

Mark Stalham



# Nitrogen and Black Dot



POTATOES

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# Background

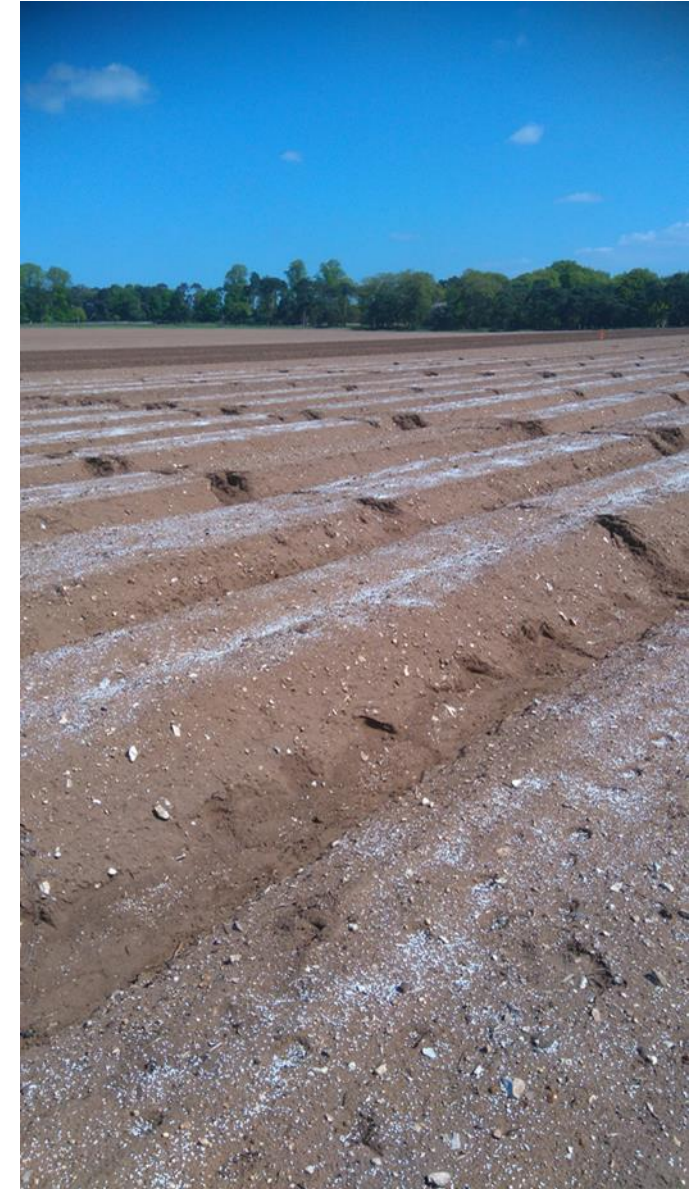
- Disease development is difficult to assess during crop growth as there is a latent period between infection and symptom expression.
- Below-ground symptoms occur once the crop starts to senesce.
- While the presence of black dot on below-ground parts of stems and stolons can be observed between haulm destruction and harvest, there is little correlation with final disease on progeny tubers.
- Disease risk should be based on evaluation of seed infection and soil contamination (Potato Council, 2011)

# Hypotheses

- Delaying time from emergence and defoliation to harvest increases the risk of black dot development in store
- Reducing N increases the risk of black dot infection through premature senescence
- Reducing N advances skinset
- Reducing N increases the risk of bruising

# N \* Black Dot Treatments

- Variety
  - Estima
- Nitrogen (all applied at planting as ammonium nitrate prills post-distoning and pre-bedtilling)
  - 180 kg/ha
  - 210 kg/ha
  - 240 kg/ha
  - 270 kg/ha
- Defoliation (Reglone 4 l/ha)
  - Early, D1 (31 July)
  - Late, D2 (20 August)
- Harvest (3.83 m<sup>2</sup>)
  - Early, H1 (20 August)
  - Late, H2 (10 September)

