Syngenta UK & Adama Agricultural Solutions UK




A review: the role of folpet in ADAS trials 2019-2021

A review of trials commissioned by Syngenta UK and Adama Agricultural Solutions UK

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ADAS

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1 INTRODUCTION

Folpet is a fungicide with a multisite mode of action against *Septoria tritici*, one of the key diseases of winter wheat in the UK. This review has been conducted to evaluate the yield contribution of folpet when added to programmes. From 2019 to 2021, in trials commissioned by the clients, Syngenta UK and Adama Agricultural Solutions UK, there were a total of 55 situations where folpet was added to programmes, across 15 trials. This data has been analysed to evaluate the effect of application timing, number of applications and rate of folpet, and the effect of the strength of the base programme.

2 DATA SUMMARY

Across the 55 instances in this analysis, folpet was added at either 1.0 l/ha or 1.5 l/ha to a single application timing (T1 or T2) a total of 20 times. At the T1 timing, six applications were made at 1.0 l/ha and four applications were made at 1.5 l/ha; when applied at T2, all 10 applications were made at 1.0 l/ha.

Additions of folpet to a base programme at both T1 and T2 applications were made in 31 instances, with 18 of these at 1.5 l/ha. Four instances of a three-way split (1.0 l/ha at T0, T1, T2) were present in the analysis.

Table 2. Number of instances where folpet was added to a base programme

	Application timing			
Rate per application (l/ha)	T1	T2	T1 & T2	T0, T1, T2
1.0	6	10	13	4
1.5	4	-	18	-

Folpet gave a positive yield benefit in 43 of the 55 instances, although this was not often sufficient to be significant in the trial the data was sourced from. Multiple applications of folpet (where total dose was ≥2.0 l/ha) most frequently gave a significant response.

Table 2. Percentage of instances where addition of folpet to a base programme gave a significant yield benefit in original trial

	Application timing			
Rate per application (l/ha)	T1	T2	T1 & T2	T0, T1, T2
1.0	16.7	0	53.8	50.0
1.5	0	-	38.9	-

Across the 55 comparisons, an average response of 0.31 t/ha was recorded. Three applications of folpet 1.0 l/ha at T0, T1 & T2 gave the largest average yield response of 0.46 t/ha across the four comparisons.

