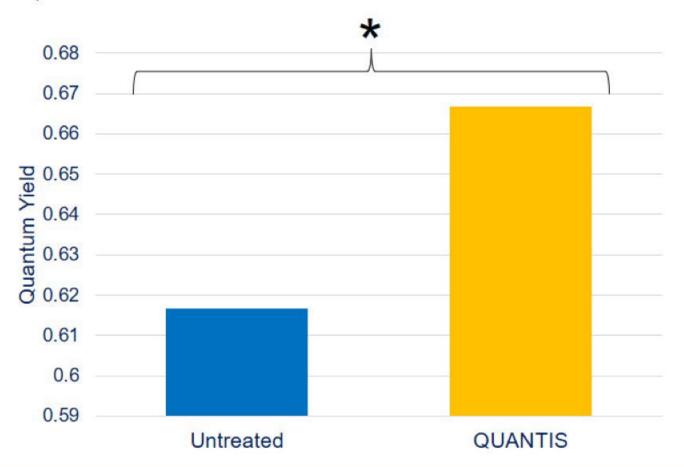


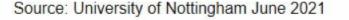
QUANTIS reduces plant stress so it can use more light (when plants are stressed, they have lower photosynthetic efficiency)



Quantum yield is a measure of light photons used (assessed by Fluorcam) 7 days post QUANTIS application with 6 days of heat stress (30°C)









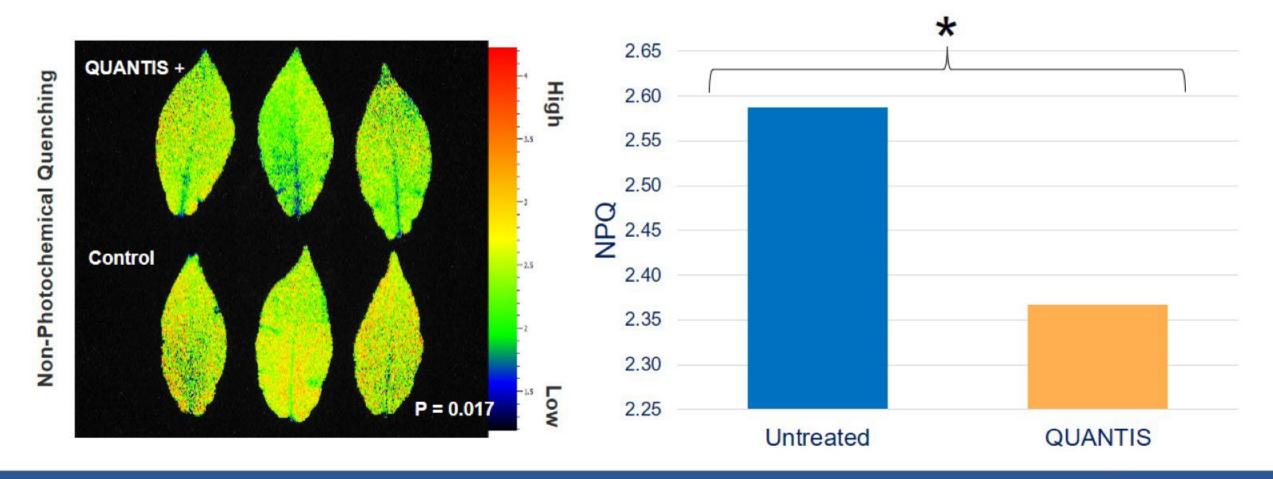


QUANTIS reduces plant stress



(when plants are stressed light can't be used and is dissipated as heat)

NPQ is a measure of heat reflected (assessed by Fluorcam) 7 days post QUANTIS application with 6 days of heat stress (30°C)







QUANTIS reduces plant stress, so cytokinin levels are maintained (Stressed plants increase gibberellic acid levels and divert assimilates to the shoots & leaves)



Hormone analysis 7 days post QUANTIS application with 6 days of heat stress (30°C)



