

III Control strategies in different cultivars

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Different strategies tested in 6 wheat cultivars

Eight different control strategies were compared in 6 different wheat cultivars. The three first cultivars were ranked as susceptible (Benchmark, Torp, Hereford), while the last three were regarded as resistant (Informer, Sheriff, Creator). The two mixtures included either susceptible or resistant cultivars. One of the treatments included the use of the decision support system Crop Protection Online (CPO) to evaluate the need for treatments. Comparisons with typical reference treatments using one, two or three treatments were made in the trials. The trials this year were located at two sites – one at AU Flakkebjerg in Zealand and one near Horsens at LMO, Jutland.

The following strategies were tested:

1. Untreated
2. 1.25 l/ha Viverda + 1.0 l/ha Ultimate S (GS 45-51) (TFI=1.3)
3. 0.6 l/ha Viverda + 0.6 l/ha Ultimate S / 0.3 l/ha Bell + 0.15 l/ha Proline EC 250 (GS 37-39 & 55-61) (TFI=1.25)
4. 0.35 l/ha Prosaro EC 250 / 0.6 l/ha Viverda + 0.6 l/ha Ultimate S / 0.3 l/ha Bell + 0.15 l/ha Proline EC 250 (GS 32/37-39 & 55-61) (TFI=1.65)
5. 0.35 l/ha Prosaro EC 250 / 1.25 l/ha Viverda + 1.0 l/ha Ultimate S / 0.6 l/ha Bell + 0.3 l/ha Proline EC 250 (GS 32/37-39 & 55-61) (TFI=3.0)
6. Crop Protection Online (CPO) (Table 1)

The trials developed significant attacks of *Septoria* but also yellow rust was particularly pronounced in Benchmark. There was a clear benefit from all fungicide treatments (Table 2). The efficacy was slightly better from the highest input; this was particularly clear in the two most susceptible cultivars, Benchmark and Hereford. When it came to yield and net yields, most treatments provided a similar output. It was, however, seen that the yield responses reflected the level of diseases in the individual cultivars. The inputs following CPO varied a lot between the included cultivars. The fungicide input was higher at Flakkebjerg compared with the LMO trial, where the most susceptible cultivars were treated 3 times. The level of *Septoria* attack in the untreated plots of the 6 cultivars is shown in Figure 1 and the level of yield in Figure 2.

Table 1. Treatments applied following recommendations from Crop Protection Online. Flakkebjerg (19350-1) and Horsens (19350-2).

Cultivars (19350-1)	Date	Products, l/ha	TFI	Costs, hkg/ha
Susceptible mixture (Mixture S)	10-05-2019	Prosaro EC 250 0.45	0.51	1.92
	27-05-2019	Propulse SE 250 + Orius 200 EW 0.5 + 0.5	0.39	3.05
	13-06-2019	Prosaro EC 250 0.44	0.5	1.89
Resistant mixture (Mixture R)	27-05-2019	Propulse SE 250 + Orius 200 EW 0.4 + 0.2	0.64	2.26
Benchmark	10-05-2019	Prosaro EC 250 0.45	0.51	1.92
	23-05-2019	Propulse SE 250 + Comet Pro 0.4 + 0.2	0.61	2.57
	27-05-2019	Propulse SE 250 + Orius 200 EW 0.5 + 0.5	0.39	3.05
	13-06-2019	Prosaro EC 250 0.44	0.5	1.89
Torp	10-05-2019	Prosaro EC 250 0.45	0.51	1.92
	27-05-2019	Propulse SE 250 + Orius 200 EW 0.5 + 0.5	0.39	3.05
	13-06-2019	Prosaro EC 250 0.44	0.5	1.89
Hereford	10-05-2019	Prosaro EC 250 0.45	0.51	1.92
	27-05-2019	Propulse SE 250 + Orius 200 EW 0.5 + 0.5	0.39	3.05
	13-06-2019	Prosaro EC 250 0.44	0.5	1.89
Sheriff	23-05-2019	Propulse SE 250 + Comet Pro 0.4 + 0.2	0.61	2.57
	13-06-2019	Prosaro EC 250 0.34	0.39	1.6
Informer	27-05-2019	Propulse SE 250 + Orius 200 EW 0.4 + 0.2	0.48	2.26
Creator	27-05-2019	Propulse SE 250 + Orius 200 EW 0.4 + 0.2	0.64	2.26

Cultivars (19350-2)	Date	Products, l/ha	TFI	Costs, hkg/ha
Susceptible mixture (Mixture S)	29-05-2019	Propulse SE 250 + Orius 200 EW 0.5 + 0.2	0.72	2.6
Resistant mixture (Mixture R)	29-05-2019	Propulse SE 250 + Orius 200 EW 0.4 + 0.2	0.64	2.3
Benchmark	29-05-2019	Propulse SE 250 + Orius 200 EW 0.5 + 0.2	0.72	2.6
Torp	29-05-2019	Propulse SE 250 + Orius 200 EW 0.5 + 0.2	0.72	2.6
Hereford	29-05-2019	Propulse SE 250 + Orius 200 EW 0.5 + 0.2	0.72	2.6
Sheriff	29-05-2019	Propulse SE 250 + Orius 200 EW 0.4 + 0.2	0.64	2.3
Informer	29-05-2019	Propulse SE 250 + Orius 200 EW 0.4 + 0.2	0.64	2.3
Creator	29-05-2019	Propulse SE 250 + Orius 200 EW 0.4 + 0.2	0.64	2.3

