AHDB Potato Desiccation Project 2019

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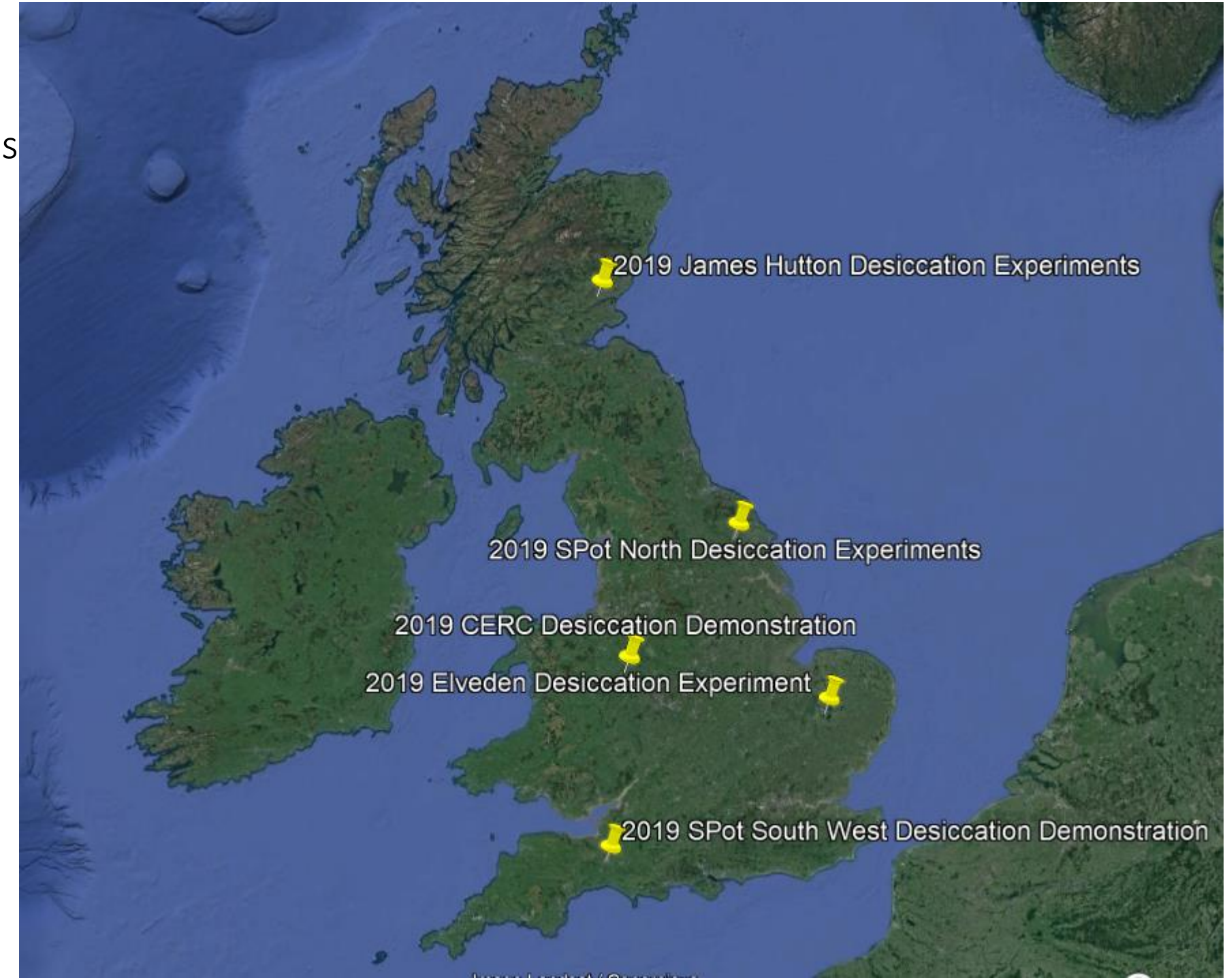
Why do we need to desiccate?

- Prevent further growth of tubers to maximize return e.g. size specification
- Remove foliage to assist harvesting
- Initiate or advance the process of skinset to reduce damage at harvest
- Reduce disease risk e.g. blight, virus
- Control of tuber dry matter concentration?

Any more?