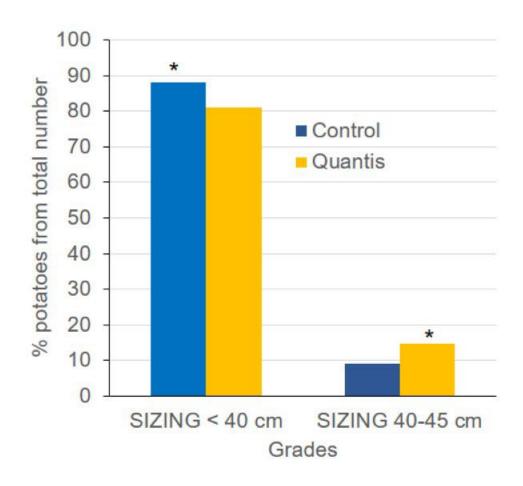


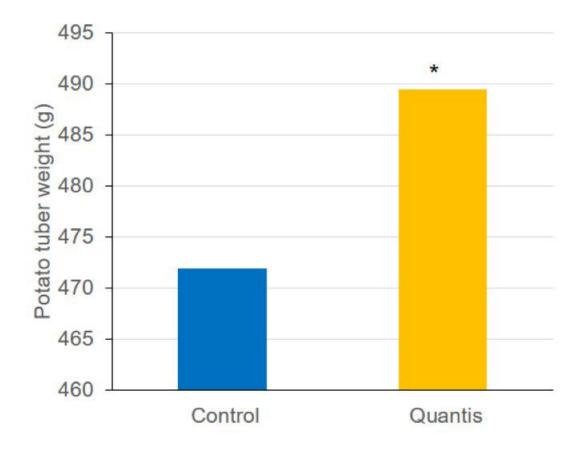




Yield response



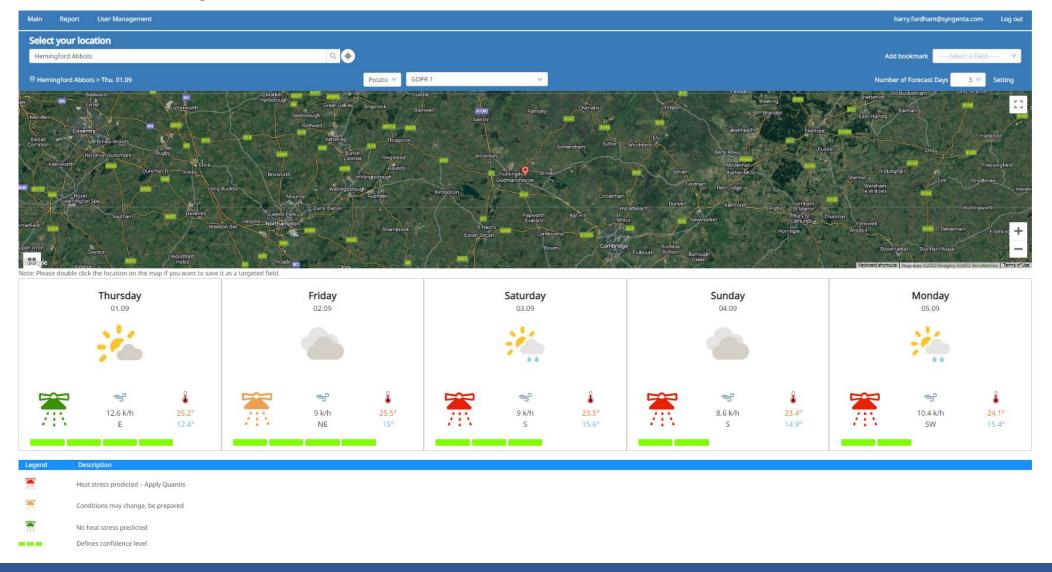








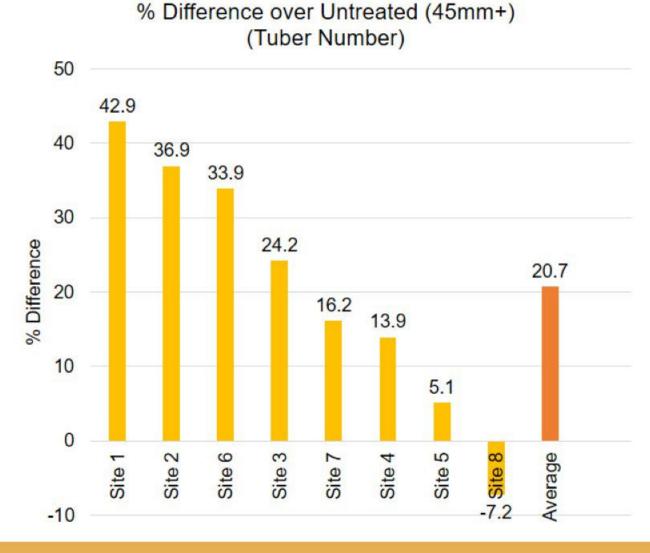
Heat stress prediction tool – Guidance of when and when not to use QUANTIS

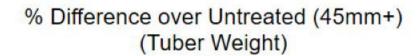






QUANTIS on potatoes – 2022 split fields









Industry working to solve the puzzle



















Agronomy Ease of Use

Operator & Public Safety

Soil Health

GHG Emissions

Extreme Weather

Resistance

Biodiversity

Economics

Industry working to solve the puzzle



















Operator & Public Safety

tv

GHG Emissions

Extreme Weather

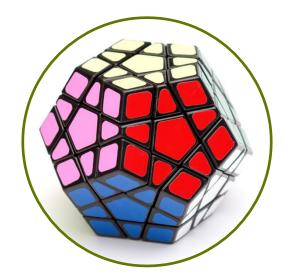
Resistance

Biodiversity

Economics







Inputs +
Digital & Support Tools





Reasons to be cheerful!