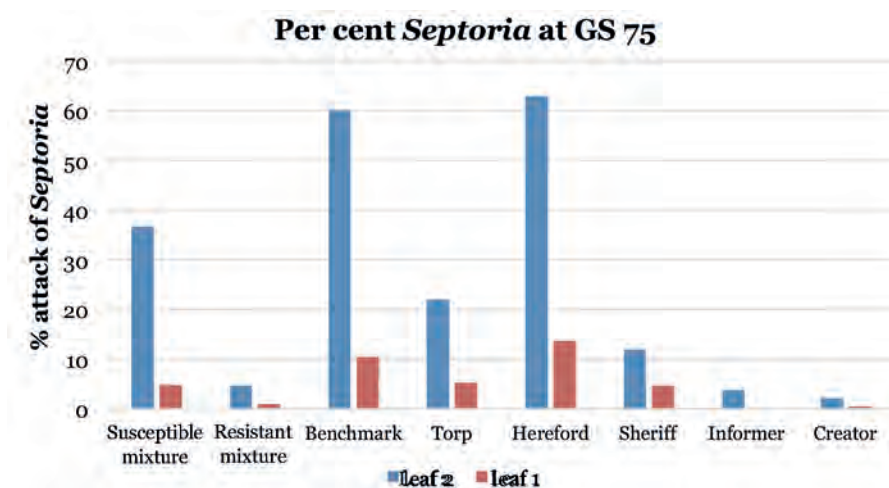


Figure 1. Data from untreated plots in the cultivar trials at both Flakkebjerg (19350-1) and LMO (19350-2), which show a variation in susceptibility to *Septoria* and overall lower level of attack in mixtures compared with single cultivars.

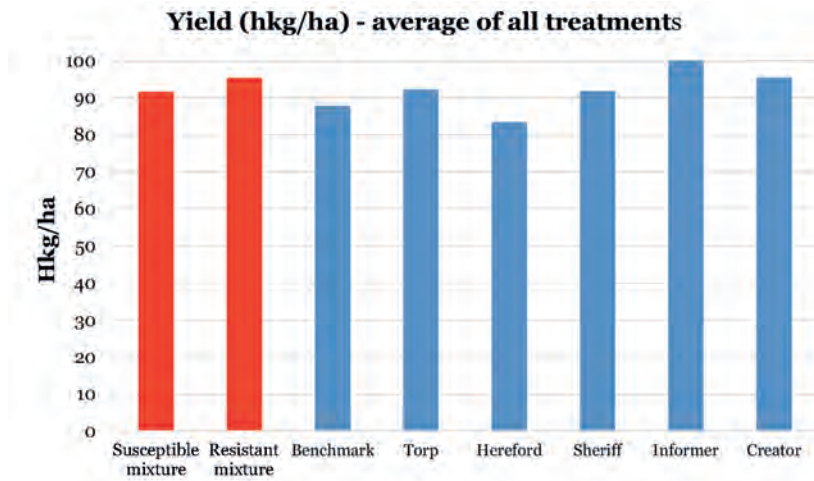


Figure 2. Data from cultivar trials at both Flakkebjerg (19350-1) and Horsens (19350-2), which show the overall yield level across treatments. Yields in mixtures were in susceptible cultivars better than the average of the individual cultivars. In resistant cultivars, the yield was similar or slightly inferior to the best of the component cultivars.



Drone photo from trial 19350-1, which included 6 cultivars and 2 cultivar mixtures. Eight different treatments were tested within each cultivar block.

Table 2. Per cent attack of Septoria, yellow rust, green leaf area and yield increases. Average of 2 trials (Flakkebjerg and Horsens) with 6 winter wheat cultivars, using 5 different fungicide treatments (19350). CPO = Crop Protection Online. Treatments with different letters are significantly different.

Cultivars	% Septoria, leaf 1, GS 75				% Septoria, leaf 2, GS 75				CPO		
	Untr.	1.25 Viverda + 1.0 Ultimate S	0.6 Viverda + 0.6 Ultimate S/ 0.3 Bell + 0.15 Proline	0.35 Prosaros / 0.6 Viverda + 0.6 Ultimate S/ 0.3 Bell + 0.15 Proline	0.35 Prosaros / 1.25 Viverda + 1.0 Ultimate S/ 0.6 Bell + 0.3 Proline	Untr.	1.25 Viverda + 1.0 Ultimate S	0.6 Viverda + 0.6 Ultimate S/ 0.3 Bell + 0.15 Proline		0.35 Prosaros / 0.6 Viverda + 0.6 Ultimate S/ 0.3 Bell + 0.15 Proline	0.35 Prosaros / 1.25 Viverda + 1.0 Ultimate S /0.6 Bell + 0.3 Proline
Mixture S	4.8	2.7	2.4	1.8	1.2	36.7	15.9	18.3	13.9	16.2	9.3
Mixture R	1.0	0.4	0.2	0.6	0.2	4.7	3.2	2.5	2.5	1.5	2.5
Benchmark	10.5	5.2	9.3	5.0	3.0	60.0	46.7	50.0	27.2	21.2	19.8
Torp	5.2	1.7	2.0	1.3	0.6	22.0	14.0	12.5	9.8	7.9	6.5
Hereford	13.7	4.0	5.2	4.0	2.0	63.3	31.7	38.3	29.2	17.3	17.5
Sheriff	4.7	1.3	1.2	1.2	1.2	12.5	7.3	6.5	7.3	4.7	7.0
Informor	0.2	0.1	0	0	0	3.7	3.2	2.4	3.2	1.7	3.0
Creator	0.5	0.2	0.3	0.2	0.1	2.1	1.2	1.8	1.7	1.2	1.4
Average	5.1 a	2.0 b	2.6 b	1.8 b	1.0 c	25.6 a	15.4 b	16.5 b	11.9 b	9.0 cd	8.4 cd
No. of trials	2										

