Guide for SRUC Cereals Open Day

Cauldshiel Farm, East Lothian

27th June 2019

Courtesy of Keith and Scott Maxwell, Cauldshiel Farm
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Content

Introduction

Welcome to our trials open event at Cauldshiel for 2019, courtesy of our host farmers Keith and Scott Maxwell.

In contrast to last year crops have had less stressful conditions to cope with. The lack of a hard winter has allowed crops to establish well and also for disease to get going. In the spring we have seen cycles of warm weather followed by cooler conditions and this has set the pattern for the early summer as well. Spring sown crops struggled for moisture at the start of the growing season but once the rain did come it has produced some thick crops. The early sowing date has meant some spring crops are well ahead of their normal development stages.

Disease levels in winter wheat were relatively low over the winter months, the cold temperatures keeping disease activity down, although mildew was noticeable on some crops. However the warmer spells in spring have encouraged yellow rust in many wheat crops. The milder winter has also mean more insects have survived and virus spread diseases are more common in 2019 than 2018.

In 2018 we reported on monitoring work for septoria mutants in winter wheat. The picture from 2018 showed that levels of mutation in the SDHI subunit were relatively low at this site compared to others being monitored. However the levels of mutations to DMI were amongst the highest detected so azole performance needs to be carefully monitored. Disease levels were relatively low in 2018 but results from other sites indicated the value of using effective mixture partners to keep resistance development from increasing. The use of any fungicide exerts a selection pressure so it is important to consider how many sprays need to be used and how to combine spray partners.

We are discussing and showing integrated methods of growing crops and managing disease at this open event. Last year we discussed issues with resistance in septoria and ramularia. Management of resistance has been based on the use of effective multisite compounds but the impending loss of chlorothalonil in 2020 means alternative strategies may have to be considered.

Using more resistant varieties and tailoring treatments to the actual risk in the crop we can reduce our reliance on fungicides. Integrated Pest Management (IPM) offers potential win:wins in terms of business efficiency and sustainability and is not something that is alien to current grower practices. The use of resistant varieties with improved resistance ratings is already common practice as is walking fields and monitoring crops so that inputs can be tailored to actual risks. For more ideas about IPM then look around the site this evening and then consider filling out a Scottish IPM plan to assess what the specific risks are on your farm, what you do already and to get ideas on other measures you can take. The plan comprises 30 simple questions (and that includes things like your name and email), takes just a few minutes to complete and your plan will be emailed back to you. The data is of course anonymised so your identity is protected.

Key Principles to consider today

- Look at the best varietal recommendations for Scottish markets
- Hear about and see the varieties favoured by the distillers
- Look at the impact of variety and tailored pesticide programmes on disease pressure at the site
- New alternatives to pesticides that might be developed
- IPM has to be tailored to your site – what have you adopted and what might you do in the future?
- We are losing tools – hear the latest on pesticides at risk and resistance management

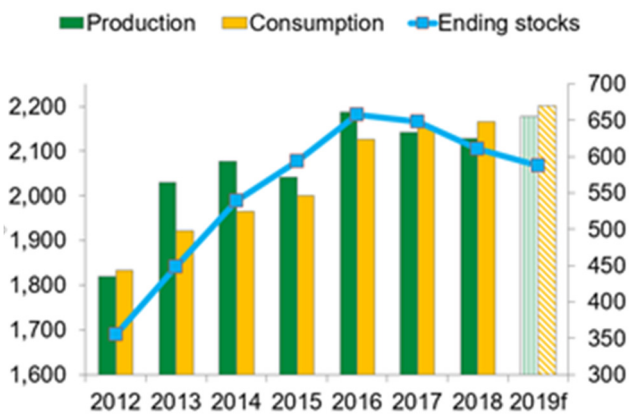
Key Recommendations

- Make an IPM plan for your farm at http://bit.ly/pestmanagementplan
- Consider what might be used in your programme instead of chlorothalonil. How can resistance be managed in wheat and barley crops?
- Identify your key pest, weed and disease risks
- Where possible select varieties that reduce these risks and are favoured by the distillers
- Plan agronomy to minimise the main risks
- Monitor crops and tailor pesticides to the in-season issues