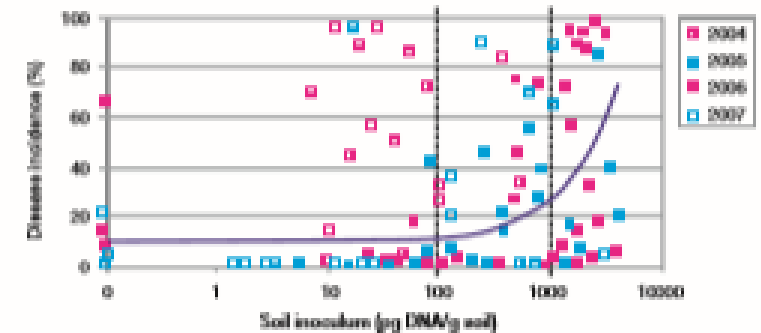


# Site background

- All combinations of N, D and H, fully randomised
- 3 replicate blocks
- Loamy sand (86 % S, 7 % Z, 7 % C, 2.7 % OM)
- Destoned: 20 April
- Planted: 26 April
- Nematicide: 26 April
- Emerged: 24 May

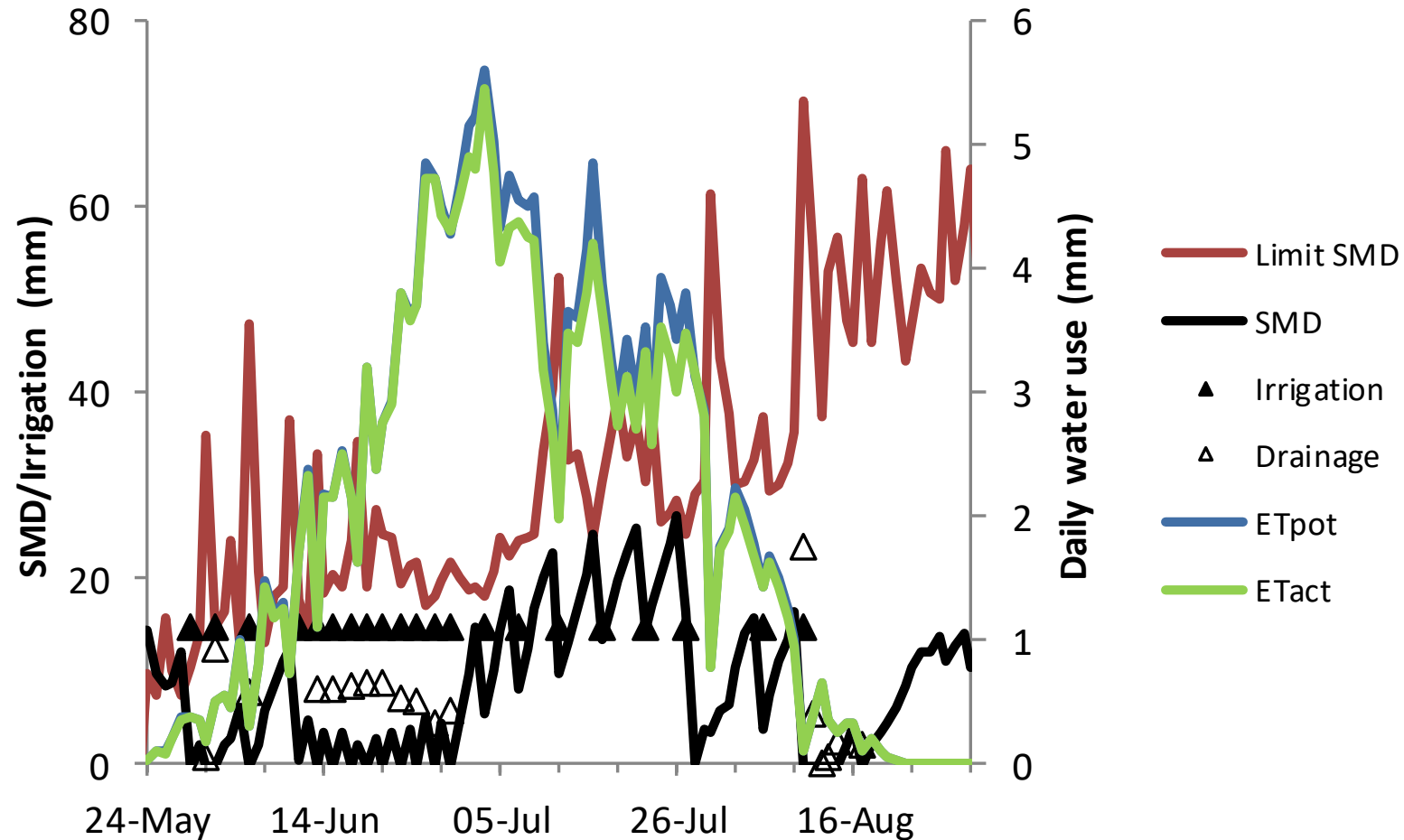
# Black dot soil test (NIAB)