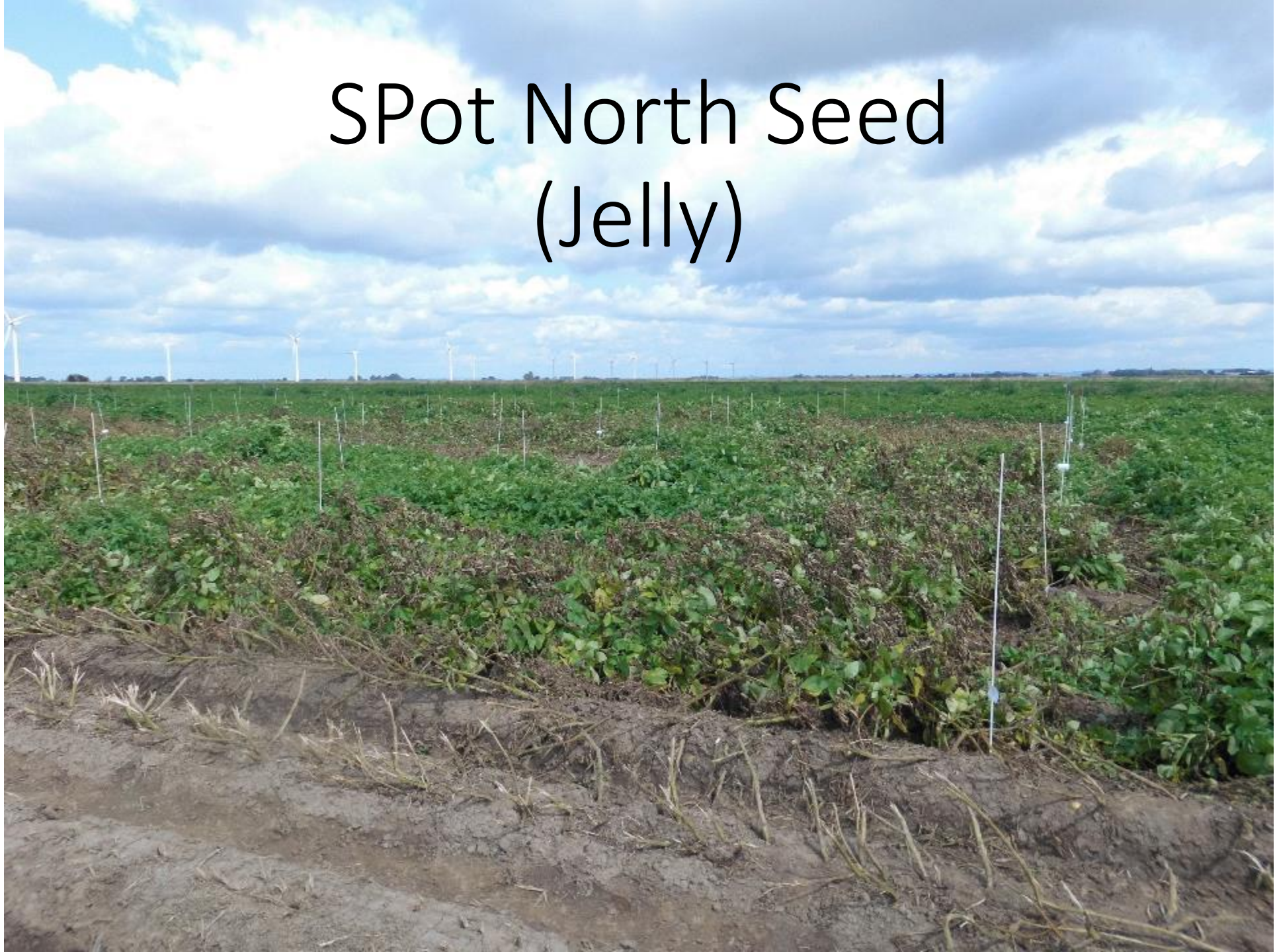
Trials locations



Protocol

- Target vigorous, complete canopies at close to commercial defoliation timings
- N fertilizer determined by RB209
- AZO + Tee-jet OPOZ flat fan 110° nozzles
- 400 l/ha (except Saltex)
- 3 bar pressure
- 3.6 m sprayed width
- 4- or 6-row plots
- Middle 2/4 rows assessed

SPot North Seed (Jelly)



Seed treatments (all rates in l/ha)

Treat	T1	T2	T3
1	Reglone 1.5 + Ranman Top 0.5	Reglone 2.5 + Ranman Top 0.5	
2	Flail + Spotlight 1.0 + Ranman Top 0.5	Ranman Top 0.5	
3	Flail + Spotlight 1.0 + Gozai 0.8 + Ranman Top 0.25	Ranman Top 0.5	
4	Gozai 0.8 + Toil 1.5 + Ranman Top 0.25	Spotlight 1.0 + Ranman Top 0.5	
5	Spotlight 1.0 + Ranman Top 0.5	Gozai 0.8 + Toil + Ranman Top 0.25	
6	Spotlight 1.0 + Gozai 0.8 + Toil 1.5 + Ranman Top 0.25	Spotlight 0.6 + Gozai 0.8 + Toil 1.5 + Ranman Top 0.25	
7	Finalsan 67 + Ranman Top 0.5	Spotlight 1.0 + Ranman Top 0.5	
8	No desiccant. Ranman Top 0.5	No desiccant. Ranman Top 0.5	
9	Spotlight 1.0 + Ranman Top 0.5	Gozai 0.8 + Toil 1.5 + Ranman Top 0.25	Spotlight 0.6 + Ranman Top 0.5
10	Haulm puller, simulated by hand. No fungicide		

Ground cover (%)

Treatment	T1	T2	T3	01-Aug	07-Aug	14-Aug	21-Aug
1	Reglone	Reglone		100	18	0	0
2	Flail+Spotlight			100	0	0	0
3	Flail+Gozai			100	0	0	0
4	Gozai	Spotlight		100	42	1	0
5	Spotlight	Gozai		100	41	10	2
6	Spotlight + Gozai	Spotlight + Gozai		100	42	2	0
7	Pelargonic acid	Spotlight		100	71	21	9
8	None	None		100	99	97	95
9	Spotlight	Gozai	Spotlight	100	52	5	0
10	Haulm pulling			100	0	0	0
	S.E. (27 D.F.)			0.2	6.4	3.6	1.7
	Control (None)			**100**	**99**	**97**	**95**
	Reglone			100	18	0	0
	Pelargonic acid			100	**71**	**21**	**9**
	Spotlight/Gozai			100	44	5	<1
	Flail/haulm pulling			100	0	0	0

Ground cover: 1 August (T1)

- Conditions
  - Time: 11:27-13:38
  - Wind: 12 km/h
  - Temperature: 18-20 °C
  - RH: 88 %
  - Cloud cover: 90 %
  - SMD: 0 mm
  - Rain within 1 hour: 0 mm

Pre-application

Post-flail

Post-flail compaction

Post-haulm pulling

Ground cover: 7 August (T2)

- Conditions
  - Time: 10:48-12:08
  - Wind: 8 km/h
  - Temperature: 17 °C
  - RH: 78 %
  - Cloud cover: 70 %
  - SMD: 10 mm
  - Rain within 1 hour: 0 mm

None

Flail

Haulm-puller

Reglone

Spotlight
&/or
Gozai

Pelargonic acid

Ground cover: 14 August (T3)

- Conditions
  - Time: 09:00-09:10
  - Wind: 1 km/h
  - Temperature: 15 °C
  - RH: 91 %
  - Cloud cover: 80 %
  - SMD: 5 mm
  - Rain within 1 hour: 0 mm

None

Flail

Haulm-
puller

Reglone

Spotlight
&/or
Gozai

Pelargonic acid

Skinning barrel

Skinning (% surface area removed in barrel) in Jelly

Treatment	T1 (1 August)	T2	T3	14-Aug	21-Aug	28-Aug
1	Reglone	Reglone		53	32	19
2	Flail + Spotlight			51	29	21
3	Flail + Gozai			46	33	18
4	Gozai	Spotlight		53	35	13
5	Spotlight	Gozai		55	40	16
6	Spotlight + Gozai	Spotlight +Gozai		54	36	12
7	Pelargonic acid	Spotlight		54	35	17
8	None	None		65	52	52
9	Spotlight	Gozai	Spotlight	52	38	12
10	Haulm pulling			44	21	13
	S.E. (27 D.F.)			3.6	3.0	3.4
	Control (None)			**65**	**52**	**52**
	Reglone			53	32	19
	Pelargonic acid			54	36	12
	Spotlight/Gozai			54	37	13
	Flail			49	31	20
	Haulm pulling			44	21	13

< 15 % is harvester-suitable

Skinset after ≈ 21 days

Vascular browning & stem-end necrosis (%)

