

## WB17-510 Fungicide timing response monitoring in winter barley

**Trial Code :** WB17-510

**Centre :** Morley, Sutton Scotney, Benniworth (Caythorpe)

**Crop :** Winter Barley

**Variety :** SY Venture

### Objective

To record and monitor the yield responses to each of the component spray timings within a fungicide spray programme on barley.

### Summary

This is the 7th year that this trial has been running. It is jointly funded by The Morley Agricultural Foundation Mentor project (formerly the National Agronomy Centre project) and NIAB TAG Members.

In 2017, disease levels varied considerably across the three sites; generally low at Morley, moderate to high ramularia at Caythorpe and high levels of net blotch at Sutton Scotney.

The mean response to fungicide was 2.22 t/ha which is slightly higher than the long-term mean of 2.15 t/ha.

The fungicide response from the T1+T2 standard programme was slightly below average at 1.73 t/ha versus 1.91 for the long-term mean.

The T0 response of 0.13 t/ha was close to the previous multi-year mean of 0.16 t/ha.

The T3 response was relatively high at 0.36 t/ha which is considerably higher than the previous mean of 0.08 t/ha in the previous 6 years. This may indicate higher disease pressure later in the season in 2017.

Specific weight increased with the level of fungicide input.

Caythorpe had relatively high levels of ramularia which was not controlled by most of the fungicide treatments but treatment 10, which included a low rate Siltra at T3, did show significant control versus the untreated.

### Treatments

Treatment No	Description	Nov	GS 25	GS 30-31	GS 33-39	GS 39-49	GS 59-61
1	Untreated						
2	Standard Programme			Kayak (0.8 l/ha) Proline 275 (0.3 l/ha )		Siltra XPRO (0.4 l/ha )	
3	T1 alone			Kayak (0.8 l/ha) Proline 275 (0.3 l/ha )			
4	T2 alone					SILTRA XPRO (0.4 l/ha )	
5	Stretch Sequence		Kayak (0.4 l/ha) Proline 275 (0.125 l/ha )	Kayak (0.4 l/ha) Proline 275 (0.175 l/ha )	Siltra XPRO (0.2 l/ha )		Siltra XPRO (0.2 l/ha )

Treatment No	Description	Nov	GS 25	GS 30-31	GS 33-39	GS 39-49	GS 59-61
6	Stretch Sequence T1 only		Kayak (0.4 l/ha) Proline 275 (0.125 l/ha )	Kayak (0.4 l/ha) Proline 275 (0.175 l/ha )			
7	Stretch Sequence T2 only				Siltra XPRO (0.2 l/ha )		Siltra XPRO (0.2 l/ha )
8	Aut T0 + Standard	Proline 275 (0.25 l/ha)		Kayak (0.8 l/ha) Proline 275 (0.3 l/ha )		Siltra XPRO (0.4 l/ha )	
9	Spr T0 + Standard		Proline 275 (0.25 l/ha )	Kayak (0.8 l/ha) Proline 275 (0.3 l/ha )		Siltra XPRO (0.4 l/ha )	
10	Standard + T3			Kayak (0.8 l/ha) Proline 275 (0.3 l/ha )		Siltra XPRO (0.4 l/ha )	Siltra XPRO (0.2 l/ha )

This long term trial funded by NIAB TAG Members and The Morley Agricultural Foundation Mentor project records the yield response to fungicide input and spray programme components in winter barley each year.

With regard to data interpretation, the "T1+T2" response is based on a comparison of treatments 2 and 1; the "T3" response is based on treatments 2 and 10 and the "T0" is a comparison of treatments 2 and 9.

## Results

Table 1: Disease on the untreated flag leaf at all three sites in June 2017

Disease on untreated leaf 1	Caythorpe 13/06/17	Morley 12/06/17	Sutton Scotney 06/06/17
Net blotch	1%	5%	60%
Ramularia	35%	1%	0%
Brown rust	4%	10%	4%
Powdery mildew	1.7%	0%	0%

The diseases present and their levels were very different at each site. At Caythorpe, the major disease was ramularia whereas at Sutton Scotney net blotch was dominant. Morley had lower disease overall but brown rust was most significant. The variety at all sites was SY Venture which has moderate disease resistance to most diseases but is particularly prone to rhynchosporium which did not develop at any of the sites in the relatively dry spring/summer of 2017.