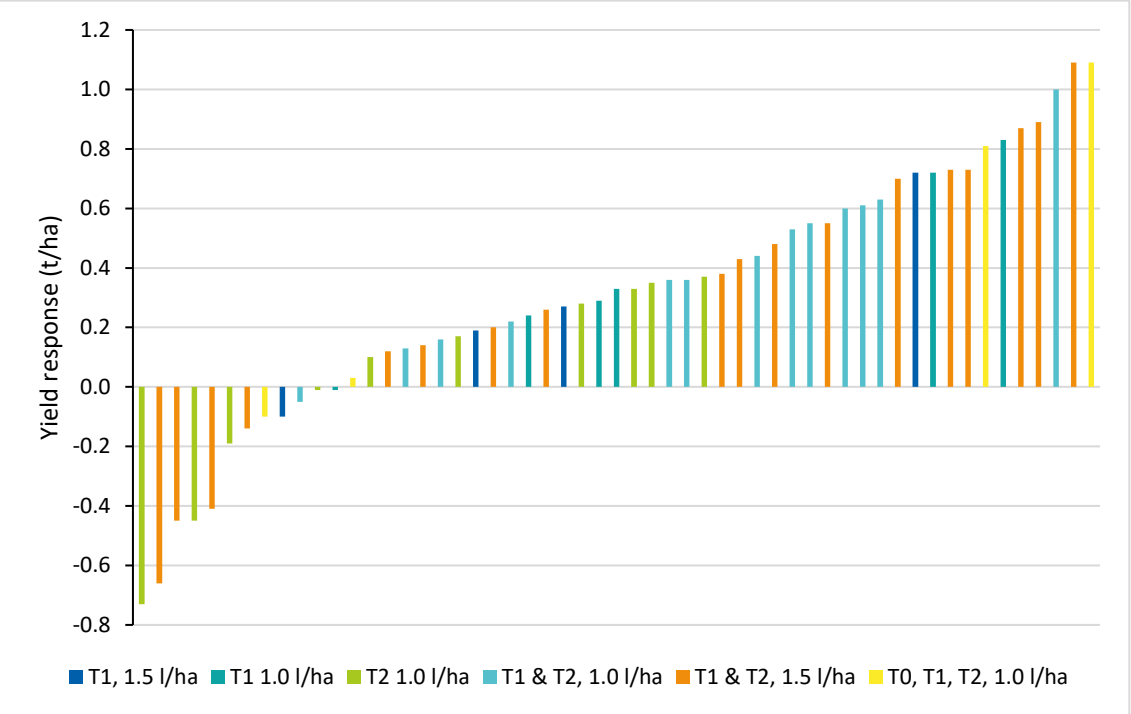

Figure 1. Yield response of 55 situations under review, grouped by timing and rate of folpet application.

Table 3. Average yield response (t/ha) across 55 comparisons

	Application timing			
Rate per application (l/ha)	T1	T2	T1 & T2	T0, T1, T2
1.0	0.40	0.02	0.43	0.46
1.5	0.27	-	0.33	-

2.1 Subdivision of data by strength of base programme

Programmes were divided into “strong” and “weak, based on the classification of a strong programme as a T2 application of any new chemistry, or Revystar XE at rates above 0.75 l/ha (half full label rate). This classification resulted in 20 “strong” and 35 “weak” programmes.

Table 4. Average yield response (t/ha) on folpet in 20 “strong” programmes

	Application timing			
Rate per application (l/ha)	T1	T2	T1 & T2	T0, T1, T2
1.0	0.35	-0.10	0.37	-0.10
1.5	-	-	-0.07	-

Table 5. Average yield response (t/ha) on folpet in 35 “weak” programmes

	Application timing			
Rate per application (l/ha)	T1	T2	T1 & T2	T0, T1, T2
1.0	0.45	0.19	0.50	0.64
1.5	0.27	-	0.41	-

3 DATA ANALYSIS

3.1 Programme type

The base fungicide programme for each comparison was classified as “strong” or “weak” by current (2021) industry standards, with a strong programme containing a T2 application of registered leading chemistry, for example Revystar XE at rate above half full label rate (0.75 l/ha), or novel (unregistered) products known to have good efficacy of septoria. Tables 4 and 5 summarise yield responses resulting from addition of folpet into 20 strong and 35 weak programmes.

At all rates and timings summarised in the above tables, the addition of folpet into weak programmes gave a greater yield response (t/ha) than the equivalent addition into a strong programme; the size of this yield difference ranged from ranged from 0.10 t/ha (1.0 l/ha at T1) to 0.74 t/ha (1.0 l/ha at T0, T1, T2), mean values by timing shown in Tables 4 and 5. Addition of single application (T1 or T2) of folpet 1.0 l/ha to a weak programme gave a larger yield response (average 0.32 t/ha) than an addition into a strong programme (average 0.13 t/ha).