- Soil inoculum twice as important as seed for infection (Denner *et al.* 1998)
- Four Score regarded as High Risk black dot by farm and agronomy team
- Soil sampled at planting
- Two replicate quantitative DNA tests performed on same sample
- Concentration *Colletotrichum coccodes* DNA
  - At lower limit of detection for test
  - 50 fg per g (0.00000000000005 %)
  - 30 fg per g
  - Mean 40 fg (0-3 spores per g or 0-1.2 sclerotia per g, Cullen *et al.* 2002): **LOW RISK**
- **Do growers test soil?**
- Disease observed at harvest, now in store at Sutton Bridge EU



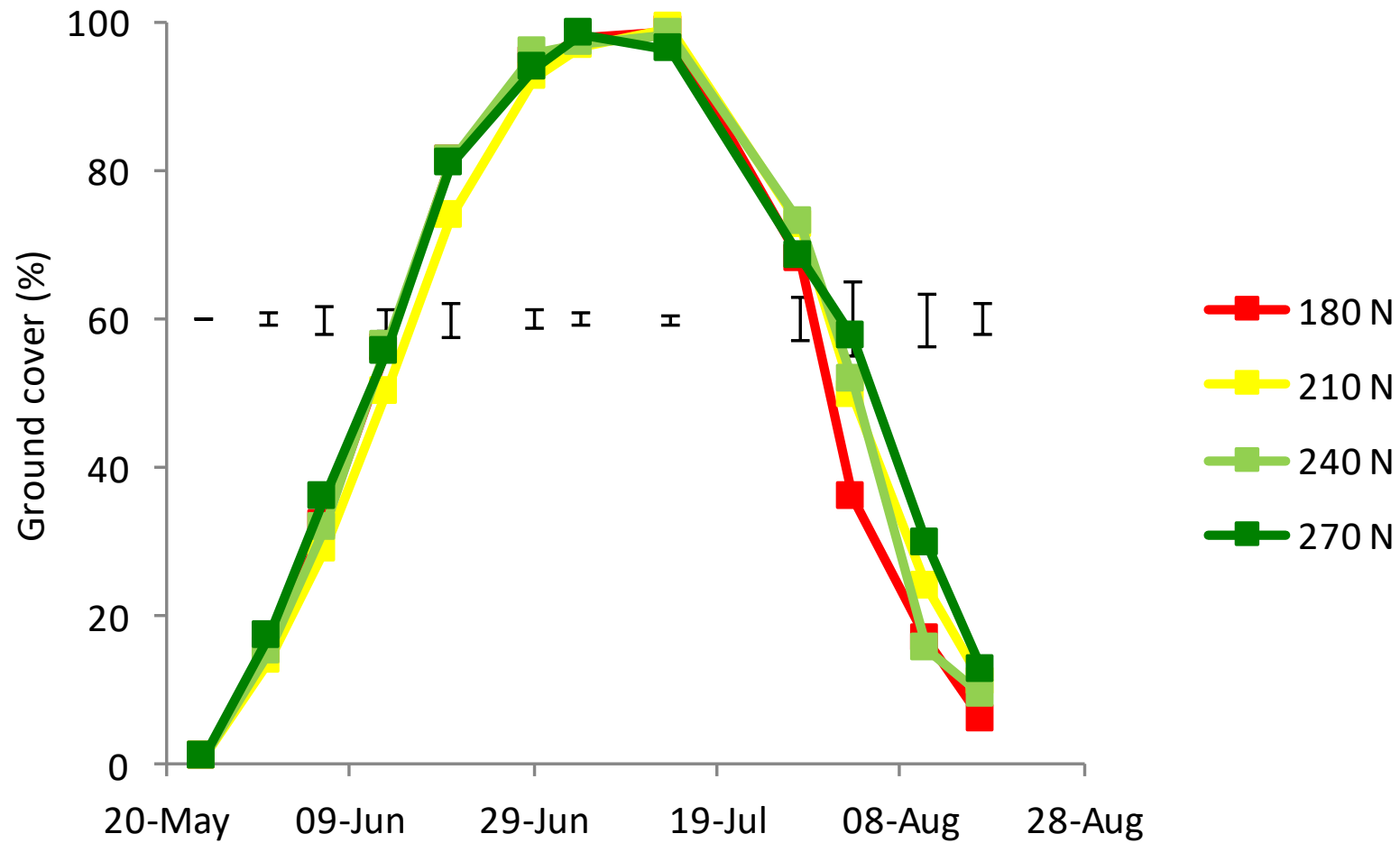


# Soil moisture deficits: well watered! Increased risk?





# Ground cover (D2 treatments only)



# Ground cover duration (main N effects)

Nitrogen	GC duration (% days)
180	5003
210	5063
240	5164
270	5271
S.E. (30 D.F.)	146.2