Table 2. Per cent attack of Septoria, yellow rust, green leaf area and yield increases. Average of 2 trials (Flakkebjerg and Horsens) with 6 winter wheat cultivars, using 5 different fungicide treatments (19350). CPO = Crop Protection Online. Treatments with different letters are significantly different. (Continued)

Cultivars (19350-1)	% yellow rust, leaf 1, GS 61				% yellow rust, leaf 1, GS 75						
	Untr.	1.25 Viverda + 1.0 Ultimate S	0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosar / 0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosar / 1.25 Viverda + 1.0 Ultimate S / 0.6 Bell + 0.3 Proline	Untr.	1.25 Viverda + 1.0 Ultimate S	0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosar / 0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosar / 1.25 Viverda + 1.0 Ultimate S / 0.6 Bell + 0.3 Proline	CPO
Mixture S	0.2	0	0	0	0	5.7	0	0	0	0	0
Mixture R	1.0	0	0	0	0.3	1.7	0	0	0	0	0
Benchmark	10.3	3.3	0	0	0	26.7	6.7	5.0	0	0	3.3
Torp	0	0	0	0	0	0	0	0	0	0	0
Hereford	0	0	0	0	0	0	0	0	0	0	0
Sheriff	0	0	0	0	0	0	0	0	0	0	0
Informor	0	0	0	0	0	0	0	0	0	0	0
Creator	0	0	0.3	0.2	0	1.3	0	0	0	0	0
Average	1.3	0.4	0.0	0.0	0	4.4	0.8	0.6	0	0	0.4
No. of trials	1										

Table 2. Per cent attack of Septoria, yellow rust, green leaf area and yield increases. Average of 2 trials (Flakkebjerg and Horsens) with 6 winter wheat cultivars, using 5 different fungicide treatments (19350). CPO = Crop Protection Online. Treatments with different letters are significantly different. (Continued)

Cultivars	% green area, leaf 1, GS 85					TGW, g						
	Untr.	1.25 Viverda + 1.0 Ultimate S	0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosaros / 0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosaros / 1.25 Viverda + 1.0 Ultimate S / 0.6 Bell + 0.3 Proline	CPO	Untr.	1.25 Viverda + 1.0 Ultimate S	0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosaros / 0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosaros / 1.25 Viverda + 1.0 Ultimate S / 0.6 Bell + 0.3 Proline	CPO
Mixture S	0	0	0	3.3	53.3	0	36.8	40.4	39.3	40.2	43.3	41.4
Mixture R	41.7	33.3	23.3	17.3	31.7	31.7	40.0	41.6	42.9	42.8	44.7	41.7
Benchmark	0	0	25.0	3.3	3.3	0	33.2	36.2	37.5	38.9	41.6	40.6
Torp	5.0	25.0	3.3	15.0	16.7	16.7	36.2	38.7	39.6	39.3	40.3	40.3
Hereford	0	3.3	0	0	10.0	6.7	36.4	40.1	39.5	40.1	41.8	41.6
Sheriff	25.0	21.7	16.7	20.0	56.7	38.3	36.6	39.0	40.2	40.3	41.6	38.4
Informor	46.7	53.3	56.7	56.7	76.7	46.7	47.3	51.5	50.7	52.4	51.4	49.4
Creator	30.0	55.0	43.3	43.3	26.7	8.3	44.3	45.3	44.0	45.8	47.6	44.4
LSD ₉₅	3.3											
Average	18.6 a	24.0 b	21.0 b	19.9 b	34.4 c	18.6 b	38.9 a	41.6 b	41.7 b	42.5 b	44.0 c	42.2 b
No. of trials	1					2						

Table 2. Per cent attack of Septoria, yellow rust, green leaf area and yield increases. Average of 2 trials (Flakkebjerg and Horsens) with 6 winter wheat cultivars, using 5 different fungicide treatments (19350). CPO = Crop Protection Online. Treatments with different letters are significantly different. (Continued)