3.2 Timing of a single folpet application

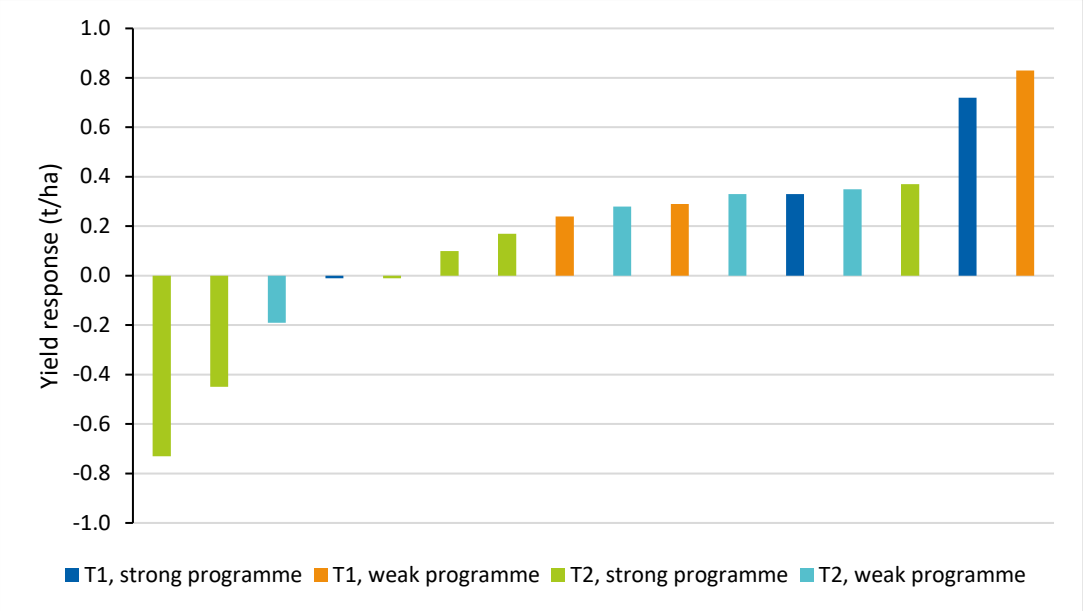

Figure 2. Yield response to inclusion of a single application of folpet 1.0 l/ha

Where a single application of folpet 1.0 l/ha was included in the programme, there was a larger yield response (t/ha) from inclusion at a T1 timing than inclusion at a T2 timing (Table 3), although the yield responses associated with the T2 timing may have been limited by the 2021 seasn, as discussed in section 3.6. This was apparent in both strong and weak base programmes (Tables 4 and 5), although the yield response in a weak programme was greater than the yield response in a strong programme for both T1 and T2 timings.

From a total of ten T1 situations, one statistically significant response was seen from adding 1.0 l/ha folpet at the T1 timing to a strong programme. In total there were ten situations in this review where the benefit of a T2 application of folpet could be analysed; these were all

1.0 l/ha applications. However, the addition of folpet into programmes did not give a statistically significant yield response in any of these individual situations.

3.3 Rate of folpet

Due to the distribution of the data in this review, the effect of rate can only be analysed where folpet was applied at T1 or T1 & T2 timings.

Across all the programmes, at both the above timings, there appeared to be no increase in yield associated with applying 1.5 l/ha of folpet compared to 1.0 l/ha and applications of 1.0 l/ha appeared to give a significant response over the base programme more frequently than applications at 1.5 l/ha. This suggests there is limited benefit to increasing rate of folpet from 1.0 l/ha to 1.5 l/ha.

Over the three years, there were 31 situations where folpet was applied at T1 & T2. A 1.5 l/ha rate was applied in 11 situations in 2020, with a further three situations in 2019 and four situations in 2021. No 1.0 l/ha T1 & T2 applications were made in 2020. As discussed in section 3.6, dry weather in 2020 limited fungicide yield responses and therefore the number of 1.5 l/ha T1 & T2 situations in 2020 may be distorting the apparent yield response seen from 1.5 l/ha. Excluding the 11 situations from 2020, the average yield response over the base programme from two applications of 1.5 l/ha was 0.64 t/ha.

In weak programmes, increasing the rate of folpet from 1.0 l/ha (six trials) to 1.5 l/ha (14 trials) at T1 & T2 applications appeared to give no yield benefit. The addition of folpet 1.0 l/ha to weak programmes gave a significant benefit in 83% of situations, but only 50% of situations where folpet 1.5 l/ha was added, it is considered this may be due to the small sample size. In strong programmes, increasing the rate of folpet at T1 & T2 applications (total 11 comparisons) appeared to give a negative yield response.

The effect of increasing the rate of folpet in T1 applications can be compared only in weak programmes. In the seven situations in this review (six from 2019, 1 from 2021), there appeared to be a negative average yield response to increasing the rate of folpet from 1.0 l/ha to 1.5 l/ha at T1 and the addition of folpet at either 1.0 l/ha or 1.5 l/ha did not give a statistically significant yield response in any of the seven situations.

3.4 Number of applications

In this review, multiple applications of folpet in programmes (either T1 & T2 or T0, T1, T2) gave a higher yield response than single application.