Little difference: <3 days at 100 % GC



Treatment effects or something else?





# Yields (H1)

Nitrogen	Defoliation	Yield >40 mm (t/ha)	Total yield (t/ha)	Tuber DM (%)	DM yield (t/ha)
180	Early	47.1	50.3	19.3	9.7
	Late	61.2	64.0	19.3	12.4
210	Early	55.2	57.1	18.9	10.8
	Late	56.2	57.8	19.0	11.0
240	Early	50.2	52.0	18.2	9.5
	Late	59.1	61.6	18.1	11.2
270	Early	53.9	56.7	18.9	10.7
	Late	56.6	58.8	18.4	10.8
S.E. (29 D.F.)		3.43	3.24	0.40	0.61

Early defoliation decreased yield, but no effect of N

# Yields (H2)

Nitrogen	Defoliation	Yield >40 mm (t/ha)	Total yield (t/ha)	Tuber DM (%)	DM yield (t/ha)
180	Early	52.3	55.1	18.4	10.1
	Late	58.4	60.2	18.7	11.2
210	Early	57.0	59.9	18.7	11.2
	Late	59.0	61.1	18.6	11.3
240	Early	54.5	57.0	18.5	10.6
	Late	62.5	64.4	18.9	12.1
270	Early	48.0	50.2	18.6	9.3
	Late	61.9	64.2	18.3	11.7
S.E. (29 D.F.)		3.43	3.24	0.40	0.61