Treatment	T1	T2	T3	Vascular browning	Stem-end necrosis
1	Reglone	Reglone		1	0
2	Flail + Spotlight			2	1
3	Flail + Gozai			1	0
4	Gozai	Spotlight		3	0
5	Spotlight	Gozai		2	0
6	Spotlight + Gozai	Spotlight + Gozai		2	1
7	Pelargonic acid	Spotlight		1	0
8	None	None		2	0
9	Spotlight	Gozai	Spotlight	2	1
10	Haulm pulling			1	0
	S.E. (27 D.F.)			0.5	0.3
	Control (None)			**2**	**0**
	Reglone			1	0
	Pelargonic acid			1	0
	Spotlight/Gozai			2	1
	Flail			2	1
	Haulm pulling			1	0

Yield (t/ha)

Treatment	T1	T2	T3	Total	>25-60 mm	>60 mm
1	Reglone	Reglone		47.4	30.0	17.4
2	Flail + Spotlight			45.7	29.0	16.8
3	Flail + Gozai			47.5	28.4	18.0
4	Gozai	Spotlight		49.8	26.4	23.3
5	Spotlight	Gozai		49.1	26.7	22.5
6	Spotlight + Gozai	Spotlight + Gozai		47.9	27.5	20.5
7	Pelargonic acid	Spotlight		51.8	31.3	20.6
8	None	None		60.0	21.3	38.8
9	Spotlight	Gozai	Spotlight	47.9	29.0	14.9
10	Haulm pulling			49.9	34.8	15.0
	S.E. (27 D.F.)			3.06	3.37	3.09
	Control (None)			**60.0**	**21.3**	**38.8**
	Reglone			47.4	30.0	17.4
	Pelargonic acid			51.8	31.3	20.6
	Spotlight/Gozai			48.7	27.8	20.3
	Flail/haulm pulling			47.7	30.7	16.6

Desiccation workshop

Flail – Quality of flail

- ideally retain 150-250mm of leaf stripped stem
- Avoid coverage of stems with haulm mulch
- Avoid wide tyres which will compress outside of bed reducing water infiltration

Ideal Flail for PPO application – Upright Easy Crop

VCS Potatoes Ltd

Desiccation workshop

Flail – Issues

Scalped Beds – Crop damage/Poor target for PPO applications

VCS Potatoes Ltd

Desiccation workshop

Flail – Manufactures

Baselier

- One of the lightest 3 bed flails
- Centre plate reduces power requirement

VCS Potatoes Ltd

Desiccation workshop

Flail – Manufactures

Grimme

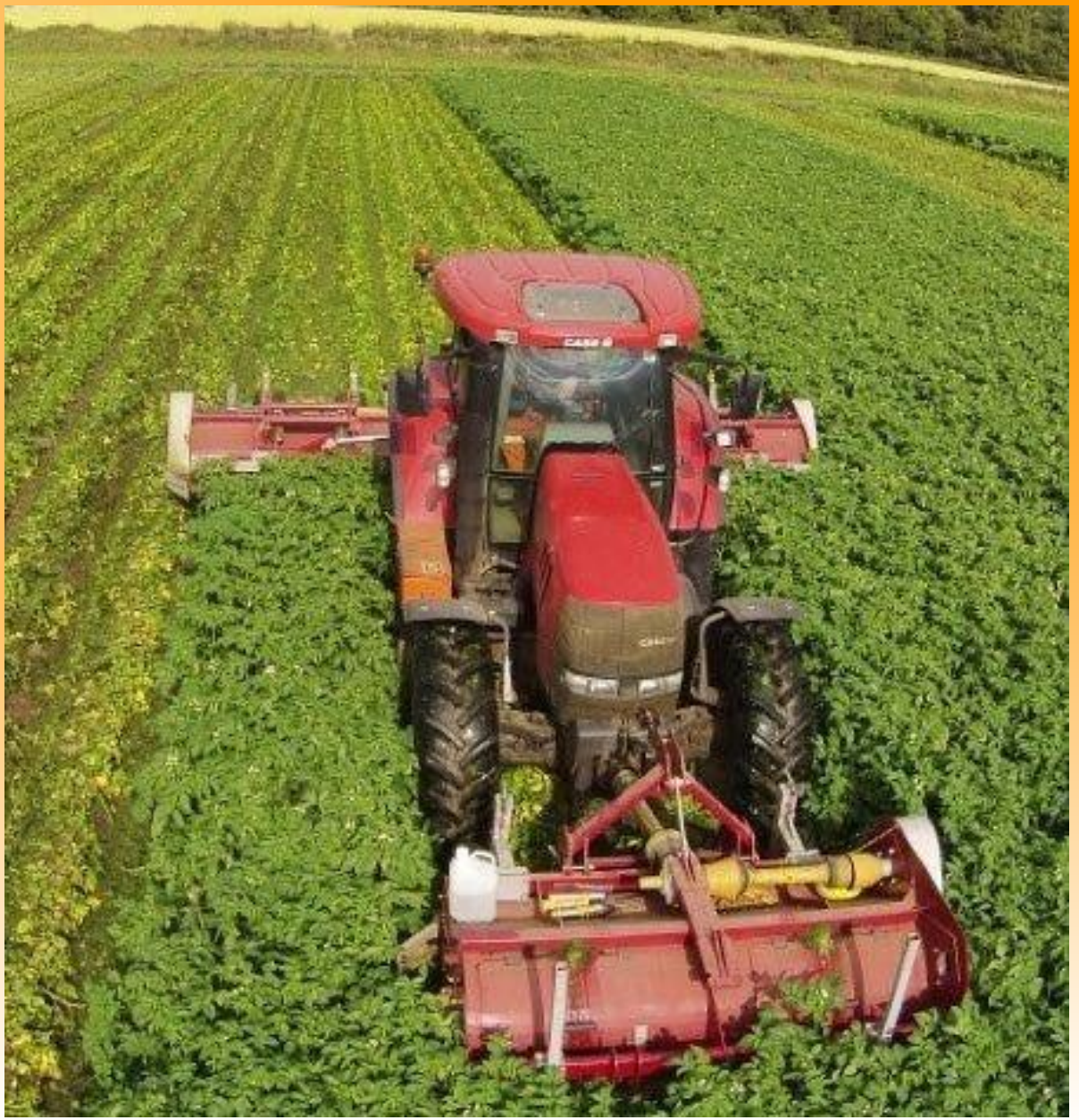
- **Front topper working width 2.3m to clear wheeling**
- **Each unit individually suspended with sprung suspension – follow soil contours**