Table 2: Yields at all three sites and 3 site mean

	Yield - Caythorpe (t/ha)	Yield - Morley (t/ha)	Yield - S.Scotney (t/ha)	Mean of 3 sites (t/ha)
Untreated	6.98	6.25	5.18	6.12
Standard Programme	8.54	8.19	6.88	7.87
T1 alone	8.28	7.41	6.28	7.32
T2 alone	8.14	7.93	7.04	7.69
Stretch sequence	8.65	8.11	7.13	7.96

	Yield - Caythorpe (t/ha)	Yield - Morley (t/ha)	Yield - S.Scotney (t/ha)	Mean of 3 sites (t/ha)
Stretch sequence T1	8.36	7.63	6.53	7.50
Stretch sequence T2	8.35	7.91	6.59	7.61
Aut T0 + Standard	7.84	8.07	7.04	7.66
Spr T0 + Standard	8.53	8.29	7.23	8.02
Standard + T3	8.96	8.26	7.48	8.25
LSD	0.84	0.57	0.51	0.37
CV%	5.93	4.22	4.37	

**Figure 1: Yield (mean of 3 sites) in 2017**

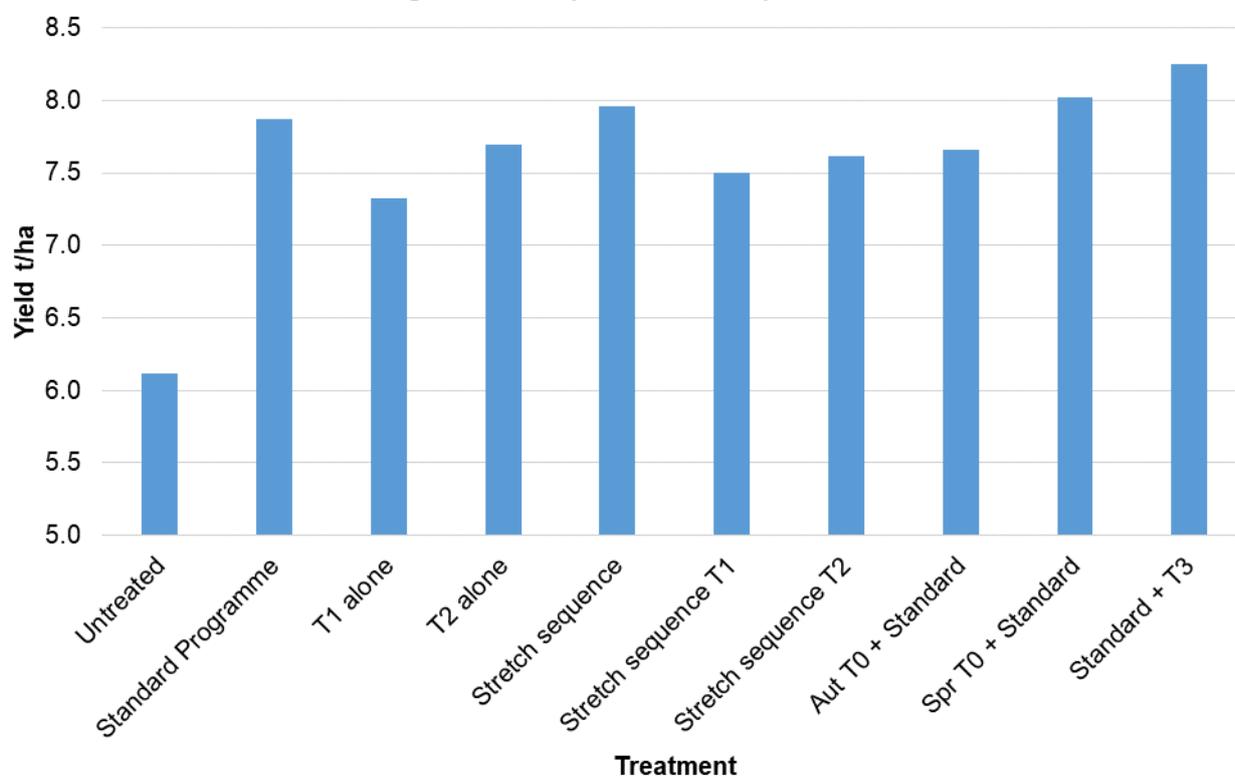


Table 2 and figure 1 above show the three-site mean yield for each treatment. Table 3 below summarises the differences between these treatments.

Table 3: Multi-site Yield and Margin versus the long-term mean.