Grain Market Drivers

Key Principles to consider today

- **World grain stocks to use fall to lowest level in 5 years.** With world grain demand set to exceed production for the third year running world stocks are predicted to fall to 103 days of supply in 2019, down by 9 days in two years. This reduces the buffer if production is disrupted. Crop problems are being seen. In the US this has been the wettest and latest planting season on record, with maize and soya plantings expected down significantly and a month or more late; reducing yield potential. In Australia, Southern Europe and N. Africa drought threatens cereal yields. However, closer to home in Scotland, the UK and most of northern Europe crop conditions have been favourable so far. World grain and oilseeds demand is suffering from poorer economic outlook on a global basis and the trade war between the US and China. Oilseeds prices are depressed by lower Chinese soya demand following their outbreak of African Swine Fever but there is a bright spot for rapeseed markets as the EU area is expected down and crops in Australia are suffering drought.



World grain supply and demand

- **The Scotch whisky sector needs another good crop of malting barley this year – and there aren't many alternatives to Scottish distilling barley**. Rising whisky exports and falling spirit stocks indicate good demand for malting barley this harvest. In addition stocks of malting barley in Scotland are understood to be low going into harvest. This puts extra pressure on the 2019 harvest delivering the necessary quality and yield.
- Spring barley sowings are expected to be lower this year in Scotland, though crop conditions are generally favourable. The dominance of brewing varieties elsewhere in Europe and the fact that EU malting barley output is expected to be little higher than last year limits options to import malting barley if the Scottish supply is tight.
- The UK's exit from the EU has been delayed until 31 October at the earliest. This now moves the new potential exit date to slap bang in the middle of the otherwise busy post-harvest grain exporting season. This change effectively puts on hold most forward export trading to the EU of new crop cereals as traders are unwilling to take on the risk of tariffs and other restrictions in the event of a no-deal. This in turn puts UK new season grain at a disadvantage and closes off market options.

Key Recommendations

- **Crops expected to be marketed in a post Brexit market environment – good or bad**. You can now sell grain forward post-Brexit through to May 2020. Start limiting your exposure.

- **Focus on local markets that will need supplied irrespective of Brexit outcome**
  - Malting and distilling have one of the most robust outlooks of any sector – prioritise wheat and barley varieties that fully meet this sector's needs.

Site information

Winter Wheat RL Varieties – field details and agronomy						
GRID REF	NT689655		**PREVIOUS CROPPING:**	Winter Oil Seed Rape		
ELEVATION	170m		**1 YEAR AGO**	Winter Barley		
SOIL TEXTURE	Loam		**2 YEARS AGO**	Spring Barley		
SOIL SERIES	Humbie					
SOIL ANALYSIS:						
pH	6.8					
P	6.27 (mod -)					
K	100 (mod -)		**PLOT SIZE**	10m x 2m		
Mg	148 (mod)					
S	14.0 (high)		**SEED RATE**	340/m^2		
Mn	*		**DATE SOWN**	28.09.18		
Cu	*					
Organic Matter	5.23%					
ROUTINE APPLICATIONS						
	N	**P_2O_5**	**K_2O**	**S**	**DATE**	**GROWTH STAGE**
FERTILISER (Kg/Ha)	0	70	70	0	11.10.18	GS10
	80	0	0	0	20.03.19	GS23
	120	0	0	27	17.04.19	GS31

	PRODUCT	RATE	DATE	GROWTH STAGE
HERBICIDE:	Picona	3.0 L/ha	18.10.18	GS 10
FUNGICIDE	Cyflamid	0.3 L/ha	12.04.19	GS 30
T0	Cherokee	1.33 L/ha		
	Epic	0.5 L/ha		
T1	Elatus Era	1.0 L/ha	30.04.19	GS 32
	Bravo	1.0 L/ha		
	Talius	0.15 L/ha		
T2	Ascra Xpro	1.2 L/ha	24.05.19	GS39-45
	Bravo	1.0 L/ha		
T3	Proline +	0.72 L/ha	19.06.19	GS65
	Amistar Opti	1.0 L/ha		
PGR	3C Cycocel	1.75 L/ha	12.04.19	GS 30
	Moddus	0.2 L/ha	12.04.19	GS 30
	Terpal (*)	0.5 L/ha	10.05.19	GS 35
OTHER	(*) Activator 90	100 mls/100L	10.05.19	GS 35
	Prowler	3.0 Kg/ha	10.10.18	GS 09