Desiccation workshop

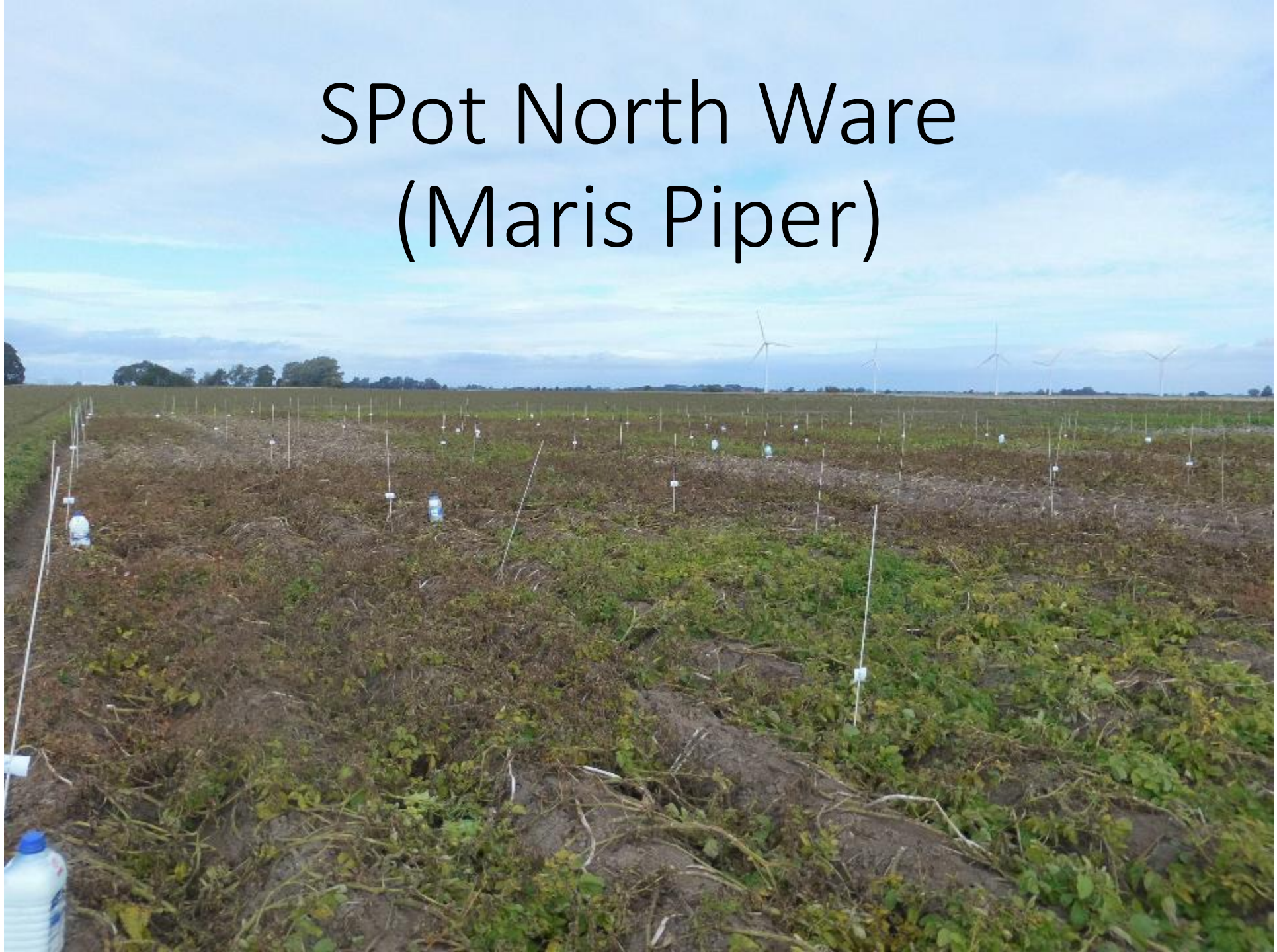
Flail – Manufactures

Scotts

- **Floating parallelogram design**
- **Longer variation of flail length**



SPot North Ware (Maris Piper)



Ware treatments (all rates in l/ha)

Treat	T1	T2	T3
1	Reglone 1.5 + Ranman Top 0.5	Reglone 2.5 + Ranman Top 0.5	
2	Flail + Spotlight 1.0 + Ranman Top 0.5	Ranman Top 0.5	
3	Flail + Spotlight 1.0 + Gozai 0.8 + Ranman Top 0.25	Ranman Top 0.5	
4	Gozai 0.8 + Toil 1.5 + Ranman Top 0.25	Spotlight 1.0 + Ranman Top 0.5	
5	Spotlight 1.0 + Ranman Top 0.5	Gozai 0.8 + Toil + Ranman Top 0.25	
6	Spotlight 1.0 + Shinkon 0.25	Gozai 0.8 + Toil + Shinkon 0.25	
7	Spotlight 1.0 + Gozai 0.8 + Toil 1.5 + Ranman Top 0.25	Spotlight 0.6 + Gozai 0.8 + Toil 1.5 + Ranman Top 0.25	
8	No desiccant. Ranman Top 0.5	No desiccant. Ranman Top 0.5	
9	Finalsan 67 + Ranman Top 0.5	Spotlight 1.0 + Ranman Top 0.5	
10	Spotlight 1.0 + Ranman Top 0.5	Gozai 0.8 + Toil 1.5 + Ranman Top 0.25	Spotlight 0.6 + Ranman Top 0.5
11	Saltex 1123 + Ranman Top 0.5	Spotlight 1.0 + Ranman Top 0.5	

Ground cover Maris Piper SPot North (%)

Treatment	T1 (5 September)	T2	T3	05-Sep	12-Sep	19-Sep	26-Sep
1	Reglone	Reglone		99	7	0	0
2	Flail + Spotlight			98	0	0	0
3	Flail + Gozai			98	0	0	0
4	Gozai	Spotlight		99	21	1	0
5	Spotlight	Gozai		99	10	2	0
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		98	14	0	0
7	Spotlight + Gozai	Spotlight + Gozai		99	12	0	0
8	None	None		99	87	46	32
9	Pelargonic acid	Spotlight		99	38	2	0
10	Spotlight	Gozai	Spotlight	99	13	2	0
11	Saltex	Spotlight		99	2	0	0
	S.E. (30 D.F.)			0.5	3.0	2.0	1.1
	Control (None)			**99**	**87**	**46**	**32**
	Reglone			99	7	0	0
	Pelagonic acid			99	38	2	0
	Spotlight/Gozai			99	15	1	0
	Flail			98	0	0	0
	Saltex			99	2	0	0

Virtually no leaf after 14 days

Ground cover: 5 September (T1)

