Fieldwise
AGRONOMY NEWS FROM HUTCHINSONS
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Brampton

5 years of Black Grass Control Research

Dick Neale (Hutchinsons Technical Manager) reviews the progress made and the knowledge gained in the first five years of trials work in controlling black grass at Brampton, near Huntingdon.

…so what have we learnt so far?

We are now in our 5th year at the Brampton Black Grass Centre of Excellence and the implementation of rotational changes to include spring barley, a close focus on cultivation practice and understanding the impact of black grass agroecology on the process of long-term control, has culminated in significant reductions in black grass infestation across the site and in all crops.

The level of impact in a relatively short period of time has surprised us all, but it serves to demonstrate that with a plan of attack based on knowledge of the weed's biology and an appreciation of the weed's likely response to a specific control measure, serious levels of black grass can be brought under acceptable commercial control within a period of 3-4 seasons.

Whole field trials

The significance of the control at Brampton is all the more relevant and reliable because it is based on a whole field basis, not exclusively small plot or tramline based treatments.

This is significant, as one of the initial observations made was that black grass thrives not across the whole site, but is linked to the heaviest 'soil zones' where clay dominates the subsoil. Of course these soil zones are also the least agreeable for delayed sowing, harbour the most slugs and have the highest percentage of seed loss during the crop establishment phase, typically around 35%.

Identifying where black grass dominates is key to focussing the optimum control package where it is most needed. Cultural control is a skilled operation and requires careful planning and implementation. Block cropping becomes almost impossible and patience during autumn field operations pays huge dividends.

Cultural control

There are potentially two directions to take regarding cultural control of black grass. The first is the suppression of seed germination via full soil inversion with the plough, together with the use of cover crops to smother or 'partner' black grass emergence over winter, prior to a spring crop. The second is the adoption of a philosophy of optimising growth of the weed during peak germination periods and eliminating it pre autumn or spring cropping.

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>>> **At Brampton we have chosen to follow the second path. Why?**

Our objective has always been sustained long term control of black grass. Ploughing is frequently cited as the most effective cultural control option but we only see its position as a clean-start inversion cultivation in high seed return situations.

National trial studies report an un-germinated seed bank decline annually of 70%, which suggests that after 5 years of minimal seed disturbance and nil return of new seeds, any remaining seeds would be non-viable. In the field however, this is proving not to be the case, with significant levels of viable seed being ploughed up after 10 or 12 years, in our observations from strip cultivations at Brampton. In addition, seed dormancy following that period of burial can take 2-3 years to break after being ploughed back up, meaning that while initially successful, ploughing is unlikely to offer a long term solution with such high populations of seed now present in soils.

This latter fact is where the 'control by suppression' theory falls short of a long term strategy. Seed viability in the soil certainly declines rapidly and at a high annual percentage, but 5-10 plants/m^2 sneaking through when defences are down can return 10,000 seeds/m^2 …putting you straight back to square one. Suppression only really works for a spring drilling scenario - so what approach is taken during other periods of the rotation?

Clear focus

Our success at Brampton is not due to any single approach, timing or herbicide package, it is a clear focus at every stage of the rotation.

We have utilised Brampton to develop the 'Micro-Wing' establishment technique with Cousins of Emneth under our joint 'i-Tillage' brand. This technique moves only 20% of the soil surface area and minimises the opportunity for grass weeds to root deeper than the active control depth for propyzamide or carbetamide.

This technique has proved highly successful and is now employed across many farms.

Focussing in on very shallow 'surface tillage' stale seedbed production has also seen the development of the 'Surface' cultivator with Cousins.

Both machines have been designed from the basis of identified agronomic need, so they both move only the soil that's needed and move it only as much as required. This optimises the seedbed weed germination and represents a long term solution of flushing weed seed from the top 50mm of soil.

Cover cropping has been investigated at Brampton along with a range of spring cropping options, however prior to 2014 black grass seed bank levels where such that cover crops were overwhelmed and only spring barley offered any realistic prospect of successful control.

Over wintered covers are being reintroduced as control levels now allow it. Grown to condition and protect soils prior to spring cropping, these covers are not used to directly control black grass and will be established during October after stale seedbed flushes are complete. Robust establishing plants are used at this timing such as oats, peas, beans and triticale.