Cultivars	Yield and increase, hkg/ha					Net increase, hkg/ha					
	Untr.	1.25 Viverda + 1.0 Ultimate S	0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosaros / 0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosaros / 1.25 Viverda + 1.0 Ultimate S / 0.6 Bell + 0.3 Proline	CPO	1.25 Viverda + 1.0 Ultimate S	0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosaros / 0.6 Viverda + 0.6 Ultimate S / 0.3 Bell + 0.15 Proline	0.35 Prosaros / 1.25 Viverda + 1.0 Ultimate S / 0.6 Bell + 0.3 Proline	CPO
Mixture S	76.9	12.4	13.5	11.2	18.9	17.7	6.8	8.1	4.1	7.5	13.0
Mixture R	84.6	9.2	11.1	10.6	13.5	9.4	3.7	5.7	3.5	2.1	7.1
Benchmark	60.7	16.5	17.6	26.7	31.2	29.8	10.9	12.2	19.6	19.8	23.8
Torp	77.3	12.8	12.9	12.8	18.6	18.1	7.2	7.5	5.7	7.1	13.4
Hereford	67.6	14.4	10.7	15.1	19.8	21.1	8.8	5.3	8.0	8.4	16.4
Sheriff	82.5	8.2	9.3	8.9	13.5	6.7	2.6	3.9	1.8	2.1	3.5
Informer	92.7	6.5	7.5	8.5	11.6	3.7	0.9	2.1	1.4	0.2	1.4
Creator	86.3	9.5	9.4	6.6	13.4	5.6	4.0	4.0	-0.5	2.0	3.3
LSD ₉₅	6.8										
Average	78.6 a	11.2 b	11.5 b	12.6 b	17.6 c	14.0 c	5.6	6.1	5.5	6.2	10.2
No. of trials	2										

Untr. = Untreated: 1.25 l/ha Viverda + 0.1 l/ha Ultimate S, GS 45-51 (costs = 5.6 hkg/ha); 0.6 l/ha Viverda + 0.6 l/ha Ultimate S, GS 37-39 / 0.3 l/ha Bell + 0.15 l/ha Proline EC 250, GS 55-61 (costs = 5.4 hkg/ha); 0.35 l/ha Prosaros EC 250, GS 32 / 0.6 l/ha Viverda + 0.6 l/ha Ultimate S, GS 37-39 / 0.3 l/ha Bell + 0.15 l/ha Proline EC 250, GS 55-61 (costs = 7.1 hkg/ha); 0.35 l/ha Prosaros EC 250, GS 32 / 1.25 l/ha Viverda + 1.0 l/ha Ultimate S, GS 37-39 / 0.6 l/ha Bell + 0.3 l/ha Proline EC 250, GS 55-61 (costs = 11.4 hkg/ha), CPO = Crop Protection Online.

Summary of results from 12 seasons validating Crop Protection Online

The trials validating the recommendations from CPO have been carried out during many seasons. A summary of data from 2008 to 2019 is shown in Figures 3-4. Each year 1-2 split plot trials were carried out including 6 different cultivars varying from susceptible to less susceptible cultivars. The data include the results from a susceptible and a resistant cultivar in each trial; in total 21 trials and 42 cultivars. The recommendations from CPO were compared with a one-, two- or three-spray strategy. Examples of strategies are shown below.

Strategy 1: One treatment using 33-75% standard rates (GS 39-45)

Strategy 2: Two treatments using 2 x 50% standard rates (GS 37-39 & 59-61)

Strategy 3: Three treatments using 3 x 50% standard rates (first treatment often mildew active) (GS 31-32, 37-39 & 59-61)

CPO input based on weekly assessments varies from 1-3 treatments with 35-50% standard rate depending on cultivar and year.

The following overall conclusions from the testing can be highlighted.

- The control of *Septoria* from all strategies was significant. A one-spray strategy was similar to a split strategy and a three-spray strategy slightly superior assessed on the 2nd leaf. CPO gave comparable control to fixed strategies although a bit more variable.
- Gross yield from strategies was very similar, although a more detailed analysis showed differences when cultivar susceptibility was included. As an average of the whole data set the one-spray strategy gave 8.1 hkg/ha, the two-spray strategy 9.3 hkg/ha, the three-spray strategy 10 hkg/ha and CPO 9.1 hkg/ha. Net yields were correspondingly 3.8, 3.8, 4.0 and 4.8 hkg/ha, respectively.
- When it comes to measuring the fungicide input from the different strategies, the input from CPO was in general lower and more variable, going from 0 to 2.9 TFI. The average input from the different strategies was 1.02, 1.39, 1.60 and 0.87 TFI, respectively, from the four strategies.
- Across the different seasons and cultivars CPO provided a comparable net yield, using 37% less fungicide compared with a two-spray strategy.



Septoria was the dominant disease in the trials testing Crop Protection Online during 12 seasons. The resistance level in the cultivars has a major impact on the cultivars' need for fungicide input. To the left a photo of a resistant cultivar and to the right a photo of a susceptible cultivar at GS 75.