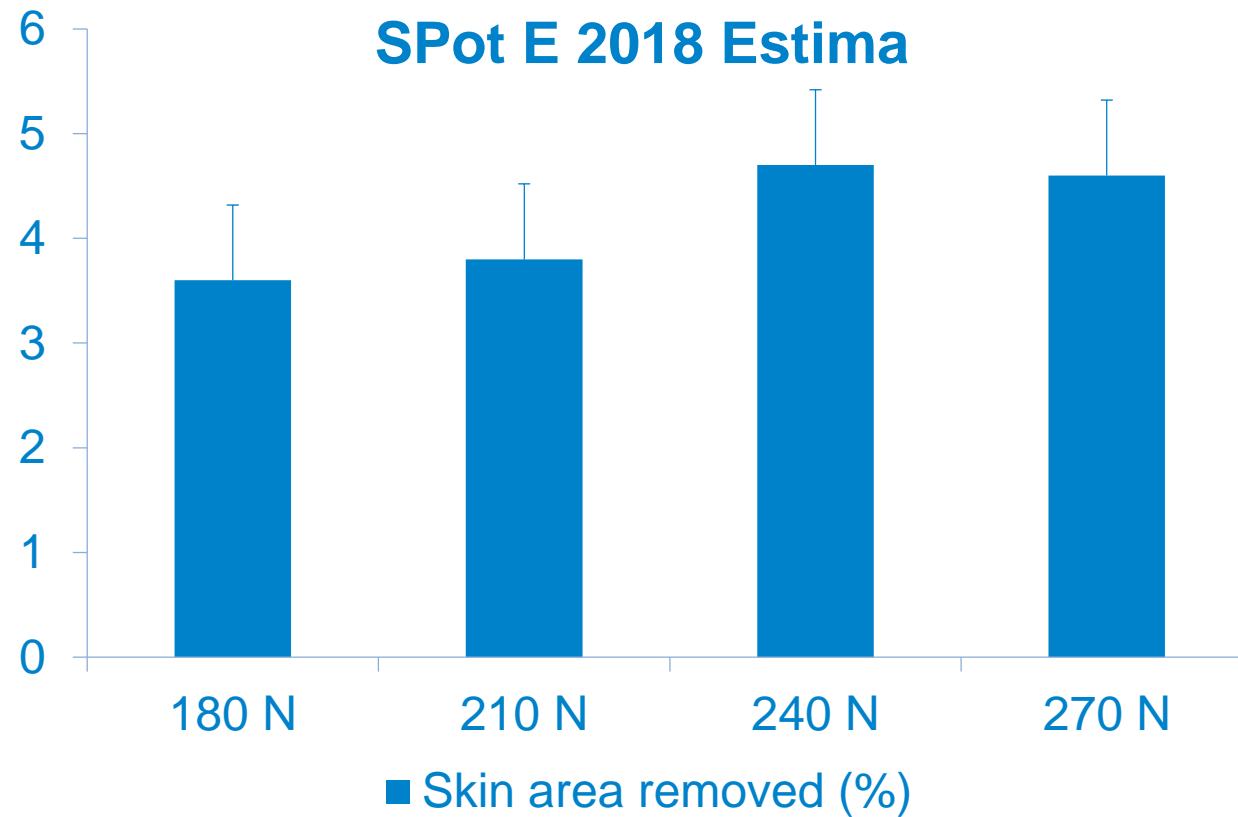
Early defoliation decreased yield, but no effect of N

# Yields (main effects of N)

Nitrogen	Yield >40 mm (t/ha)	Total yield (t/ha)	Tuber DM (%)	DM yield (t/ha)
180	54.8	57.4	18.9	10.9
210	56.9	59.0	18.8	11.1
240	56.6	58.8	18.4	10.8
270	55.1	57.5	18.5	10.6
S.E. (29 D.F.)	1.72	1.62	0.20	0.30