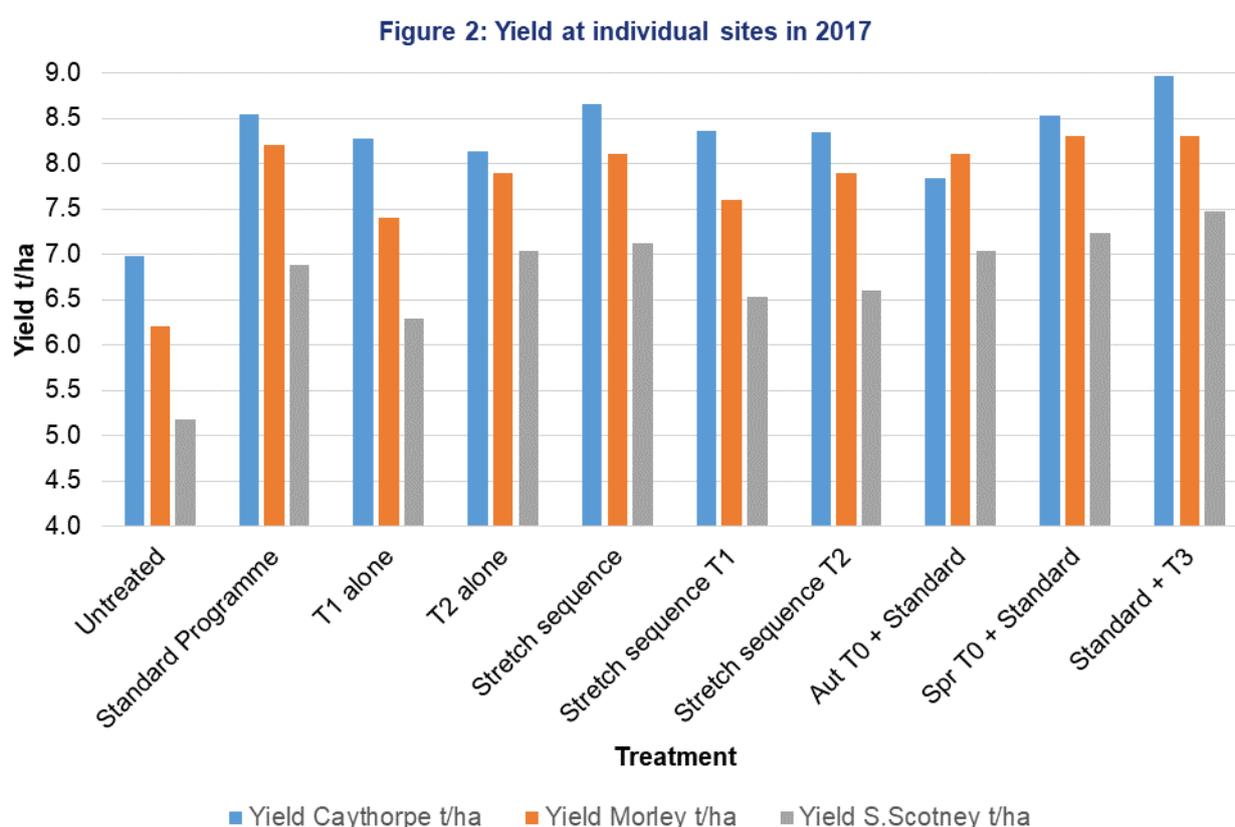
Comparison vs Standard Programme	3 Site Mean Yield Response 2017 vs Standard Programme (t/ha)	Margin over Fungicide Cost in 2017 @ £118/t	3 Site Mean Response 2011 - 2016 (t/ha)
Benefit of T1 + T2 vs Untreated	1.73	£160	1.91
Benefit of T3	0.36	£32	0.08
Benefit of T0 (Spring)	0.13	£4	0.16

Comparison vs Standard Programme	3 Site Mean Yield Response 2017 vs Standard Programme (t/ha)	Margin over Fungicide Cost in 2017 @ £118/t	3 Site Mean Response 2011 - 2016 (t/ha)
Total Response to T0+T1+T2+T3	2.22	£196	2.15
Benefit of T0 (Autumn)	-0.21	-£38	-0.08
Benefit of "Stretch Programme"	0.09	£11	-0.1
LSD	0.37		

Across all sites, the mean response to the standard T1+ T2 was 1.73 t/ha versus the untreated. This is slightly less than the average response when compared with the 6 year mean. Response to an additional T0 or T3 application was 0.13 and 0.36 t/ha, respectively. Compared to previous years, this is an average response to a T0 spray but a very high response to a T3 spray. This may be an indication of the diseases which developed later in the season in 2017.

The positive margin response to these yields is largely based on the standard T1 + T2 but, in 2017, T3 contributed £32/ha after fungicide costs in this trial.

As has commonly been seen in previous years, the autumn T0 and the "stretch programme" where the T1 and/or the T2 fungicide is split showed little or no yield or margin benefit.



The treatment yields at each site are shown in table 1 and figure 2 above and summarised in table 4 below. There were large differences in yield between the sites with an untreated range of 5.18 to 6.98 t/ha. The highest yields, generally, were at Caythorpe which had good yield potential and moderate disease pressure and the lowest was at Sutton Scotney which had very high disease pressure. Morley generally has a lower yield potential but it also had lower disease pressure.

Table 4: Yield responses at each site

Comparison vs Standard Programme	Yield Response 2017 - Caythorpe (t/ha)	Yield Response 2017 - Morley (t/ha)	Yield Response 2017 - S.Scotney (t/ha)
Benefit of T1 + T2 vs Untreated	1.56	1.94	1.7
Benefit of T3	0.42	0.07	0.6
Benefit of T0 (Spring)	-0.01	0.04	0.35
Total Response to T0+T1+T2+T3	1.97	2.05	2.65
Benefit of T0 (Autumn)	-0.7	-0.12	0.16
Benefit of "Stretch Programme"	0.11	-0.08	0.25
LSD	0.84	0.57	0.51
CV%	5.93	4.22	4.37

In table 4, Morley had the highest yield response but from the lowest disease pressure. Conditions were dry at Morley in spring /summer 2017 but the yield response is larger than would be expected and similar to the long-term mean. Caythorpe had the lowest response to fungicide use of the 3 trials but the most prominent disease, ramularia, was not controlled by any of the early timings. Only the T3 spray had a significant effect on the disease, resulting in a 0.42 t/ha yield response. Sutton Scotney had high net blotch pressure which was controlled well by the standard programme.