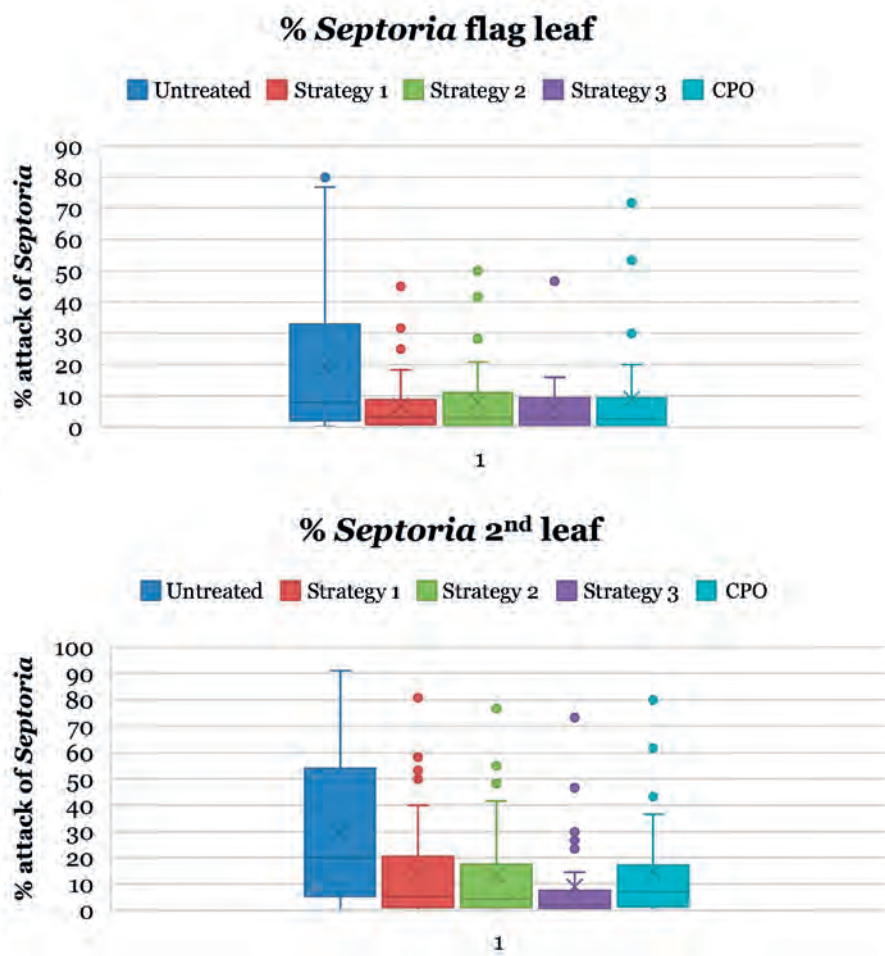


Figure 3. Data from 21 trials with 2 cultivars comparing 3 different strategies with CPO recommendations. Data show control of *Septoria* on the flag leaf and the 2nd leaf. Vertical lines indicate the median and “X” the mean.

Diseases in winter wheat	Examples of thresholds in CPO
Eyespot	>35% plants attacked at GS 30-32
Mildew	>10% plants attacked from GS 29 (Susceptible) >25% plants attacked from GS 29 (Resistant) After GS 40 no recommendations
<i>Septoria</i>	4 days with precipitation from GS 32 (S) 5 days with precipitation from GS 37 (R) Or attack on third leaf from GS 45-60
Brown rust	>25% plants attacked in susceptible cultivars
Yellow rust	GS 29-60 1% plants attacked in susceptible cultivars