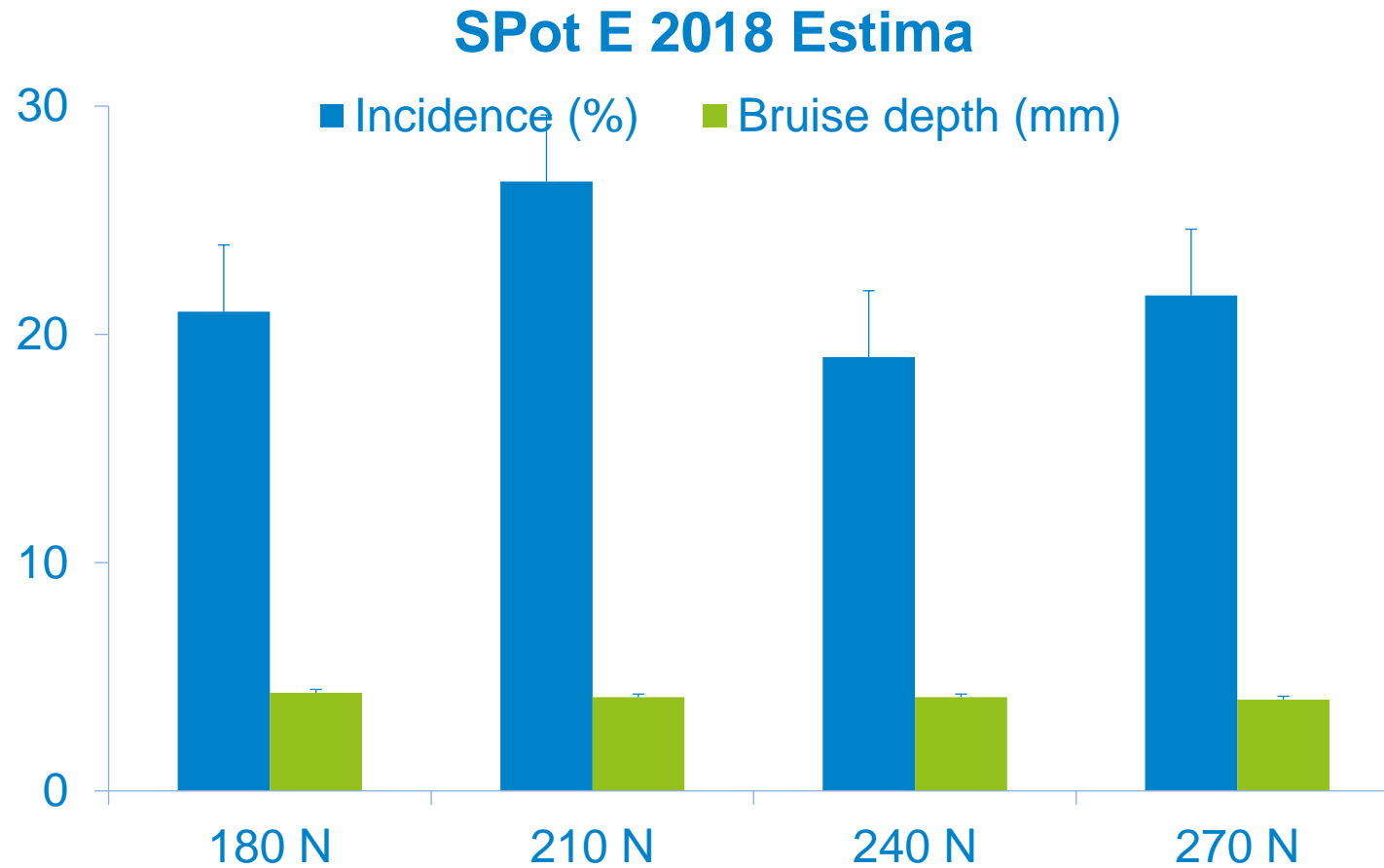
No effect of N rate on yield, but directional effect on DM%

# Increased N delays skinset?





# Increased N reduces bruising?



# SPot Scotland 2017 Black dot (9 November assessment: early)



No.	Regime	Incidence (%)	S.E.	Proportion < 5 % SA (%)	S.E.	Severity (% SA)	S.E.
1	Planting: Liquid Top-dress: Standard Total: 177 kg N/ha	22.0	15.87	96.0	3.46	1.05	0.981
2	Planting: Standard Top-dress: Ridge Inject Total 175 kg N/ha	11.3	1.15	98.0	0.00	0.40	0.142
3	Planting: Standard Top-dress: 0 Total: 147 kg N/ha	16.7	6.43	96.7	4.16	0.98	1.294
4	Planting: Standard Top-dress: Standard Total: 176 kg N/ha	21.3	7.02	93.3	6.43	1.91	2.074

- Black dot incidence from short-term storage was moderate
- Worse severity in the higher-yielding N treatments?

# Summary

- Soil test showed very low *C. coccodes* inoculum concentration
- No effect of N rate on early ground cover development
- Canopies lasted slightly longer with increased N, but <3 days at 100 % GC from 180 to 270 kg N/ha
- No effect of N rate on yield or grading, but trend for DM % to decrease with more N
- Higher N delayed skinset
- No effect of N on bruising
- Effects on Black Dot? TBC April 2019

# Acknowledgements

- NIAB CUF would like to thank Andrew Francis and Emma Kelcher and their team at Elveden for all their help and support in conducting experiments and trials during 2018-2018
- AHDB staff involved in the SPot East programme including: Jenny Bashford, Graham Bannister and Teresa Meadows
- Nick Winmill of Agrii and Tony Miller of John Innes Centre for supplying soil nitrate-measuring probes
- Peter Raatjes of RMA for installing Adcon soil water monitoring probes