
Trial Title: Periodic harvest of sugar beet and fungicide interaction

Centre: Morley

Trial Code: SBT17-810

Variety: Darnella

Objective: To determine the growth rate and yield benefit of sugar beet treated with and without a triazole-based fungicide programme during the summer and early autumn.

Mentor theme: Long-term monitoring

Background: In 1997 a long term study was initiated at Morley Research Centre to examine the relationship between yield and lifting date in sugar beet; this is known as the 'periodic lift study'. Since 2007 the monthly comparisons of adjusted yields have been carried out either following, or in the absence of, a summer fungicide regime (using triazole-based products).

Summary: In 2017 the programme was based on Escolta (cyproconazole + trifloxystrobin) applied on 1st August, 31st August and 22nd September 2017. The programme compared a one or two-spray fungicide regime. Across all timings the addition of a full rate single fungicide spray gave an average yield response of 11% compared to the untreated. Yield response increased to 15% with the use of a two-spray programme at low and reduced rates. The use of a two-spray, full-rate programme provided the greatest yield response of 16% compared to the untreated.

- In 2017 the sugar beet (cv. Darnella) was drilled on 31/03/2017 and all crop inputs were as the Morley Farm crop with the exception of fungicide applications (see Appendix for details).
- In 2017 the programme was based on Escolta (cyproconazole + trifloxystrobin) applied on 1st August, 31st August and 22nd September 2017. The programme compared a one or two-spray fungicide regime (Table 1). The two-spray programme was applied at either a low rate (0.175 l/ha fb 0.175 l/ha), a reduced rate (0.35 l/ha fb 0.175 l/ha), a full rate or a full rate stretched programme (0.35 l/ha fb 0.35 l/ha).
- Adjusted yield response and sugar content at monthly lift intervals are shown in Figure 1. Maximum yield was achieved from the two-spray full rate fungicide programme lifted in January with an adjusted yield of 134 t/ha compared to the corresponding untreated yield of 113 t/ha.
- Table 2 shows the yields for each fungicide programme as a % of the untreated (no fungicide programme) for each lift timing. Across all timings the addition of a full rate single fungicide spray gave an average yield response of 11% compared to the untreated. Yield response increased to 15% with the use of a two-spray programme at low and reduced rates. The use of a two-spray full rate programme provided the greatest yield response of 16% compared to the untreated.
- Despite the variety (cv.Darnella) being reasonably susceptible to rust, disease pressure was low this season with rust infection peaking in October at 4.9%. The main disease pressure came from Cercospora found at 12.5% in December. Ramularia and Cercospora infection generally increased until December then dropped off in January. The relatively low disease pressure could go some way to explain the low yield response of the two-spray programme (regardless of dose) compared to the one-spray programme.

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Table 1: Treatment table.

Trt	Treatments T1	Treatments T2	Treatments T2	Lift dates
	Late July	Late August (4 wk interval)	Mid September (6 wk interval)	Third Week of (or as close to):
1	-	-		August
2	-	-		September
3	ESCOLTA @ 0.35 l/ha	-		September
4	-	-		October
5	ESCOLTA @ 0.35 l/ha	-		October
6	-	-		November
7	ESCOLTA @ 0.35 l/ha	-		November
8	ESCOLTA @ 0.175 l/ha	ESCOLTA @ 0.175 l/ha		November (Two spray programme – low rate)
9	ESCOLTA @ 0.175 l/ha	ESCOLTA @ 0.35 l/ha		November (Two spray programme – reduced rate)
10	ESCOLTA @ 0.35 l/ha	ESCOLTA @ 0.35 l/ha		November (Two spray programme – full rate)
11	ESCOLTA @ 0.35 l/ha		ESCOLTA @ 0.35 l/ha	November (Two spray stretch programme – full rate)
12	-	-		December
13	ESCOLTA @ 0.35 l/ha	-		December
14	ESCOLTA @ 0.175 l/ha	ESCOLTA @ 0.175 l/ha		December (Two spray programme – low rate)
15	ESCOLTA @ 0.175 l/ha	ESCOLTA @ 0.35 l/ha		December (Two spray programme – reduced rate)
16	ESCOLTA @ 0.35 l/ha	ESCOLTA @ 0.35 l/ha		December (Two spray programme – full rate)
17	ESCOLTA @ 0.35 l/ha		ESCOLTA @ 0.35 l/ha	December (Two spray stretch programme – full rate)
18	-	-		January
19	ESCOLTA @ 0.35 l/ha	-		January
20	ESCOLTA @ 0.175 l/ha	ESCOLTA @ 0.175 l/ha		January (Two spray programme – low rate)
21	ESCOLTA @ 0.175 l/ha	ESCOLTA @ 0.35 l/ha		January (Two spray programme – reduced rate)
22	ESCOLTA @ 0.35 l/ha	ESCOLTA @ 0.35 l/ha		January (Two spray programme – full rate)
23	ESCOLTA @ 0.35 l/ha		ESCOLTA @ 0.35 l/ha	January (Two spray stretch programme – full rate)