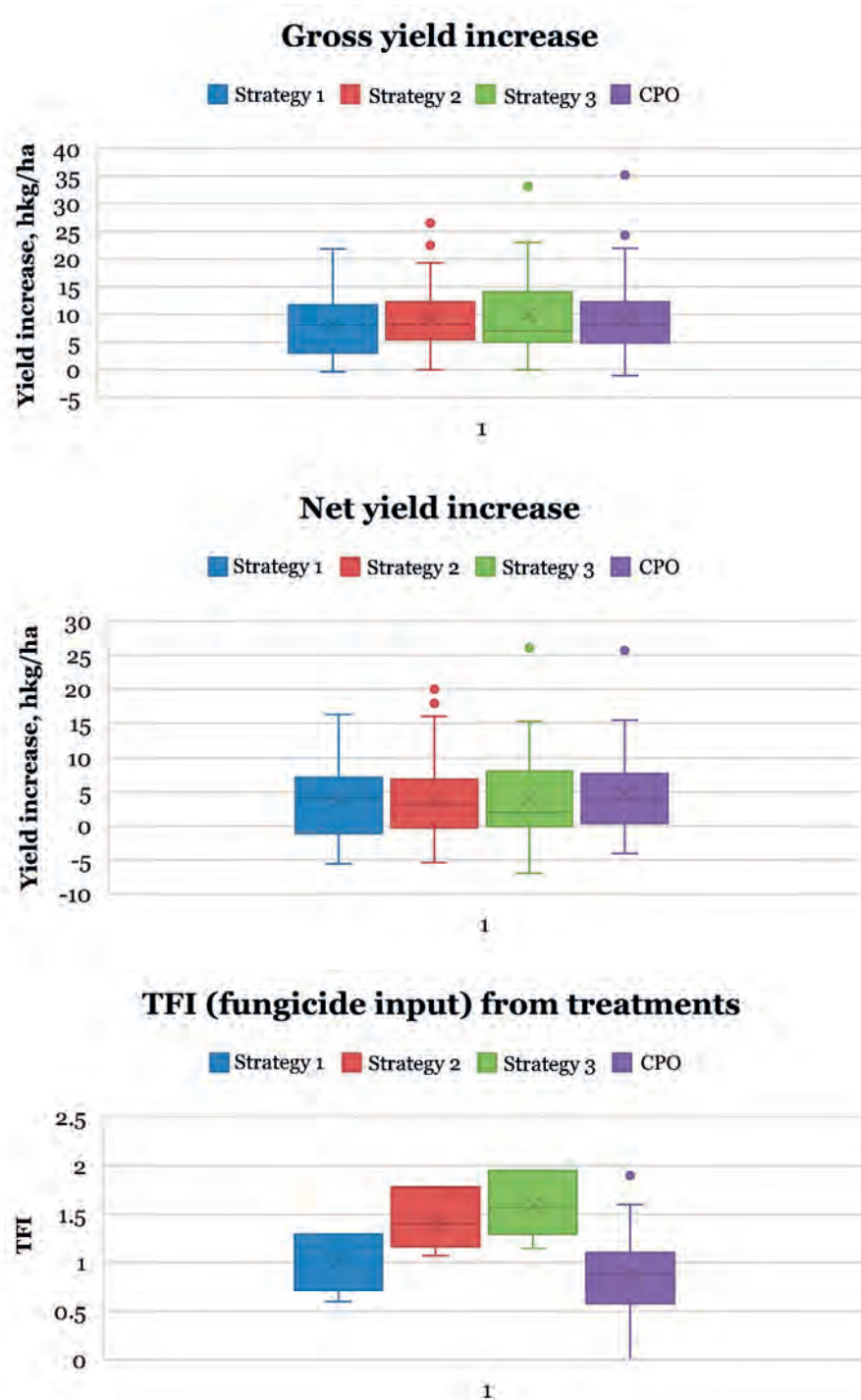


Figure 4. Data from 21 trials with 2 cultivars comparing 3 different strategies with CPO recommendations. Data show gross yield, net yield from treatments and the input of fungicides (TFI) from the different control strategies. Vertical lines indicate the median and “X” the mean.

Control strategies in different winter barley cultivars

Five different control strategies including a control and recommendations from Crop Protection Online were tested in four winter barley cultivars. One trial was located at Flakkebjerg and one at LMO near Horsens. The treatments given below were tested in the two trials (Table 3). Table 4 shows the results from the testing.

1. Untreated
2. 0.35 l/ha Prosaro EC 250 / 0.4 l/ha Balaya + 0.2 l/ha Entargo (GS 32 + GS 51) (TFI=1.11)
3. 0.5 l/ha Balaya + 0.25 l/ha Entargo (GS 37-39) (TFI=1.03)
4. 0.35 l/ha Prosaro EC 250 / 0.5 l/ha Propulse SE 250 + 0.3 l/ha Comet Pro (GS 32 + GS 51) (TFI= 1.21)
5. Crop Protection Online

The overall disease control of brown rust and net blotch from the different control strategies was satisfactory, including the CPO treatments, which performed slightly better for control of brown rust compared with other fixed strategies. The yield responses from treatments were relatively similar (8.8-10.6 hkg/ha), and overall the strategies provided very comparable gross and net yields (Figure 5).

Table 3. Treatments applied following recommendations from Crop Protection Online. Flakkebjerg (19351-1) and Horsens (19351-2).

Cultivars (19351-1)	Date	Products	TFI	Costs, hkg/ha
Frigg	25-04-2019 23-05-2019	Comet Pro + Propulse SE 250 0.21 + 0.26 Bell 0.5	0.17 + 0.29 0.6	4.9
Memento	25-04-2019	Comet Pro + Propulse SE 250 0.21 + 0.26	0.17 + 0.29	2.2
Celtic	25-04-2019 15-05-2019	Comet Pro + Propulse SE 250 0.21 + 0.26 Comet Pro + Propulse SE 250 0.28 + 0.34	0.17 + 0.29 0.23 + 0.38	4.9
Matros	25-04-2019	Comet Pro + Propulse SE 250 0.21 + 0.26	0.17 + 0.29	2.2

Cultivars (19351-2)	Date	Products	TFI	Costs, hkg/ha
Frigg	05-05-2019 15-05-2019	Comet Pro + Propulse SE 250 0.25 + 0.3 Comet Pro + Propulse SE 250 0.2 + 0.25	0.2 + 0.34 0.16 + 0.28	4.6
Memento	05-05-2019 15-05-2019	Comet Pro + Propulse SE 250 0.25 + 0.3 Comet Pro + Propulse SE 250 0.2 + 0.25	0.2 + 0.34 0.16 + 0.28	4.6
Celtic	05-05-2019 15-05-2019	Comet Pro + Propulse SE 250 0.25 + 0.3 Comet Pro + Propulse SE 250 0.2 + 0.25	0.2 + 0.34 0.16 + 0.28	4.6
Matros	05-05-2019 15-05-2019	Comet Pro + Propulse SE 250 0.25 + 0.3 Comet Pro + Propulse SE 250 0.2 + 0.25	0.2 + 0.34 0.16 + 0.28	4.6

Table 4. Control of diseases in winter barley and yield increases from 2 trials in 4 winter barley cultivars using 4 different strategies (19351). Treatments with different letters are significantly different.