- Conditions
  - Time: 10:00-12:30
  - Wind: 10 km/h
  - Temperature: 18 °C
  - RH: 90 %
  - Cloud cover: 50 %
  - SMD: 10 mm
  - Rain within 1 hour: 0 mm

Pre-application

Post-flail

Ground cover: 12 September (T2)

- Conditions
  - Time: 10:00-12:30
  - Wind: 4 km/h
  - Temperature: 18 °C
  - RH: 82 %
  - Cloud cover: 70 %
  - SMD: 15 mm
  - Rain within 1 hour: 0 mm

None

Flail

Reglone

Spotlight and/or Gozai

Pelargonic acid

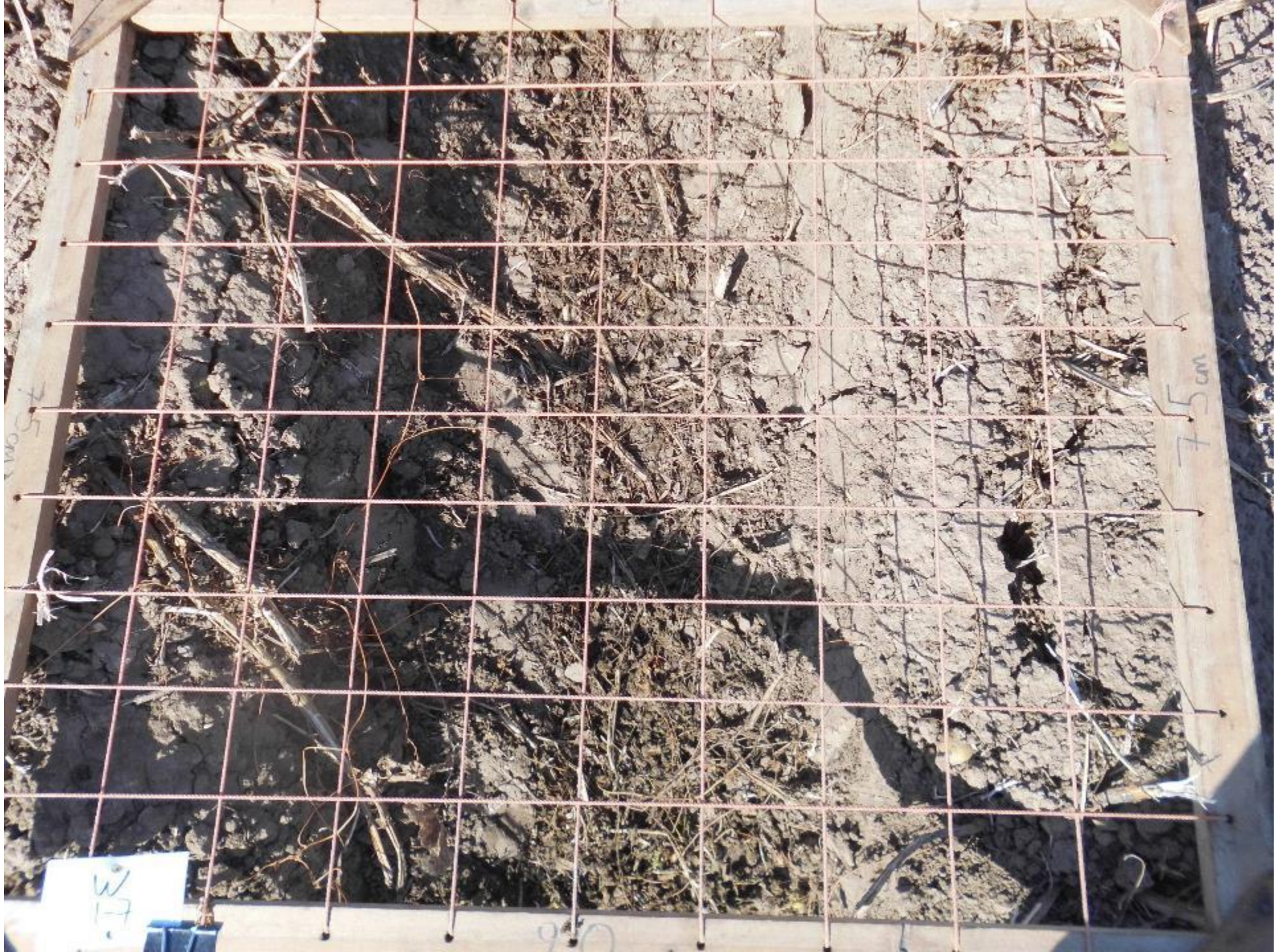
Saltex

Ground cover: 19 September (T3)

- Conditions
  - Time: 12:40-12:50
  - Wind: 2 km/h
  - Temperature: 20 °C
  - RH: 61 %
  - Cloud cover: 10 %
  - SMD: 10 mm
  - Rain within 1 hour: 0 mm

None

Flail



Reglone

Spotlight and/or Gozai

Pelargonic acid

Saltex

Skinning barrel

Skinning (% surface area removed in barrel)

Treatment	T1 (5 September)	T2	T3	19-Sep	26-Sep
1	Reglone	Reglone		5.0	0.9
2	Flail + Spotlight			5.4	0.8
3	Flail + Gozai			5.4	0.9
4	Gozai	Spotlight		6.2	1.2
5	Spotlight	Gozai		5.6	1.2
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		5.2	1.2
7	Spotlight + Gozai	Spotlight + Gozai		6.1	0.9
8	None	None		8.3	3.0
9	Pelargonic acid	Spotlight		6.5	1.8
10	Spotlight	Gozai	Spotlight	5.9	1.2
11	Saltex	Spotlight		5.7	0.9
	S.E. (30 D.F.)			0.56	0.37
	Control (None)			**8.3**	**3.0**
	Reglone			5.0	0.9
	Pelargonic acid			6.5	1.8
	Spotlight/Gozai			5.8	1.1
	Flail			5.4	0.9
	Saltex			5.7	0.9

Skinset after 14 days

None

Reglone

Flail

Spotlight
&/or
Gozai

Pelargonic acid

Saltex

Yield (t/ha)

Treatment	T1	T2	T3	Total	>40 mm	>80 mm
1	Reglone	Reglone		53.5	52.0	1.4
2	Flail + Spotlight			57.1	54.9	1.6
3	Flail + Gozai			55.8	54.2	0.0
4	Gozai	Spotlight		52.7	51.2	3.6
5	Spotlight	Gozai		54.0	52.5	3.1
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		56.9	55.4	5.4
7	Spotlight + Gozai	Spotlight + Gozai		55.9	54.1	1.5
8	None	None		64.6	62.5	5.1
9	Pelargonic acid	Spotlight		56.7	55.4	0.8
10	Spotlight	Gozai	Spotlight	58.7	56.9	0.0
11	Saltex	Spotlight		58.5	56.2	0.0
	S.E. (30 D.F.)			4.95	4.86	1.65
	Control (None)			**64.6**	**62.5**	**5.1**
	Reglone			53.5	52.0	1.4
	Pelargonic acid			56.7	55.4	0.8
	Spotlight/Gozai			55.6	54.0	2.7
	Flail			56.5	54.6	0.8
	Saltex			58.5	56.2	0.0