Spring barley RL varieties – field details and agronomy

GRID REF	NT473656	**PREVIOUS CROPPING:**	Winter wheat
ELEVATION	140m	**1 YEAR AGO**	Winter wheat
SOIL TEXTURE	Loam	**2 YEARS AGO**	Winter rape
SOIL SERIES	Humbie		
SOIL ANALYSIS:			
pH	6.6		
P	9.51 (mod -)		
K	110 (mod -)	**PLOT SIZE**	10m x 2m
Mg	117 (mod)		
S	6.6 (mod)	**SEED RATE**	360/m^2
Mn	11 (mod)	**DATE SOWN**	25.03.19
Cu	*		
Organic Matter	5.86 %		

ROUTINE APPLICATIONS

FERTILISER (Kg/Ha)	**N**	**P_2O_5**	**K_2O**	**S**	**DATE**	**GROWTH STAGE**
	60	60	60	15	28.03.19	GS03
	60	0	0	0	17.04.19	GS11

	PRODUCT	RATE	DATE	GROWTH STAGE
HERBICIDE:	Pennant	100 g/ha	10.05.19	GS23
	HighLoad Mircam	1.0 L/ha	10.05.19	GS23
	Compitox	0.5 L/ha	10.05.19	GS23
FUNGICIDE	Siltra Xpro +	0.6 L/ha	25.05.19	GS 31
T1	Bravo +	1.0 L/ha		
	Cyflamid	0.25 L/ha		
T2	Priaxor	1.2 L/ha	19.06.19	GS 53
	Bravo	1.25 L/ha		
OTHER	Manganese	1.0 L/ha	30.04.19	GS14
	Manganese	1.0 L/ha	25.05.19	GS31
Insecticide	Hallmark Zeon	50mls/ha	19.06.19	GS 50

Trials demonstrated

Wheat Variety Choice - Key Principles

- There is wide variety choice in winter cereals compared to the more narrow focus in malting spring barley. This provides growers with flexibility and timeliness in management of their winter crops.

- When making variety choices, check market requirements and agronomic strengths and weaknesses.

- Improved disease resistance and stem strength reduces the risk of poor yield or reduced quality in years of high disease pressure, or climatic stress.

- Your choices should also be considered as part of a broader market and crop management strategy.

Winter Wheat Choices

- The soft feed and distilling category is the strongest it has been for many years, with the recent entries, KWS Jackal and Elation, joined by two new varieties, LG Skyscraper and LG Spotlight.

- KWS Jackal, Elation and LG Skyscraper have high yield potential and LG Spotlight has by far the best combination of specific weight and Hagberg falling number of any soft wheat.

- Established varieties such as Viscount and Leeds are becoming outclassed on yield, though both have been appreciated for their consistency on farm.

- LG Sundance with its good resistance to Septoria and LG Motown for early maturity are also worth considering.

- Revelation has very good distilling quality but is late maturing, so only use this for early drilling, or at early-harvested sites.

- KWS Extase is a new hard milling wheat with outstanding untreated yield, high specific weight and early maturity.

The full list of wheat varieties is available as a separate hand out.

Winter Wheat Fungicide Trials

The wheat fungicide trials has established septoria in the autumn but levels were restricted by the dry periods in spring. In contrast mildew did become established and more recently yellow rust has become noticeable. Septoria levels are higher than last year but are lower than in some of the wettest years at this site. Fungicide inputs can be tailored in an integrated way to suit the varietal ratings and disease pressure in individual crops but are essential to maintain wheat yield.
The wheat trials we are showing this year are looking at combinations of fungicides which will test the best methods of stewarding fungicides, whilst maintaining yields and margins. The first trial we are showing is looking at the effect of restricting total dose as a method of managing resistance development. The second trial is looking at effect of using fungicides in mixtures rather than alternating them in a programme. The site was tested for the levels of

septoria isolates with SDHI and azole mutations in the spring so that we know what the base levels are. The programmes demonstrated will let us see if combinations of fungicides can manage the mutants that are there or whether some programmes increase their frequency. We will discuss what latest thinking is and show where alternations and combinations have best managed disease. Yields from these trials will be presented at the winter agronomy meetings.