Cultivars	% brown rust, leaf 1, GS 69					% brown rust, leaf 2, GS 69/71				
	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO
Frigg	2.4	0.7	0.4	0.4	0.1	10.5	5.4	2.8	1.3	0.9
Memento	2.0	1.3	2.2	1.2	0.9	9.9	2.2	3.2	4.3	4.0
Celtic	11.7	6.7	1.5	6.3	0.7	26.7	8.5	6.7	9.7	5.0
Matros	1.5	1.3	0.2	0.8	0.2	11.7	1.9	1.7	1.8	1.7
Average	4.4	2.5	1.1	2.2	0.5	14.7	4.5	3.6	4.3	2.9
No. of trials	1					2				

Cultivars	% net blotch, leaf 2-3, GS 71					% green leaf area, leaf 2, GS 75				
	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO
Frigg	1.8	7.9	0.5	0.2	0.2	3.0	42.0	30.0	50.0	43.0
Memento	3.2	1.2	1.0	1.9	0.7	0.0	38.0	27.0	30.0	20.0
Celtic	10.7	4.7	2.0	3.0	1.7	0.0	28.0	22.0	30.0	50.0
Matros	5.0	1.2	1.3	0.8	0.8	0.0	47.0	42.0	53.0	0.0
Average	5.2	3.8	1.2	1.5	0.9	0.8	38.8	30.3	40.8	28.3
No. of trials	1					1				

Cultivars	Yield and yield increase, hkg/ha					Net increase, hkg/ha				
	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	
Frigg	70.8	15.8	5.9	8.2	8.8	10.6	1.6	3.2	4.0	
Memento	74.6	3.8	5.4	6.9	6.0	-1.4	1.1	1.9	2.6	
Celtic	58.0	11.8	14.3	14.2	17.8	6.6	10.0	9.2	13.0	
Matros	66.8	8.6	9.4	11.7	9.6	3.4	5.1	6.7	6.2	
LSD ₉₅	4.6 (2 trials)									
Average	67.6 a	10.0 b	8.8 b	10.3 b	10.6 b	4.8	4.5	5.3	6.5	

Untr. = Untreated; 0.35 l/ha Prosaro EC 250, GS 32 / 0.4 l/ha Balaya + 0.2 l/ha Entargo, GS 51 (costs = 5.2 hkg/ha); 0.5 l/ha Balaya + 0.25 l/ha Entargo, GS 37-39 (costs = 4.3 hkg/ha); 0.35 l/ha Prosaro EC 250, GS 32 / 0.5 l/ha Propulse SE 250 + 0.3 l/ha Comet Pro, GS 51 (costs = 4.8 hkg/ha); CPO = Crop Protection Online.

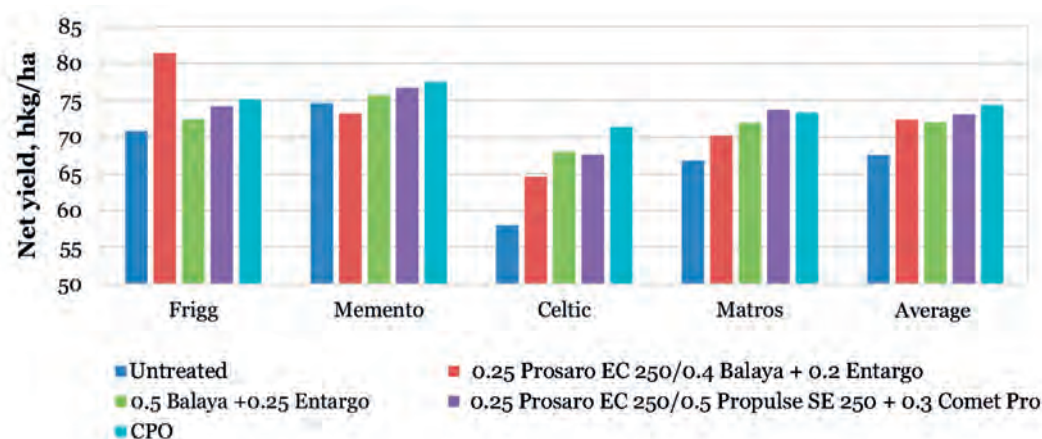


Figure 5. Net yield from different control strategies in 4 winter barley cultivars. Average of 2 trials (19351).

Control strategies in different spring barley cultivars

Five different control strategies including control and Crop Protection Online (CPO) were tested in four spring barley cultivars. One trial was located at Flakkebjerg and one at LMO near Horsens. The treatments given below were tested in the two trials. Table 5 shows the input recommended by CPO, and Table 6 shows a summary of the two trials.

1. Untreated
2. 0.35 l/ha Prosaro EC 250 / 0.4 l/ha Balaya + 0.2 l/ha Entargo (GS 31 + GS 51) (TFI=1.11)
3. 0.5 l/ha Balaya + 0.25 l/ha Entargo (GS 37-49) (TFI=1.03)
4. 0.35 l/ha Prosaro EC 250 / 0.5 l/ha Propulse SE 250 + 0.3 l/ha Comet Pro (GS 31 + GS 51) (TFI=1.21)
5. Crop Protection Online (CPO)

The overall disease control from the different control strategies was satisfactory including the CPO treatments. However, the performance of the CPO treatments was slightly inferior to strategies 2 and 4 for control of brown rust. The yield responses from the treatments were relatively similar but the two-spray strategies were better than the one-spray strategy as a result of the severe attack of brown rust. A look at the specific data from the Horsens trial (19352-2) indicates that two sprays should have been applied at this locality also.

Table 5. Treatments applied following recommendations from Crop Protection Online. Flakkebjerg (19352-1) and Horsens (19352-2).