Elveden Ware (Royal)

Ground cover (%)

Treatment	T1 (4 September)	T2	T3	04-Sep	11-Sep	18-Sep	25-Sep	02-Oct
1	Reglone	Reglone		97	27	0	0	0
2	Flail + Spotlight			97	0	0	0	0
3	Flail + Gozai			99	0	0	0	0
4	Gozai	Spotlight		99	77	23	2	0
5	Spotlight	Gozai		98	74	25	8	0
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		99	93	23	4	0
7	Spotlight + Gozai	Spotlight + Gozai		99	85	19	1	0
8	None	None		98	92	72	47	33
9	Pelargonic acid	Spotlight		100	95	52	10	0
10	Spotlight	Gozai	Spotlight	97	83	20	1	0
11	Saltex	Spotlight		99	78	3	0	0
	S.E. (30 D.F.)			0.7	5.8	6.2	4.9	2.1
	Control (None)			**98**	**92**	**72**	**47**	**33**
	Reglone			97	27	0	0	0
	Pelagonic acid			100	95	52	10	0
	Spotlight/Gozai			98	78	22	3	0
	Flail			98	0	0	0	0
	Saltex			99	78	3	0	0

Much slower kill for non-Reglone chemical treatments

Ground cover: 4 September (T1)

- Conditions
  - Time: 09:45-12:55
  - Wind: 12 km/h
  - Temperature: 18 °C
  - RH: 52-87 %
  - Cloud cover: 50 %
  - SMD: 20 mm
  - Rain within 1 hour: 0 mm

Pre-application

Post-flail

Flail

Ground cover: 11 September (T2)

- Conditions
  - Time: 10:00-11:45
  - Wind: 20 km/h
  - Temperature: 18 °C
  - RH: 80 %
  - Cloud cover: 80 %
  - SMD: 25 mm
  - Rain within 1 hour: 0.1 mm

None

Flail

Reglone

Spotlight and/or Gozai

Pelargonic acid

Saltex

Ground cover: 18 September (T3)

- Conditions
  - Time: 09:11-09:25
  - Wind: 3 km/h
  - Temperature: 12 °C
  - RH: 87 %
  - Cloud cover: 20 %
  - SMD: 25 mm
  - Rain within 1 hour: 0 mm

None

Flail

Reglone

Spotlight and/or Gozai

Pelargonic acid

Saltex

Ground cover: 25 September

None

Flail

Reglone

Spotlight and/or Gozai

Pelargonic acid

Saltex

Skinning barrel

Skinning (incidence with >1% SA skinned, %)

Treatment	T1	T2	T3	18-Sep	25-Sep	02-Oct
1	Reglone	Reglone		100	98	96
2	Flail + Spotlight			100	98	95
3	Flail + Gozai			100	99	95
4	Gozai	Spotlight		99	93	93
5	Spotlight	Gozai		100	99	97
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		100	100	97
7	Spotlight + Gozai	Spotlight + Gozai		100	98	95
8	None	None		99	100	100
9	Pelargonic acid	Spotlight		100	98	96
10	Spotlight	Gozai	Spotlight	100	99	93
11	Saltex	Spotlight		100	97	96
	S.E. (30 D.F.)			0.4	1.7	1.7
	Control (None)			**99**	**100**	**100**
	Reglone			100	98	96
	Pelargonic acid			100	98	96
	Spotlight/Gozai			100	98	95
	Flail			100	99	95
	Saltex			100	97	96

Skinning (% surface area removed in barrel)

Treatment	T1 (4 September)	T2	T3	18-Sep	25-Sep	02-Oct
1	Reglone	Reglone		43.6	11.7	8.8
2	Flail + Spotlight			56.2	11.7	11.9
3	Flail + Gozai			53.1	12.2	12.2
4	Gozai	Spotlight		54.7	10.9	10.5
5	Spotlight	Gozai		45.6	10.8	9.1
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		53.2	12.3	13.0
7	Spotlight + Gozai	Spotlight + Gozai		49.2	12.5	10.7
8	None	None		54.6	23.0	26.3
9	Pelargonic acid	Spotlight		57.6	16.2	11.5
10	Spotlight	Gozai	Spotlight	48.8	11.2	10.7
11	Saltex	Spotlight		56.5	13.1	13.0
	S.E. (30 D.F.)			3.77	2.42	1.12
	Control (None)			**54.6**	**23.0**	**26.3**
	Reglone			43.6	11.4	8.8
	Pelargonic acid			57.6	16.2	11.5
	Spotlight/Gozai			50.3	11.5	10.8
	Flail			54.7	12.0	12.1
	Saltex			56.5	13.1	13.0

Skinset after ≈ 21 days

None

Reglone

Flail

Spotlight
&/or
Gozai

Pelargonic acid

Saltex

Vascular browning & stem-end necrosis (%)

Treatment	T1	T2	T3	Vascular browning	Stem-end necrosis
1	Reglone	Reglone		26	3.0
2	Flail + Spotlight			27	3.0
3	Flail + Gozai			34	1.0
4	Gozai	Spotlight		28	1.0
5	Spotlight	Gozai		27	2.0
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		27	3.0
7	Spotlight + Gozai	Spotlight + Gozai		25	2.0
8	None	None		28	0.0
9	Pelargonic acid	Spotlight		31	1.0
10	Spotlight	Gozai	Spotlight	32	4.0
11	Saltex	Spotlight		27	2.0
	S.E. (30 D.F.)			3.5	1.17
	Control (None)			**28**	**0.0**
	Reglone			26	3.0
	Pelargonic acid			31	1.0
	Spotlight/Gozai			28	2.4
	Flail			30	2.0
	Saltex			27	2.0

None

Flail

Reglone

Spotlight and/or Gozai

Pelargonic acid

Saltex

Yield (t/ha)