Winter Wheat Nitrogen Trials

Nitrogen is one of the most important nutrients to consider in crop growth and SRUC is carrying out a wide spread of research on nitrogen and its effects on cereal production. This includes work on how nitrogen applications affect grain quality for different end uses, fertiliser recommendations, efficiencies of nitrogen supply and utilisation, and the development of technology and precision agriculture techniques in identifying nitrogen stress.

Advances in technology are making precision agriculture techniques more available including satellite Earth observation with sensors at high spatial and temporal resolutions along with easier and cheaper availability and developments in low-cost unmanned aerial vehicles (UAVs). Precision agriculture techniques have the potential to allow targeted management reducing inputs and SRUC is examining many different sensors for accuracy, ability to detect crop differences and the potential to integrate these sensors with crop models for yield prediction.

Spring barley varieties: AHDB Recommended List

[AHDB and Scottish Government funded]

- Laureate is now the market leader for malting in Scotland with the Concerto intake dropping to just under 40% followed KWS Sassy 3% and Sienna 2%.
- LG Diablo has been given full approval for malt distilling with high yielding candidates SY Tungsten and LG Serengeti also having potential for both brewing and distilling.
- Propino is becoming outclassed by RGT Planet and Cosmopolitan which are high yielding brewing varieties that also make good choices for feed use.
- Olympus and Fairing are preferred fulling approved for grain distilling
- Waggon and Scholar are preferred feed options, though Waggon is now longer in trials. Likewise, new high-yielding malting varieties are good options.

The full list of spring and winter barley varieties is available as a separate hand out.

Spring Barley Fungicide Trials

Spring barley crops this season are at risk of ramularia, and SRUC data shows that ramularia has declined in sensitivity to both SDHI and azole fungicides. The step change happened in 2016 and it is almost unprecedented to see such a shift in two fungicide groups in a single season and very concerning. We are continuing to work on alternative control measures and to develop more robust resistance ratings for varieties. In the past we have relied on chlorothalonil to control ramularia but given the recent ruling on its registration and unavailability after 2020, alternatives will have to be found. The trials at the site this year look at fungicide options and discuss how useful these have been in a changeable year for disease pressure

One of the major drivers of IPM is to investigate the use of alternatives to conventional chemistry throughout the programme. At this site we have a trial comparing an elicitor seed treatment with untreated seed. A range of elicitor options at T0 are being compared. All of the programmes have a reduced fungicide input, based on the good disease control seen in previous years from elicitor/reduced fungicide rate programmes. Two varieties are being used in the trial (Propino and Laureate).

Optimising Fungicide Timing in Spring Barley

[Funded by Mains of Loirston Trust]

Fungicide programmes in spring barley often involve an application (T1) made at the start of stem extension (GS30/31), followed by a second application (T2) during booting (GS45/49). The T1 applications tend to be made routinely even if no disease is visible in the crop. Their main purpose is to prevent rhynchosporium leaf blotch developing during stem extension, because this disease can be difficult to control after it becomes established. However, the latent period of infection for rhynchosporium (the time between spore germination and development of symptoms) is 14-21 days, which is roughly the period between the T1 and T2 timings.

Thus, if disease is not visible in the crop or present within leaf tissue at T1, it may be possible to omit the T1 spray altogether and deal with any infection occurring after then with the T2 application. A series of fungicide timing experiments are being conducted at several sites (including this one) to test the theory.

Take home message: Results to date from two years of trials show that when the risk of rhynchosporium development is low, for example where straw is buried or removed, resistant varieties are being grown and the spring weather is relatively dry, the T1 application can be omitted without a reduction in yield. A single application at T2 can maximise yield either through control of late disease and/or physiological effects on grain numbers and starch storage capacity.