Cultivars (19352-1)	Date	Products, l/ha	TFI	Costs, hkg/ha
Crossway	07-06-2019	Propulse SE 250 + Comet Pro 0.34 + 0.28 Propulse SE 250 + Comet Pro 0.3 + 0.3	1.16	5.36
Laurikka	07-06-2019	Propulse SE 250 + Comet Pro 0.34 + 0.28 Propulse SE 250 + Comet Pro 0.3 + 0.3	1.16	5.36
Evergreen	07-06-2019	Propulse SE 250 + Comet Pro 0.22 + 0.2 Propulse SE 250 + Comet Pro 0.3 + 0.3	0.96	4.68
KWS Irina	07-06-2019	Propulse SE 250 + Comet Pro 0.34 + 0.28 Propulse SE 250 + Comet Pro 0.3 + 0.3	1.16	5.36

Cultivars (19352-2)	Date	Products, l/ha	TFI	Costs, hkg/ha
Crossway	24-06-2019	Propulse SE 250 + Comet Pro 0.3 + 0.3	0.47	2.64
Laurikka	24-06-2019	Propulse SE 250 + Comet Pro 0.3 + 0.3	0.47	2.64
Evergreen	24-06-2019	Propulse SE 250 + Comet Pro 0.3 + 0.3	0.47	2.64
KWS Irina	24-06-2019	Propulse SE 250 + Comet Pro 0.3 + 0.3	0.47	2.64

Table 6. Control of diseases in spring barley and yield increases from 2 trials in 4 different spring barley cultivars using 5 different strategies. Untr. = Untreated. CPO = Crop Protection Online (Flakkebjerg (19352-1) and Horsens (19352-2)). Treatments with different letters are significantly different.

Cultivars	% brown rust, leaf 2, GS 69/61					% brown rust, leaf 2, GS 73				
	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO
Crossway	76.7	4.9	9.0	2.8	13.0	33.3	23.3	15.0	14.0	12.7
Laurikka	50.0	1.8	12.2	1.5	11.4	31.7	18.3	23.3	23.3	28.3
Evergreen	42.5	1.4	7.9	0.8	4.4	40.0	23.3	30.0	28.3	8.3
KWS Irina	48.3	9.2	19.2	4.5	17.5	21.7	23.3	25.0	26.7	36.7
LSD ₉₅	-					15.8				
Average	54.4	4.3 a	12.1 b	2.4 a	11.6 b	31.7	22.1	23.3	23.1	21.5
No. of trials	2					1				
Cultivars	% net blotch, leaf 2, GS 73					% <i>Ramularia</i> , leaf 2/4, GS 73/61				
	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO
Crossway	8.3	5.0	4.0	2.7	2.7	27.5	28.7	18.4	12.4	10.8
Laurikka	7.0	5.0	5.0	4.0	6.7	23.3	10.0	11.7	11.7	15.3
Evergreen	8.3	3.0	4.0	5.7	3.0	24.2	11.7	20.9	14.2	8.4
KWS Irina	5.7	5.0	4.0	6.7	8.3	15.9	11.8	18.4	13.5	23.0
LSD ₉₅	4.7					-				
Average	7.3 a	4.5 b	4.3 b	4.8 b	5.2 b	22.7 a	15.6 b	17.4 b	13.0 b	14.4 b
No. of trials	1					2				
Cultivars	GLA %, leaf 1, GS 73/77					TGW, g/1000				
	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO
Crossway	28.5	58.4	53.3	56.7	52.5	44.5	50.3	46.3	49.5	48.6
Laurikka	37.5	50.0	46.7	38.3	32.5	39.5	42.9	41.5	45.3	42.7
Evergreen	21.9	55.0	36.7	50.0	56.7	46.1	47.3	47.5	48.4	49.1
KWS Irina	41.7	54.2	49.2	29.2	26.2	43.2	47.4	45.3	50.0	47.7
LSD ₉₅	15.5					2.7				
Average	32.4 a	54.4 b	46.5 b	43.5 ab	42.0 ab	43.3a	47.0 b	45.2 ab	48.3 b	47.0 b
No. of trials	1					2				
Cultivars	Yield and yield increase, hkg/ha					Net increase, hkg/ha				
	Untr.	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	0.35 Prosaro / 0.4 Balaya + 0.2 Entargo	0.5 Balaya + 0.25 Entargo	0.35 Prosaro / 0.5 Propulse + 0.3 Comet Pro	CPO	
Crossway	50.8	13.8	9.2	14.2	7.1	8.1	4.9	9.2	3.1	
Laurikka	43.7	23.7	18.2	23.9	18.7	18.0	13.9	18.9	14.7	
Evergreen	50.2	14.5	11.6	12.30	14.9	8.8	7.3	7.3	11.2	
KWS Irina	45.6	14.4	7.6	18.1	10.8	8.7	3.3	13.1	6.8	
LSD ₉₅	6.9					-				
Average	47.6 a	16.6 b	11.7 c	17.1 b	12.9 c	11.4	7.4	12.1	8.9	
No. of trials	2					2				

0.35 l/ha Prosaro EC 250, GS 31 / 0.4 l/ha Balaya + 0.2 l/ha Entargo, GS 51 (costs = 5.2 hkg/ha); 0.5 l/ha Balaya + 0.25 l/ha Entargo, GS 37-49 (costs = 4.3 hkg/ha); 0.35 l/ha Prosaro EC 250, GS 31 / 0.5 l/ha Propulse SE 250 + 0.3 l/ha Comet Pro, GS 51 (costs = 4.8 hkg/ha); CPO = Crop Protection Online.