Figure 3: Specific weight (mean of 3 sites in 2017)

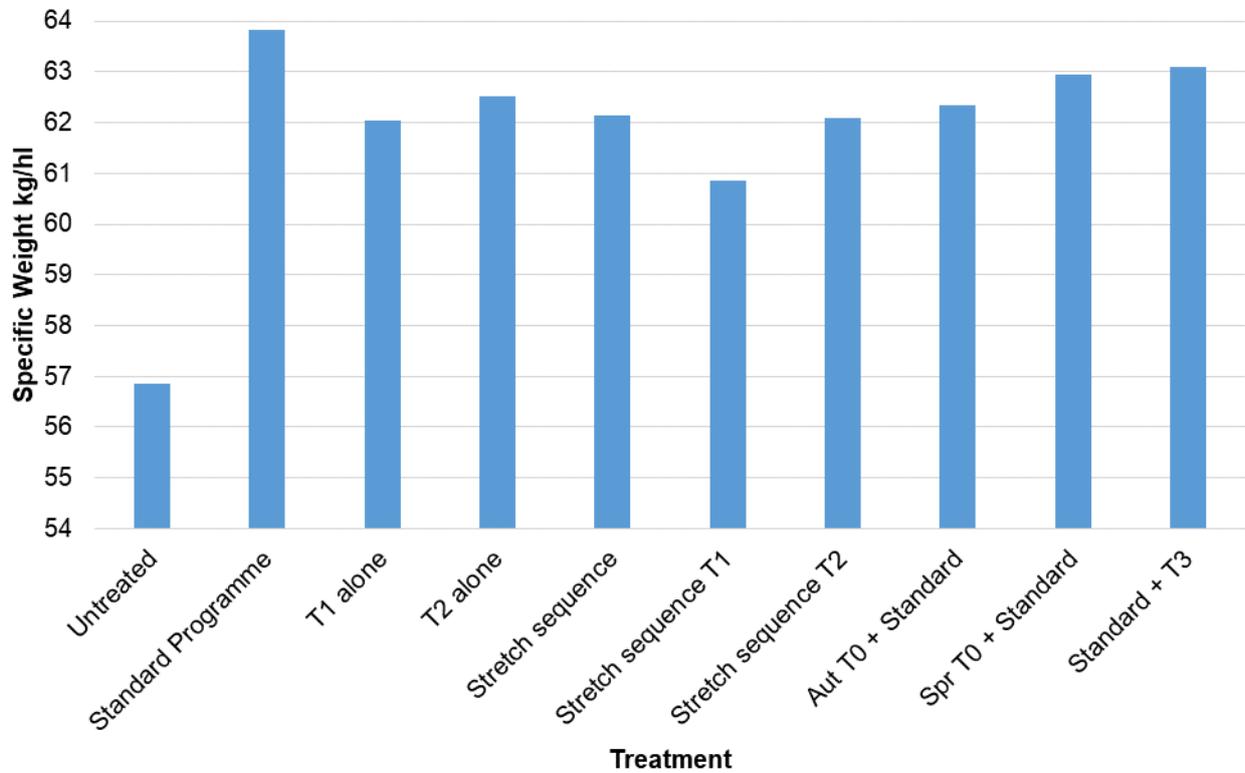


Table 5: Specific Weight at all three sites and 3 Site Mean.

	Sp. wt. - Caythorpe (kg/hl)	Sp. wt. - Morley (kg/hl)	Sp. wt. - S.Scotney (kg/ha)	Mean of 3 Sites (kg/hl)
Untreated	51.59	59.53	59.47	56.86
Standard Programme	60.54	66.30	64.67	63.84
T1 alone	58.89	64.23	63.00	62.04
T2 alone	56.98	65.77	64.83	62.53
Stretch sequence	57.72	66.17	62.57	62.15
Stretch sequence T1	57.23	63.80	61.53	60.85
Stretch sequence T2	56.59	66.13	63.57	62.10
Aut T0 + Standard	56.79	66.23	64.00	62.34
Spr T0 + Standard	58.08	66.57	64.20	62.95
Standard + T3	57.12	66.90	65.27	63.10
LSD	4.39	1.95	1.66	1.76
CV%	4.48	1.74	1.53	