Our rotational approach would now be:-

1. Evaluate quantity of fresh seed return before deciding on potential for autumn or spring cropping in individual fields or soil zones.
2. Establish Winter Oilseed Rape with a minimal soil disturbance technique. (All WOSR at Brampton is now established using the 'Micro-Wing' technique).
3. For autumn cereal cropping in high risk soil zones, no sowing is carried out before the 15th October.
4. 2nd wheats have been replaced with Hyvido hybrid barley which has demonstrated exceptionally high reductions in black grass seed return.
5. Ploughing is an option used as a clean start inversion cultivation in high seed return situations.
6. 'Min Til' deep tine cultivations are the primary driver of the burgeoning black grass population across the UK, so are now avoided at Brampton.
7. Other than where ploughing, no cultivations extend deeper than 125mm with 50mm being the optimum now at Brampton.
8. 50mm cultivations are carried out twice at a 3-4 week interval to optimise black grass emergence pre drilling and each pass is rolled.
9. Glyphosate is used to control flushes of more than 800 plants /m^2 before they pass 3 leaves.
10. The same cultivation strategy is used for both autumn and spring cropping seedbeds.
11. Wheat variety selection has little impact on black grass control when sowings are delayed into October …but seeding rate does.
12. Seed rates should realistically reflect field survival in October sown heavy soil. At Brampton field survival closely matches national data at 65%, so approximately 500 seeds/m^2 need sowing.
13. Spring Barley is utilised to optimise black grass control …no other spring crop can give the black grass control afforded by spring barley.
14. Cover crops should be utilised outside the main black grass germination windows, a summer cover from June-August and a winter cover from October-February.
15. Focused soil movement should be practised to optimise black grass growth during August-October. Minimal soil movement should be the aim at sowing, be it October or March.

Our work at Brampton continues and we look forward to welcoming you again to our grower open days in June 2016.

Black grass control with variable seed rate

Precision agronomy can play a significant part in black grass control - Nick Strelczuk (Precision Technology Specialist) reviews the promising results of our variable seed rate trials at Brampton.

Our variable seed rate work has shown real promise in helping crops compete with black grass. Using 'Omnia Precision', Hutchinsons' precision farming service, we have been able to use appropriate seed rate plans to implement variable seed rates across all cereal crops.

The effect of soil type on crop establishment has been consistent over the last 5 years at Brampton, with establishment rates regularly varying in the same field from between 50% and 95% (see Figure 1. below).

Figure 1: Soil zone map showing the relationship between heavier soil types and lower establishment rates.

Using over 500 seeds /m^2 in winter wheat, on the heaviest soils, has allowed mid-October sown wheat to establish well and effectively compete with black grass.

In spring barley the results are even more impressive, given that it is a short season crop, the correct seed rate sets the crop up right from the start. The results from our work with spring barley have been compelling, see table 1 (below).

Seed Rate / m^2	Spring Barley Ears / m^2	Black Grass / m^2
550	713	33
450	521	84
350	489	219

Table 1: the effects of different spring barley seed rates on black grass numbers

From farm scale demonstrations using three different seed rates in 24metre tramlines across three different soil types, we have observed reduced black grass heads/m^2 in the heavier soils, but optimised the barley plant number in the black grass free loam soil.

Having high enough plant counts, particularly in spring crops, is an essential component in any black grass control strategy. The effective variation in seed rate from soil type to soil type can be so great as to make this a significant undertaking if attempting to do this manually, whereas the use of precision technology calculates appropriate seed rates for the soil type concerned with a few clicks of the computer mouse.

In winter wheat the variation in seed rate can be as high as 66% (300-500/m^2) in a highly variable soil type situation, in spring Barley 45% (350-500/m^2) and in hybrid winter barley 38% (180-250/m^2).

Hybrid winter barley is a very effective weapon in the battle with black grass and from the outset the additional seed cost over conventional types should be viewed as an additional herbicide, with the hybrid barley itself often more effective than more herbicide in the 'stack'.

However, as hybrid barley seed is more expensive, it therefore makes little sense to expose this effective investment to excessively high seedbed losses. We would therefore recommend use of this technology where winter wheat would be at higher risk of failure due to black grass pressure, but where seedbed condition would not greatly impact crop establishment.

Applying variable rates of residual herbicides

Matt Ward (Services Leader) explains our field scale trial work, using the precision application of variable rates of residual herbicides, which aims to produce both economic and effective black grass control.

From the outset at Brampton, even in the worst black grass fields, the density of black grass was variable and often closely associated with different soil types. The poorer draining areas, with heavier clay subsoils, were most closely associated with the highest black grass populations.

Initially, these were the obvious areas to increase winter wheat seed rates above the average field rate, to ensure there were sufficient plants to compete. Standard farm practice, as a consequence, has changed over the past 5 years with higher seed rates than 400 seeds being commonplace. It should be remembered however, the role that higher seed rates play - one of reducing black grass 'tillering'. It is herbicides that remain responsible for controlling the actual plant numbers.