Nitrogen rate and timing to update fertiliser recommendations for spring barley

It can be challenging to grow high yielding spring barley crops that reliably achieve the grain N specifications required by end users. Yields of some new varieties are around 12% greater than traditional malting varieties. Growers tend to be cautious in their N rates to avoid exceeding grain N% thresholds and as a result could be missing out on some of the yield potential of modern varieties by using sub-optimal rates. Other complications arise from barley production being extended onto heavier soils and the differing grain N requirements for different end uses.

AHDB is funding trials at 4 sites across the UK to provide information on the optimum N rate and timing for modern spring barley varieties to update fertilizer recommendations. At this site, the optimum N rate is being determined for 3 varieties (Concerto, Laureate and Planet), and the optimum timing (at the standard recommended rate) for 4 varieties (Concerto, Laureate, Planet and Diablo). Trials are currently in their second year.

Results last year showed no difference between varieties in their optimum N rate in spite of the higher yields of Laureate and Planet compared to Concerto. In the exceptionally dry spring and early summer conditions last year, the greatest yield and low grain N% was achieved when part of the N was applied to the seed bed and the rest after crop emergence. Weather conditions this year are in stark contrast to those last year; it remains to be seen whether this affects the N response of the varieties differently.

Traditional spring barley varieties and land races

Current barley varieties are grown under high input conditions such as the addition of nutrients, fungicides and herbicides. These inputs have consequences such as nitrification through leaching into ground water and fungicide and herbicide resistant diseases and weeds. To reduce the environmental impact and increasing restrictions on these inputs, varieties can be developed through breeding that are more adapted to lower input conditions. Traditional crop material originating from different countries is a source for useful variation that can be used for developing more robust crop material.

At SRUC we have been testing traditional varieties and landraces for their performance in Scottish field conditions under different conditions. We have been looking at yield stability over several year periods and identified a small number of lines that could be used as pre breeding material. The current material grown at this site is a sub selection of lines that performed stable under low input conditions and will be further tested for malting quality.

Barley Yellow Dwarf Virus (BYDV) Management

The loss of the neonicotionoid seed treatments will have an impact on the management of BYDV in cereals this autumn and next spring. Consequently there will be a reliance on the use of pyrethroid insecticides for the management of aphids and the transmission of BYDV into cereals. Grain aphids in Scotland are demonstrating resistance to the pyrethroid aphicides. As a result reliance on a pyrethroid aphicide spray is a risk as grain aphids may not be adequately controlled, elevating the risk of BYDV.

The most effective way of managing the ‘green-bridge’ of aphids on volunteers and stubble is to kill off any aphid host plants before sowing. Ideally stubble from the previous crop should be desiccated with a herbicide, ploughed in 7-10 days later and left for another 2 weeks before sowing the next crop. This will ensure that any aphid host plants will be dead and any aphids on them will have starved to death.

Alternatively, stubble can be ploughed in and sowing delayed for 4 weeks to allow enough time for plants to die along with the aphids.

Both of these approaches will reduce the threat from walking aphids by killing off their host plants that could keep the aphids (and BYDV) ticking over. Aphids are quite resilient and can work their way up to the soil surface after ploughing, so killing off the plants is essential so that they won’t have anything to feed on underground. However, for aphids flying into the crop at crop emergence aphicide sprays are the only option.

A combined approach of tackling the ‘green-bridge’ for the walking aphids and using an aphicide to target the flying aphids is the only option available this autumn to reduce the risk of BYDV. Reducing the availability of BYDV reservoirs in winter cereals and volunteers/stubble, and in aphids overwintering on winter cereals will reduce the risk to spring cereals, where a pyrethroid aphicide spray at early crop emergence is again the only option currently available, and this may not take care of the grain aphid due to widespread resistance.

Because of the resistance issue in the grain aphid, try to avoid the use of pyrethroid aphicides on cereals for BYDV unless absolutely necessary – aphid colonies on the leaves in the autumn and on spring-sown cereals at crop emergence.

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BASF have generously donated materials which have been used as husbandry inputs on this year's trials; Picona, Crystal, 3C Chlormequat 750, Pictor, Priaxor and Terpal.

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For further information about Scottish Government funded R&D at SRUC contact:

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