**Figure 4: Specific weight at individual sites in 2017**

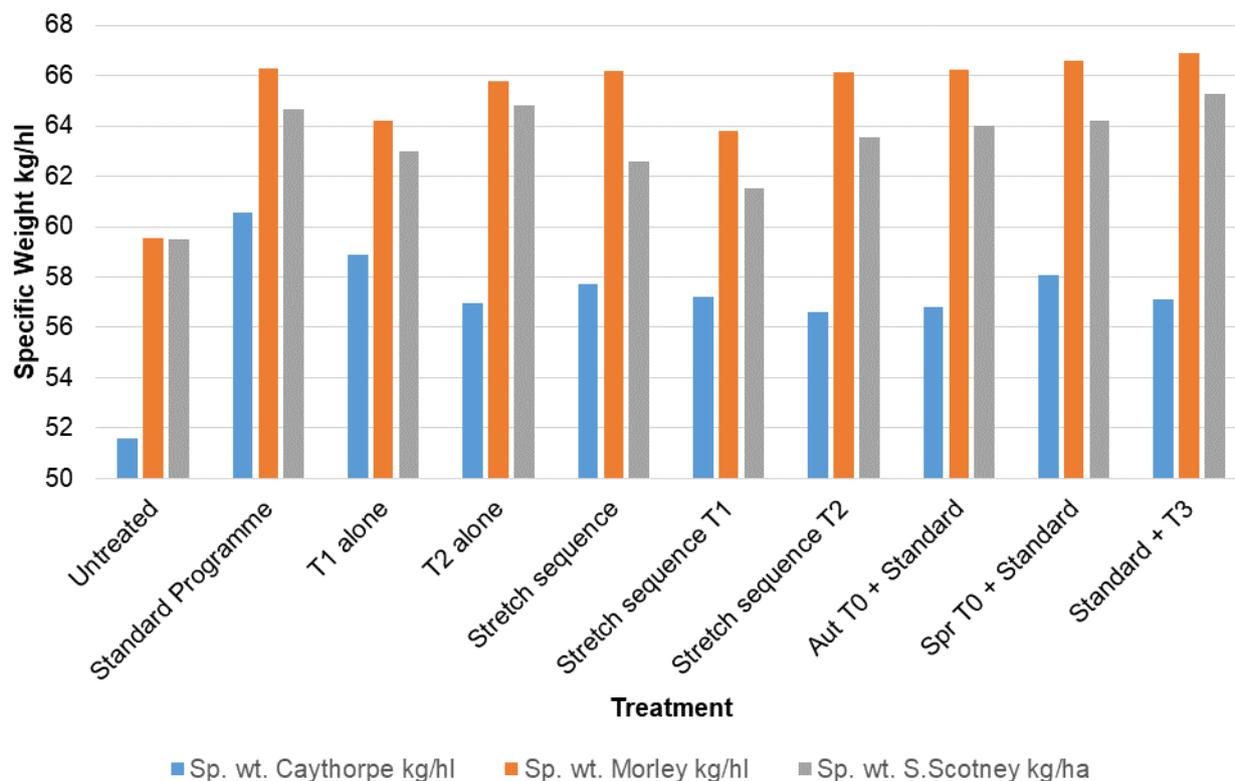


Table 5 and figures 3 and 4 show the specific weight results for 2017. Specific weight was significantly improved by all fungicide use. In addition, the level of this improvement tended to mirror the level of fungicide input. The specific weights were particularly low at Caythorpe (Table 5; Figure 4) where ramularia levels were relatively high in all treatments and not well controlled by many treatments.

Table 6 shows the levels of recorded ramularia at Caythorpe for all treatments. The majority of the spray programmes did not control ramularia. There was however, a significantly lower level of disease in treatment 10 versus the untreated, Treatment 10 had an additional low rate of Siltra at T3 (GS 59-61) versus the standard programme.

Table 6: Ramularia levels at Caythorpe

Ramularia at Caythorpe 2017	% Ramularia on Leaf 1 on 13/06/17
Untreated	35
Standard Programme	23.3
T1 alone	23.3
T2 alone	31.7
Stretch sequence	20.7
Stretch sequence T1	45
Stretch sequence T2	21.7
Aut T0 + Standard	21.7
Spr T0 + Standard	26.7
Standard + T3	6.3
LSD	20.29
CV%	46.34