As a consequence, at Brampton we have identified the 'high risk' soil types and then revising these to incorporate black grass areas that we have mapped, we have looked at varying the rates of residual herbicides in wheat, barley and oilseed rape using the 'Omnia precision' service.

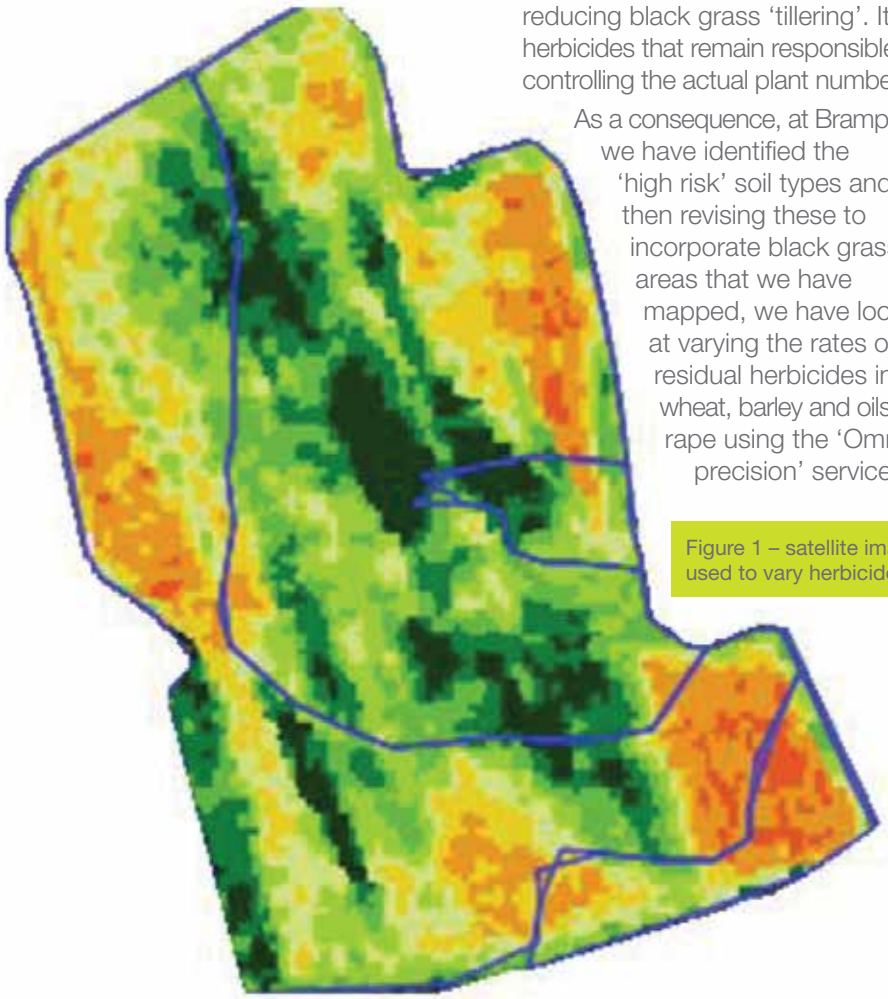

Figure 1 – satellite image used to vary herbicide rate.

In wheat, rather than using full rates of triallate and 2 full doses of flufenacet, the areas with the lowest black grass pressure have only received one and a half doses of flufenacet, representing a saving of over £28/ha.

In oilseed rape, rates of carbetamide and propyzamide can both be reduced in low risk areas without compromising black grass control. Most recently we have implemented the same principles in spring barley. In spring 2015 the 'Omnia precision' software has been used to combine the soil type map with a satellite NDVI image that has identified some early emerged black grass. Once these high risk zones were identified, we applied a tank mix of pendimethalin, picolinafen and prosulfocarb at three different rates.

Figure 1(satellite image) demonstrates that the whole field does not need a full rate treatment of the tank mix. 19 hectares received full rate, 11 hectares received two-thirds rate and 4 hectares were not treated - saving over £17 per hectare over the whole field.

In conclusion:

varying herbicide rates using 'Omnia precision' is the perfect demonstration of economic and environmental sustainability, using appropriate herbicide doses to gain maximum, effective control at optimum cost.

Early Weed Control Strategies in Oilseed Rape

For any crop, good weed control is vital in ensuring maximum profitability as well as contributing to an overall anti resistance strategy. Dr David Ellerton (Hutchinsons Technical Development Director) discusses early season options for controlling both grass and broad leaved weeds in oilseed rape, as well as exploring the environmental considerations of poor application decisions.