Across all 55 comparisons, there was a mean yield response benefit of 0.03 t/ha from increasing from a single T1 application of 1.0 l/ha folpet to two applications of 1.0 l/ha at T1 & T2. Of the 14 situations analysed where 1.0 l/ha folpet was added to programmes at T1 & T2, seven showed a significant benefit. A slightly larger yield response was seen in weak programmes (0.05 t/ha) compared to strong programmes (0.02 t/ha).

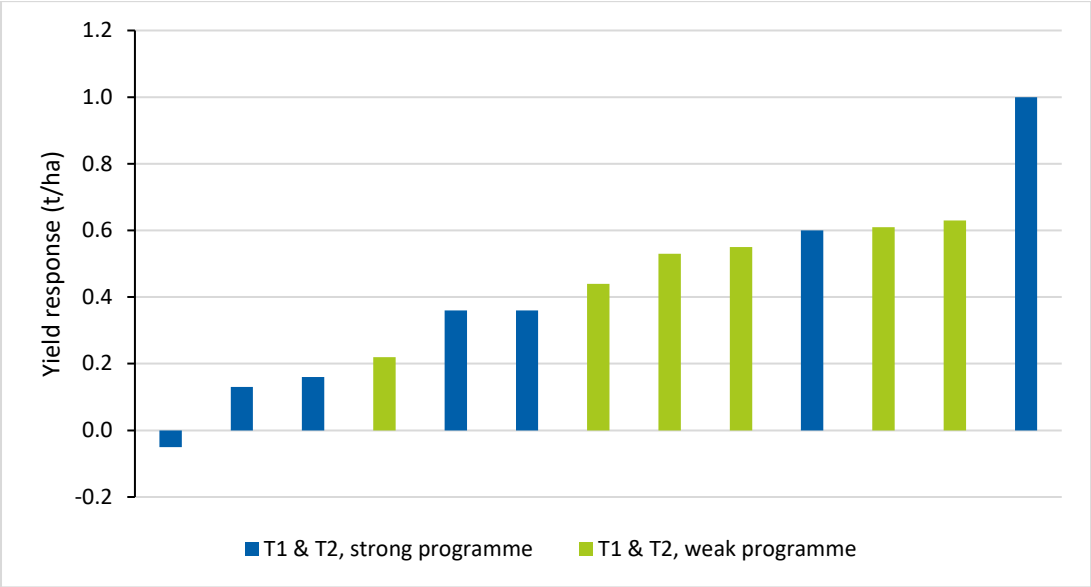

Figure 3. Yield response to inclusion of folpet 1.0 l/ha at T1 & T2 in programmes of different strengths

Irrespective of programme strength, in this analysis, three applications of folpet 1.0 l/ha (T0, T1, T2) gave a larger yield response than a T1 & T2 application of 1.5 l/ha, for the same total dose. Three applications gave the largest average yield response of 0.46 t/ha, with 50% of instances giving a significant benefit over the base programme. However, this average was created from a limited dataset of only four instances, which ranged from -0.10 t/ha to 1.09 t/ha. The average yield response of two applications of 1.5 l/ha was also compromised by the 2020 season, as discussed in sections 3.3 and 3.6.

In the three weak programmes, the three application split gave the highest average yield response observed in this review (0.64 t/ha), although in the one strong programme in this analysis, a small negative yield benefit was observed however this should not be considered representative.

3.5 Economic return of folpet use

Using a wheat price around £250/t (January 2022), and a folpet cost of £7.50/L, for each litre of folpet included in a programme, a yield response of 0.03 t/ha is needed to break-even, with any responses above this creating profit for the grower.

Based on the 55 situations collected in this review, overall, a single application of folpet at T1 or multiple applications gave an economic return on use. All applications of folpet gave an economic return in weak programmes, with applications of 1.0 l/ha at T1 or 1.0 l/ha at T1 & T2 also giving an economic return in the stronger programmes.