#### Multi-year Results

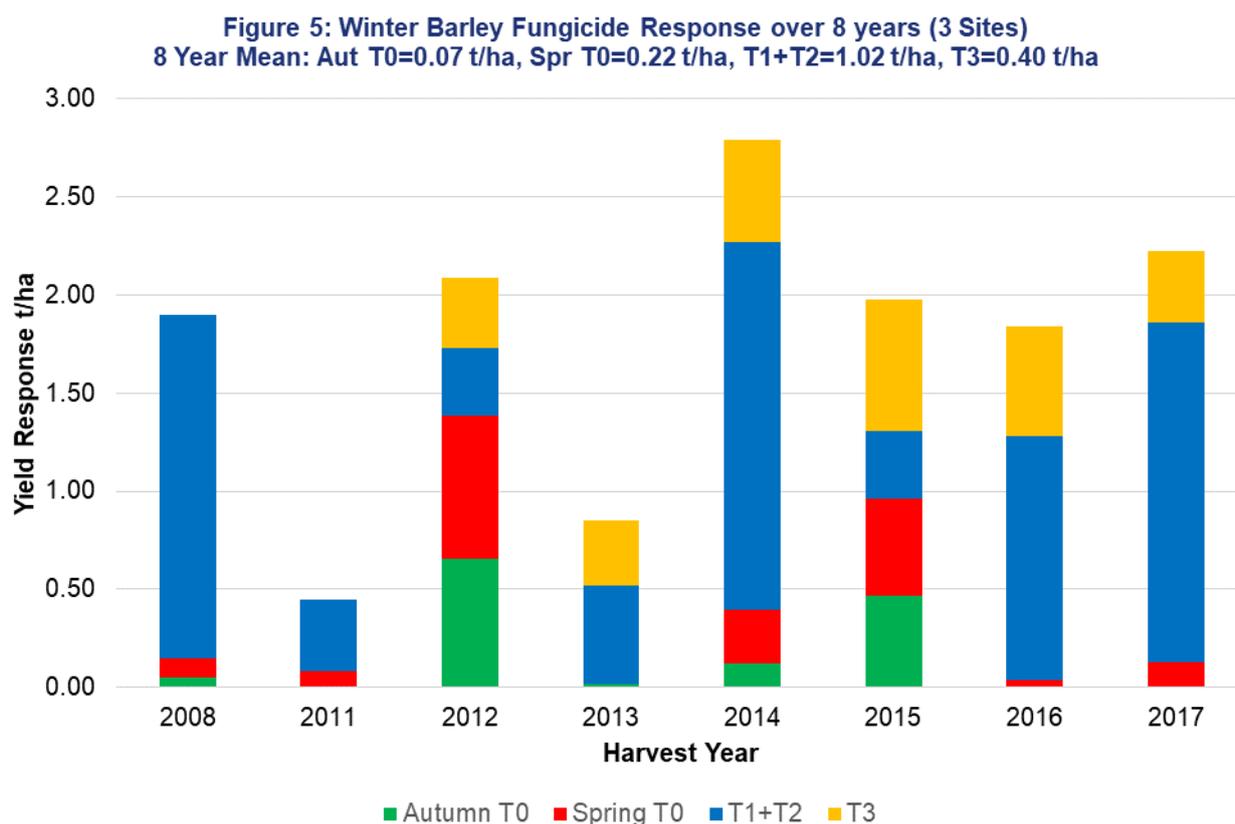
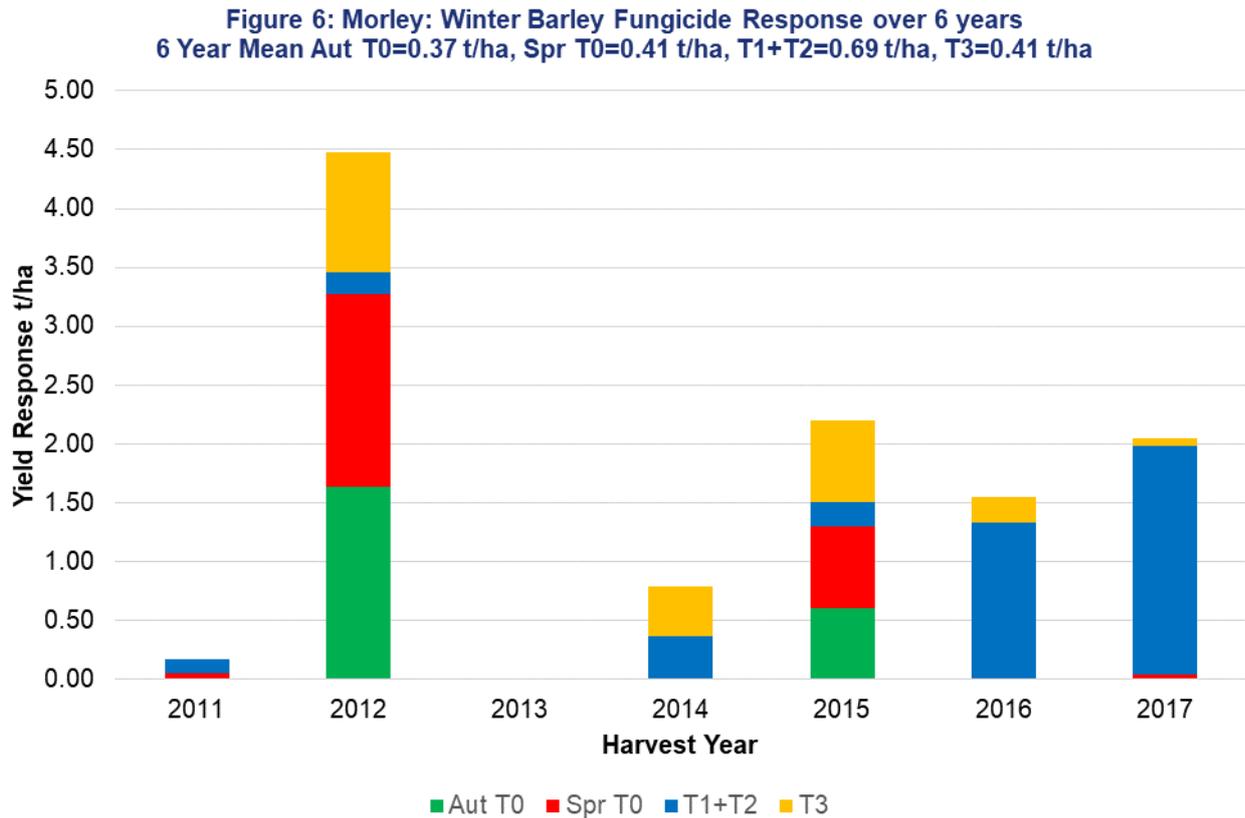