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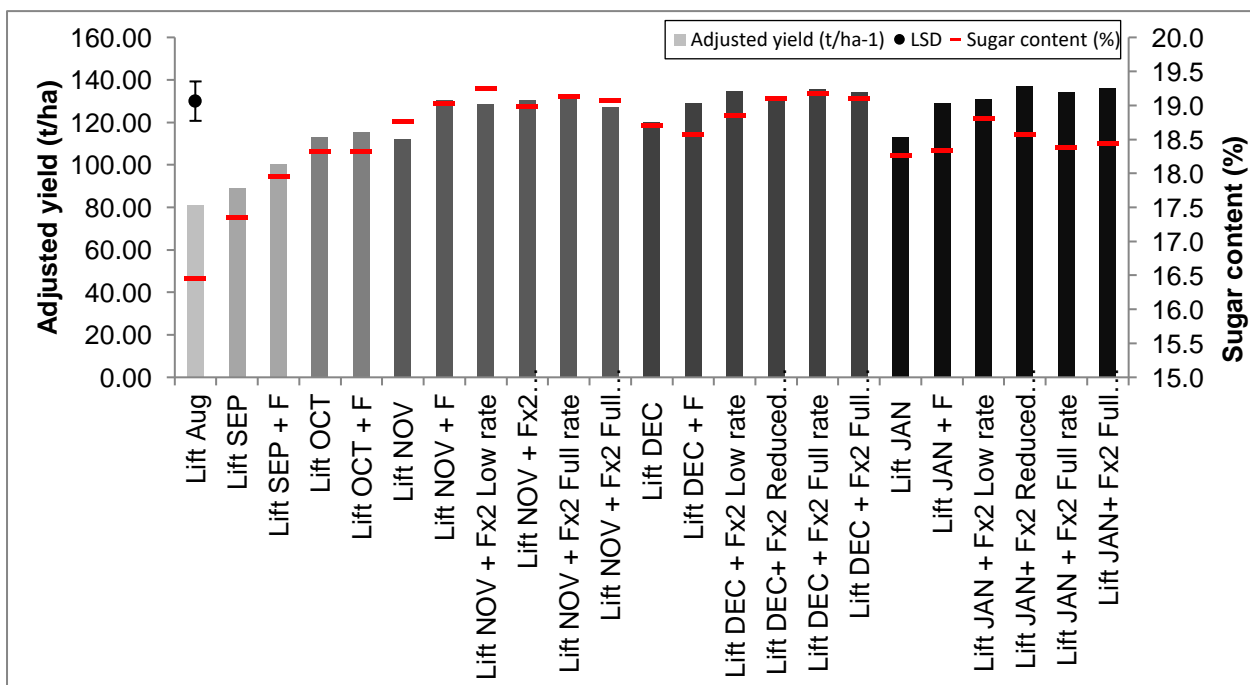
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- The margins over untreated (based on a crop price of £22.00/t and a single fungicide spray (at 0.35l/ha of Escolta) that costs £28/ha including application) are shown in Table 3. The two spray fungicide programmes produced the highest margins compared to a one spray programme on lift timings on or after December. The data suggests that where sugar beet are planned to be lifted later in the season (December or January) then a two spray fungicide programme would be advantageous with yield return outweighing the cost of the additional fungicide application.
- The five year relative mean yield response (%) compared to untreated is shown in Table 4. Typically, a single fungicide spray programme increased yields by around 5%. Where a two spray fungicide programme was used yields are increased by c.8%, with little notable difference between low, reduced, full or stretched two spray programmes.

Figure 1. Adjusted sugar beet yield (t/ha) and sugar content (%) in response to variations in dose and timings of a triazole based summer fungicide regime across six lift months (August 2017- January 2018)



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Table 2. Sugar beet yield (%) relative to untreated for corresponding lift timing

Treatment	Aug	Sep	Oct	Nov	Dec	Jan	Mean
Untreated	100	100	100	100	100	100	100
F Full		113	102	117	107	114	111
Fx2 Low				115	112	116	114
Fx2 Reduced				117	110	121	116
Fx2 Full				118	113	119	116
Fx2 Full Stretch				113	111	120	115

Table 3. Gross margin minus cost of fungicide and fungicide spray operations

Treatment	Aug	Sep	Oct	Nov	Dec	Jan	Mean
F Full	-	222	32	380	169	325	225
Fx2 Low	-	-	-	342	288	365	331
Fx2 Reduced	-	-	-	368	228	486	361
Fx2 Full	-	-	-	382	286	411	360
Fx2 Full Stretch	-	-	-	279	251	453	328

Table 4. 5 year (2013-2017) relative mean yield response (%) compared to untreated

Treatment	Aug	Sep	Oct	Nov	Dec	Jan	Mean
F Full	-	6.2	2.5	3.4	6.5	7.0	5.1
Fx2 Low	-	-	-	6.4	9.4	9.8	8.5
Fx2 Reduced	-	-	-	4.2	5.6	11.6	7.2
Fx2 Full	-	-	-	5.8	8.3	10.4	8.2
Fx2 Full Stretch	-	-	-	6.1	8.2	12.0	8.8