Treatment	T1	T2	T3	Total	>40 mm	>80 mm
1	Reglone	Reglone		68.3	67.6	19.3
2	Flail + Spotlight			62.9	61.5	16.9
3	Flail + Gozai			65.3	64.2	22.4
4	Gozai	Spotlight		66.5	65.8	21.7
5	Spotlight	Gozai		72.6	71.9	18.0
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		69.4	68.5	17.8
7	Spotlight + Gozai	Spotlight + Gozai		68.1	67.4	24.3
8	None	None		78.6	77.7	24.6
9	Pelargonic acid	Spotlight		68.3	67.4	19.1
10	Spotlight	Gozai	Spotlight	72.5	71.6	19.1
11	Saltex	Spotlight		72.2	71.5	28.3
	S.E. (30 D.F.)			3.64	3.64	4.43
	Control (None)			**78.6**	**77.7**	**24.6**
	Reglone			68.3	67.6	19.3
	Pelargonic acid			68.3	67.4	19.1
	Spotlight/Gozai			69.8	69.4	20.2
	Flail			64.1	62.9	19.7
	Saltex			72.2	71.5	28.3

Stolon adhesion (incidence, %)

Treatment	T1	T2	T3	Detached	Easily detached	Removes plug
1	Reglone	Reglone		41.0	56.0	3.0
2	Flail + Spotlight			49.0	50.0	1.0
3	Flail + Gozai			45.0	55.0	0.0
4	Gozai	Spotlight		49.0	51.0	0.0
5	Spotlight	Gozai		52.0	46.0	2.0
6	Spotlight (+ Shinkon)	Gozai (+ Shinkon)		50.0	50.0	0.0
7	Spotlight + Gozai	Spotlight + Gozai		55.0	44.0	1.0
8	None	None		71.0	29.0	0.0
9	Pelargonic acid	Spotlight		52.0	48.0	0.0
10	Spotlight	Gozai	Spotlight	43.0	55.0	2.0
11	Saltex	Spotlight		55.0	45.0	0.0
	S.E. (30 D.F.)			4.80	4.66	0.71
	Control (None)			**71.0**	**29.0**	**0.0**
	Reglone			41.0	56.0	3.0
	Pelargonic acid			52.0	48.0	0.0
	Spotlight/Gozai			49.8	49.2	1.0
	Flail			47.0	52.5	0.5
	Saltex			55.0	45.0	0.0

Stolons adhere more when defoliated

Ground cover summary

- Flail and haulm-pulling instant canopy death
- No regrowth within 4 weeks of T1 in any treatment inc. flail
- Reglone and Saltex most effective in removing leaves. Saltex efficacy dependent on atmospheric conditions
- Spotlight and/or Gozai straights or combinations all similar, but only 2-4 days slower in killing leaves than Reglone. Initial kill may be slow
- Pelargonic acid slowest to act on leaves
- Stem desiccation data still to be analysed, but large varietal difference in speed of desiccation

Skinset summary (3 weeks post-T1): 5 experiments + 2 demonstrations

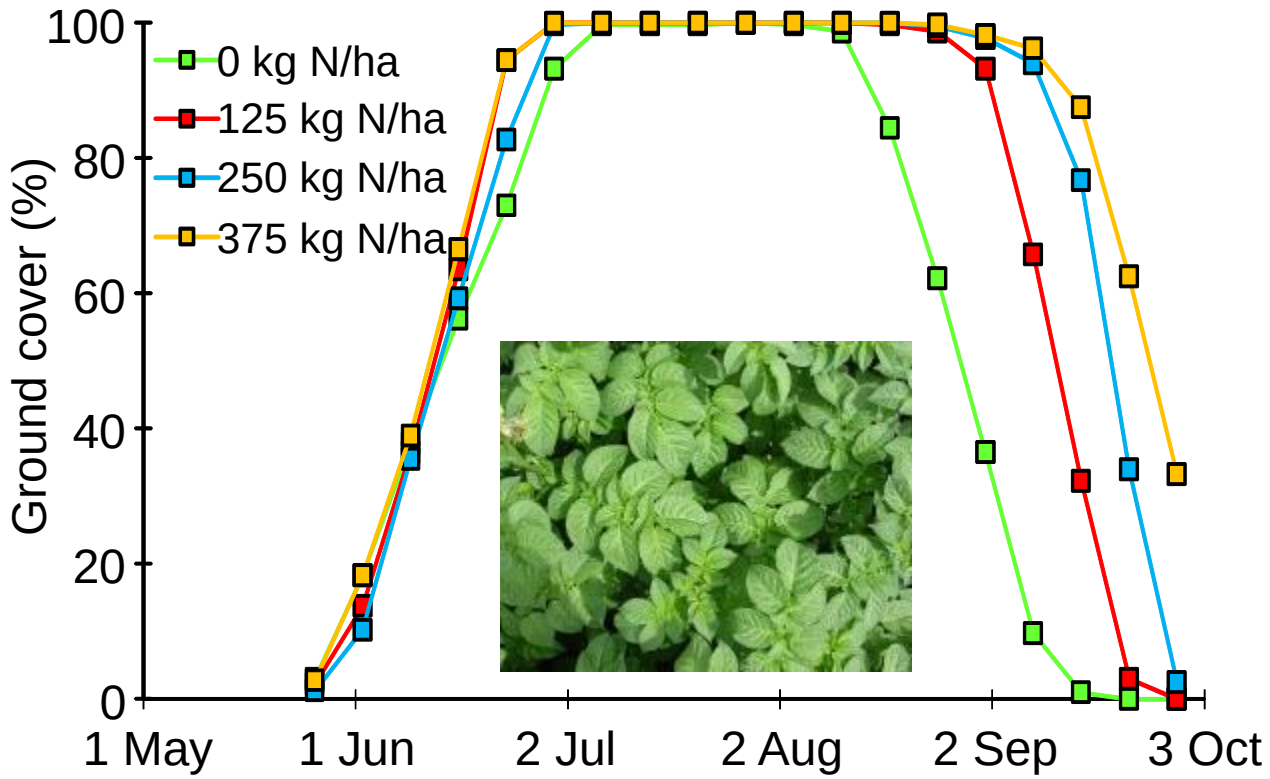
Treatment	Skinning (% SA)
Control (None)	**33.0**
Reglone	19.9
Pelargonic acid	23.8
Spotlight/Gozai	22.9
Flail/haulm pulling	19.7
(Saltex)†	(16.4)†

†5 trials only

Skinset summary

- Not defoliating slows skinset, but not always immediately
- Spotlight/Gozai combinations no different to Reglone, flail, haulm-pulling or Saltex in terms of skinset at 3 weeks post-T1
- Two crops (Georgina and Maris Piper ware) were fully skinset after 2 weeks. Jelly seed and Scottish crops 4 weeks. Royal not set sufficiently even after 4 weeks
- Yield: no significant difference across methods: typically 10 t/ha yield gain by undefoliated crops in 3 weeks from T1
- No effect of defoliation method, chemical or timing on vascular browning or stem-end necrosis
- Stolon detachment. No problems in Jelly, Maris Piper and Georgina but some adhesion in Royal. Undefoliated crops less attachment. Virtually no stolon plug removal in any crop