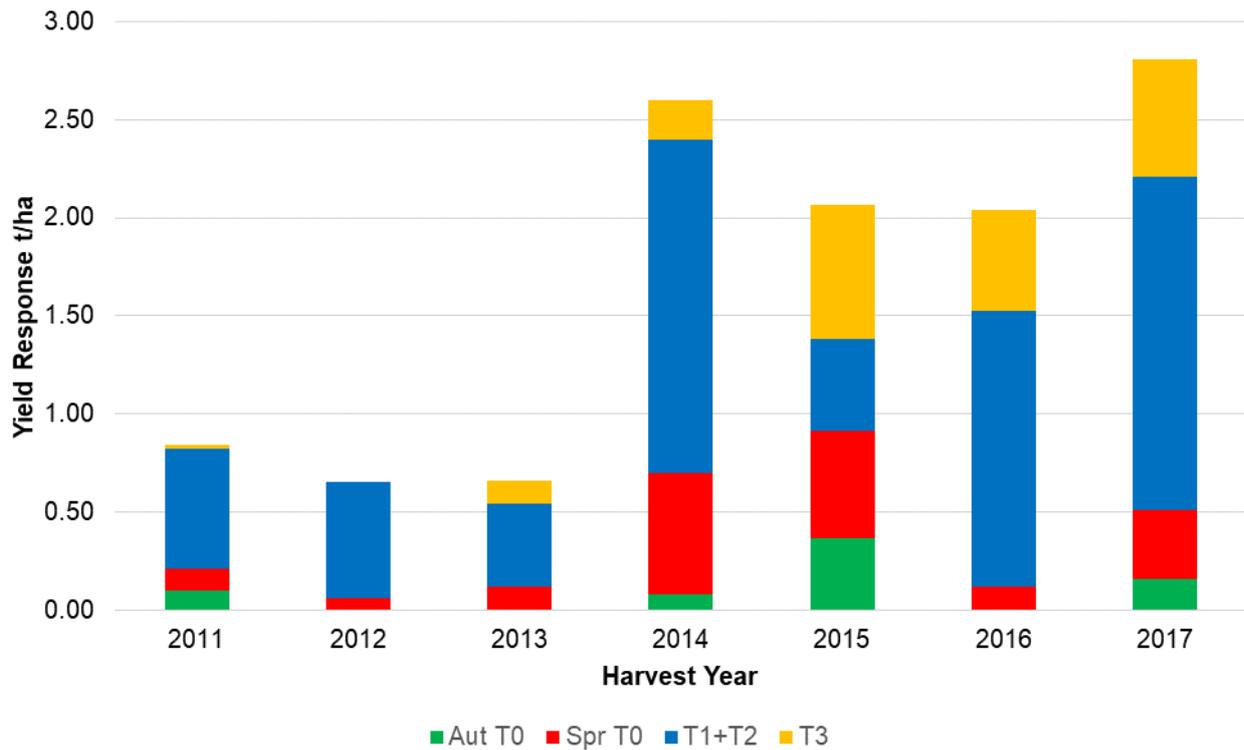
Figure 5 shows the available mean results for 8 years across all three sites at Morley, Sutton Scotney and Caythorpe. The data for 2011 and 2013 covers only two sites as the trial did not run in Caythorpe in 2011 and Morley in 2013. In addition, data for 2008 is only available as multi-site means and no individual site data is shown.

Across these 3 sites there has been a yield response from an autumn fungicide in 3 of 8 years, particularly in the wet autumn of 2012. However, this mean data in 2012 is largely a result of a large autumn response at one site, Morley (Figure 6) and the mean multi-site and year figure is only 0.07 t/ha