Note – January is based on 3 year mean (no January lifts in 2015 and 2016)

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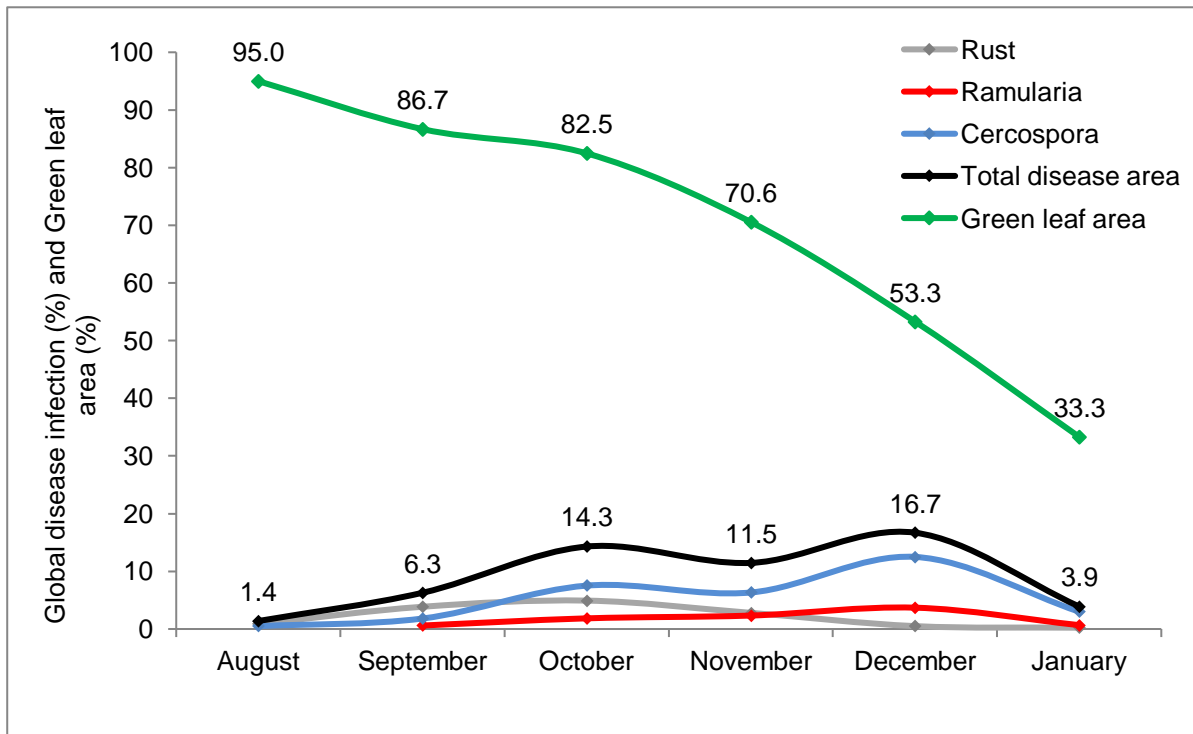


Figure 2. Global disease scores (%) for rust, ramularia, cercospora and total disease (sum of all diseases) and green leaf area.

Field details & overall applications to crop

Crop:	Sugar Beet
Trial ID:	SBT17-810
Location:	Hacketts, Morley
Variety:	Darnella
Seed rate:	1 unit/ha
Soil type:	Ashley Series. Sandy Clay Loam
Soil analysis:	
Previous crop:	Winter Wheat
Drill date:	31/03/2017
Harvest date:	Periodic lift
Drilled plot size: m2	6 x 10m ² (inc. buffers)
Harvested plot size: m2	1 x 10 m
Replicates:	3

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Input type	Product	Product rate	Date	
Herbicide:	Surrender	3.0 l/ha	25/11/17	
	Volcan Combi	2.8 l/ha	04/04/17	
	Betanal Maxx Pro	1.0 l/ha	06/05/17	
	Target SC	0.8 l/ha	06/05/17	
	Centurion max	1.0 l/ha	16/05/17	
	Safari Lite WSB	0.2 kg/ha	18/05/17	
	Beta Team	1.0 l/ha	18/05/17	
	Safari Lite WSB	0.2 kg/ha	30/05/17	
	Beta Team	1.0 l/ha	30/05/17	
	Falcon	1.0 l/ha	20/06/17	
	Vivendi 200	0.8 l/ha	20/06/17	
Fertiliser:	Cattle Muck	15 kg/ha	24/10/16	
	Liquid N 27+S	77 kg N/ha 14 kg S/ha	04/04/17	
	Liquid N 27+S	35 kg N/ha 6 kg S/ha	24/05/17	
Adjuvant:	Companion Gold	0.5 l/ha	25/11/17	
	Logic	0.5 l/ha	18/05/17	

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