Effect of N application rate on canopy persistence in Brooke (CUF 2007-9)

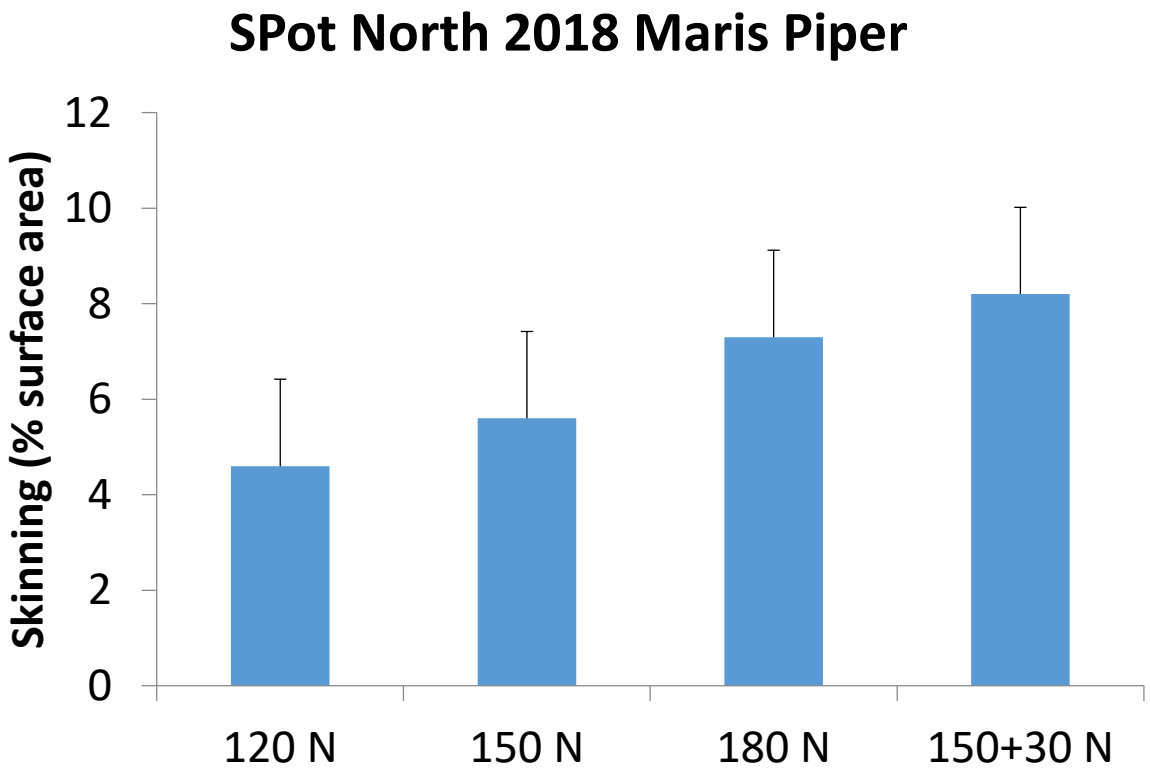


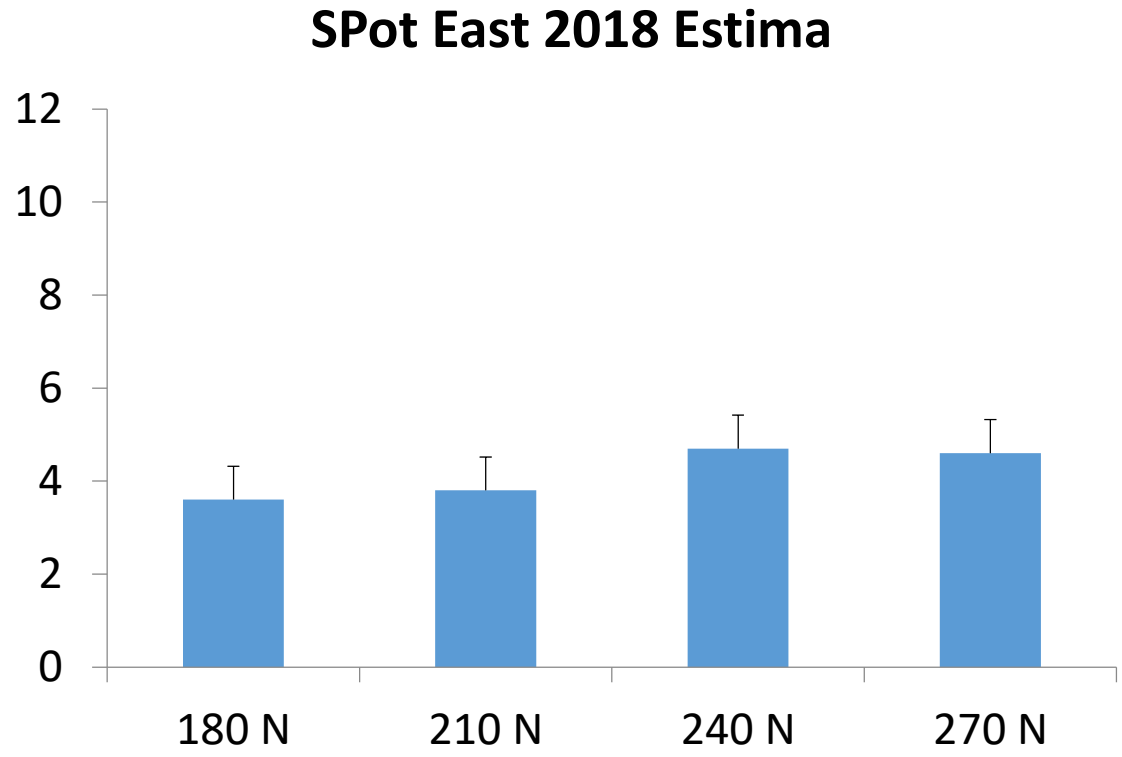
No effect of N rate on black dot

Nitrogen	Incidence (%)	Proportion <5 % SA (%)	Severity (% SA)
180	56.4	74.8	4.97
210	55.4	74.8	6.12
240	50.2	77.0	5.65
270	57.5	73.9	5.60
S.E. (30 D.F.)	3.60	2.83	0.783

Source: SPot East 2018

Increased N delays skinset





AHDB Potato Desiccation Project 2019

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