In strong programmes, the yield responses associated with applications of folpet 1.0 l/ha at T1 or 1.0 l/ha at T1 & T2 gave a margin over folpet cost of £80/ha and £77.50/ha respectively. The greatest margins over folpet cost were seen in weaker programmes, with 1.0 l/ha applied at T0, T1, T2 giving a response of £152.50/ha. Although larger margins were seen where folpet was added to weaker programmes, as in the stronger programmes, there was little separation between additions of folpet to weaker programmes at 1.0 l/ha at T1 or 1.0 l/ha at T1 & T2 (giving margin over folpet cost of £105/ha and £110/ha respectively).

As wheat prices increase, the margins associated with folpet use also increase, for example, based on the figures in this review, the margin associated with a single T1 application of 1.0 l/ha increases by £20/ha for every £50/t increase in grain price above £250.

3.6 The effect of year

The data in this review was extracted from field trial experiments in the period 2019-2021. These trials were predominately positioned in highly susceptible varieties to the target disease, *S. tritici* and located in Herefordshire, in the west of the UK, where annual rainfall is typically higher than the UK average. However, the onset and severity of the *S. tritici* epidemic varies each season, and is highly dependent on weather patterns through April-June.

In total, 15 situations were included in the analysis from 2019, 14 situations from 2020 and 26 situations from 2021. In 2019, rainfall patterns were close to normal. In 2020, rainfall was below average throughout the spring and summer, resulting in a very low *S. tritici* pressure throughout the season, and limited yield differences due to drought and premature senesce of crops. An exceptionally wet May in 2021 resulted in a late onset of the *S. tritici* epidemic, with a high pressure in June and July.

The late onset of the epidemic may be reflected in the low yield responses associated with 1.0 l/ha T2 applications: nine of the 10 situations in this category were from 2021. The peak of the epidemic was around 4-6 weeks after T2 applications, testing the persistence of a protectant product.

The majority of the data available from 2020 were situations where folpet was applied at 1.5 l/ha at T1 & T2 (11 situations), and showed an average yield response of 0.13 t/ha. The remaining seven situations (2019 and 2021) showed an average yield response of 0.64 t/ha and therefore the 2020 data may be skewing the average yield response down for this positioning of folpet (total 18 situations across 2019-2021).

In other comparisons, there was some seasonal variation observed, for example, in 2019 (five situations), the average benefit of folpet 1.0 l/ha T1 & T2 was 0.28 t/ha, however in 2021 (eight situations), the average benefit of folpet in the same positioning was 0.52 t/ha. A T1 1.0 l/ha application in 2019 gave an average yield response of 0.54 t/ha, but the equivalent positioning in 2021 gave a yield response of 0.33 t/ha.

4 CONCLUSIONS

The majority of the trials used to extract the comparisons for this review were located in Herefordshire, in the west of the UK and in highly susceptible varieties to the target disease, *S. tritici*. A limited number of these comparisons were drawn from the same trials and therefore there is likely to be a significant site-season effect that should be considered when interpreting the results. Due to this, and the unbalanced nature of data reviewed, it was not possible to complete a statistical analysis of the data.

Throughout all comparable rates and timings, across the 55 instances in the 2019-2021 period, the addition of folpet into weak programmes gave a greater yield response (t/ha) than the equivalent addition into a strong programme.

In both strong and weak programmes, the addition of a single application of folpet appeared to give the greatest yield response when applied at the T1 timing. However, multiple applications of folpet tended to increase the yield response, with two applications (T1 & T2) appearing to give a yield response benefit over a single application. Although the data in this review is limited, there appeared to be a further yield response to three applications of folpet 1.0 l/ha (T0, T1, T2) in weak programmes.

There was no apparent benefit to increasing the rate of folpet from 1.0 l/ha to 1.5 l/ha, regardless of the number of applications made, or base programme strength. For the two application T1 & T2 timing, this may be due to a season effect influencing the data and should be considered with caution.

Overall, irrespective of programme strength, the data analysed in this review suggests that a single T1 1.0 l/ha or two applications of 1.0 l/ha at T1 & T2 provide the greatest economic benefits, although a larger benefit is apparent in weaker programmes than stronger programmes. In weak programmes, there is a small amount of evidence to suggest that three applications of 1.0 l/ha (T0, T1, T2) gives the largest yield response and associated margin over folpet cost.