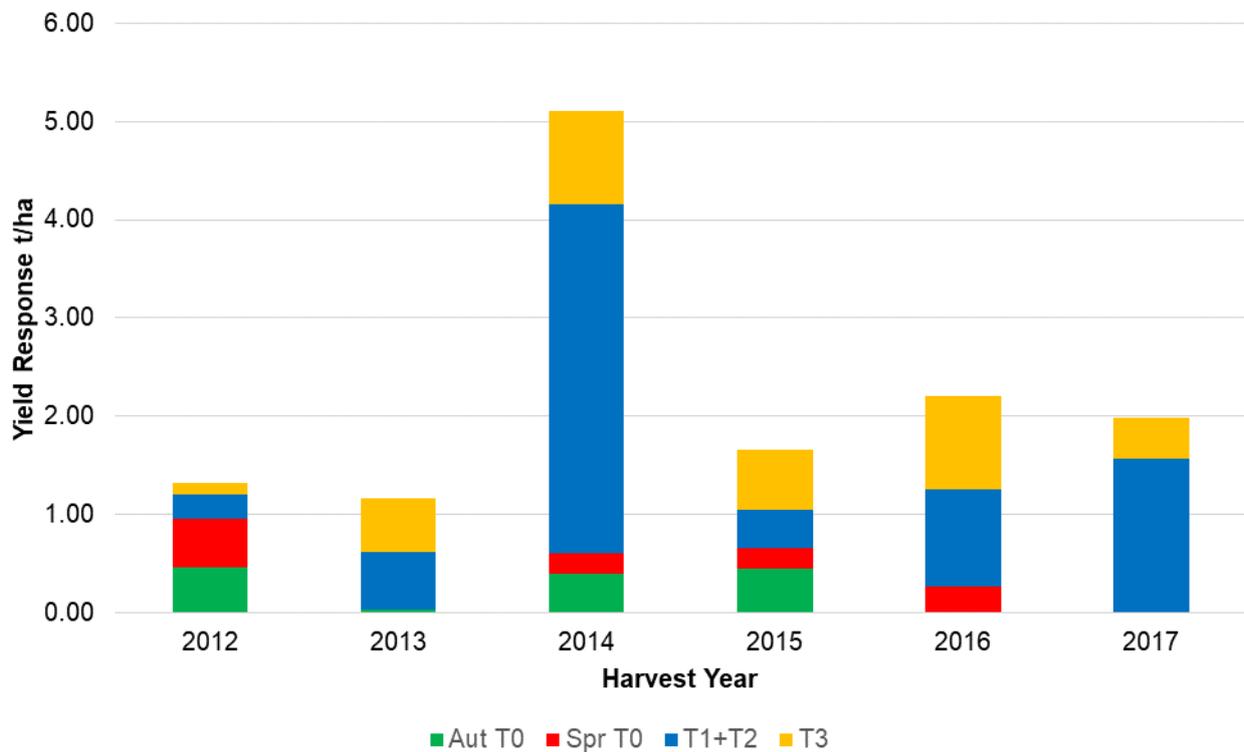
There has also been a response to a spring T0 in most years at most sites. The 8 year, multi-site mean is relatively modest at 0.22 t/ha but the level of this response varies considerable from site to site and year to year and is related to early disease levels in March.



**Figure 7: Sutton Scotney: Winter Barley Fungicide Response over 7 years**  
 7 Year Mean Aut T0=0.10 t/ha, Spr T0=0.28 t/ha, T1+T2=0.99 t/ha, T3=0.30 t/ha



**Figure 8: Caythorpe: Winter Barley Fungicide Response over 6 years**  
 6 Year Mean Aut T0=0.22 t/ha, Spr T0=0.20 t/ha, T1+T2=1.22 t/ha, T3=0.60 t/ha



The response to T1+ T2 sprays also varies from year to year (figure 5) and at each site (figure 6,7,and 8) and in most years this is the largest response and these sprays form the core of winter barley programs giving a mean response of 1.02 t/ha.

The T3 response tends to exceed the T0 response with a mean of 0.40 t/ha but again it is variable. However, all sites have seen a positive T3 response in each of the last 5 tested years. This may be a response to the increasing incidence of ramularia which tends to develop later in the growing season.

Overall, the average response to a full fungicide program is 1.71 t/ha but this response is highly variable depending on the level and timing of disease pressure. In most years an autumn T0 is unlikely to give a financial return and a spring T0 should only be considered

if disease levels are high in March. The T1,T2 as well as the T3 spray are likely to give an economic response and represent a lower risk strategy.

## Appendix

Field details:

Trial Code	WB17-510BE	WB17-510MR	WB17-510SS
Trial Centre	Benniworth	Morley	Sutton Scotney
Trial Location	Caythorpe	Morley	Sutton Scotney
Crop	Winter Barley	Winter Barley	Winter Barley
Previous Crop	Winter Wheat	Winter Wheat	Winter Beans
Soil Type	Clay Loam	Sandy Clay Loam	Sandy Silt Loam
Soil Analysis	pH 7.8, OM 2.7%, 29 mgP/l, 218 mgK/l, 58 mgMg/l	pH 8.0, 11 mgP/l, 96 mgK/l, 38 mgMg/l	pH 7.8, 38 mgP/l, 294 mgK/l, 38 mgMg/l
Soil Mineral Nitrogen	Not available	0-30cm 11 kgN/ha, 30-60 cm 19 kgN/ha	10 kgN/ha
Total N/ha Applied	190 kgN/ha	140 kgN/ha	150 kgN/ha
Drill Date	30/09/16	06/10/16	03/10/16
Seed Rate	350 seeds/m <sup>2</sup>	300 seeds/m <sup>2</sup>	300 seeds/m <sup>2</sup>
Drilled Plot Size	2m x 12m	2m x 12m	2m x 12m
Replicates	3	3	3
Harvest Date	13/07/17	17/07/17	06/07/17

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