Managing resistant weeds

With ever increasing resistance in a range of grassweeds to ALS inhibitors including sulphonylureas (such as mesosulfuron/iodosulfuron, flupyrsulfuron and pyroxsulam) and to ACCase inhibitors such as fenoxaprop and clodinafop, weed control in cereals is becoming increasingly difficult. The presence of break crops (e.g. oilseed rape and field beans) in the rotation does present the opportunity to use a wider range of products with alternative modes of action as part of a rotational anti-resistance strategy.

Autumn 2014 showed the benefit of creating stale seedbeds, encouraging germination of a range of volunteers and grassweeds prior to drilling winter cereals - which could then be controlled with applications of glyphosate based products and further cultivations. This approach not only reduced the grassweed and volunteer cereal populations, but also destroyed a significant number of resistant plants.

Due to early drilling of the crop, oilseed rape growers do not usually have the same opportunity. This often leads to weeds emerging with the crop, resulting in early competition and consequent problems with their control. Nevertheless, if we are in a position this autumn where there is adequate moisture in seedbeds, then this could lead to rapid grassweed germination and give growers the opportunity to burn off weeds prior to oilseed rape drilling.

Every effort should be made this autumn to utilise this vital cultural control method if at all possible.

While focused on the control of grass weeds and optimising performance from residual graminicides, a clear benefit from utilizing the 'Micro-Wing' establishment system is an overall reduction in weed populations, both grass and broad leaved. We have seen significant reductions in charlock, cranesbill and cleavers emerging within the crop at Brampton.

Pre-emergence herbicide use

The first opportunity to apply selective herbicides in oilseed rape occurs within the first 48 hours after drilling (before the seed has the opportunity to chit) with the use of certain metazachlor based products. If this opportunity is missed, application will have to wait until the fully expanded cotyledon stage of the crop. A range of products are available and product choice should be guided by the expected weed spectrum. Metazachlor alone will control weeds such as chickweed, mayweed and speedwells and offers a limited effect on black grass.

The addition of dimethanamid-P will give improved control of cranesbill, poppy, shepherds purse and charlock.

Another option is the combination of quinmerac and metazachlor which adds cleavers, poppy, speedwells and red dead-nettle to the metazachlor susceptible weeds. A further alternative is to tank mix metazachlor based products with clomazone which offers additional control of cleavers, fools parsley, hedge mustard, shepherds purse and chickweed.

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>>> However it is important to remember that while metazachlor may be applied post emergence of the crop, clomazone should only be used as soon as possible after sowing, pre-emergence of crop and weed, or serious crop damage can result. Other potential active ingredients include the ALS inhibitor imazamox, as found in Cleranda, as a means of controlling weeds such as charlock and oilseed rape volunteers in Clearfield® varieties of oilseed rape. With this latter product it is vital that growers ensure the crop they are treating is a Clearfield® variety before spraying or they will destroy the crop. It is also essential to plan a strategy to control Clearfield® volunteers in following crops as they will be unaffected by ALS products which are often the usual methods of control.

Environmental impact management

One consideration that growers need to bear in mind when applying some of these products is that metazachlor is regularly being reported at levels above that permitted under the Drinking Water Directive (DWD). Therefore, growers should be aware of the restrictions placed on the label of metazachor based products limiting applications to a maximum individual dose of 750 gai/ha and a total dose of 1000 gai/ha over a three year period in order to avoid metazachlor exceeding the DWD limit.

In addition, stewardship guidelines have recently been issued to try to further reduce the risk of peaks appearing in water. This covers a number of strategies including use of a 6m grass buffer strip or 5m no-spray zone next to water, employing minimum tillage techniques moving only the top 4-6 cm, not applying if drains are flowing or heavy rainfall imminent and avoiding the use of metazachlor on drained fields after the end of September. A further approach is to replace some of the metazachlor with active ingredients such as dimethanamid or quinmerac, or utilize an alternative to metazachlor from the same group of chemistry, such as dimethachlor.

Many growers will be applying metazachlor at a similar time to slug pellets, where metaldehyde is causing similar problems in water. The use of these active ingredients combined with issues around autumn applied propyzamide and carbetamide means that oilseed rape growers, in particular, will have to pay considerable attention to avoiding contamination of water this autumn, if we are to avoid further restrictions on the use of these products.

Again, the 'Micro-Wing' establishment technique, developed at Brampton, has a major and positive impact in reducing the passage of herbicides and metaldehyde to field drainage systems. This improves the overall performance by retaining a.i. where it can deliver best performance and reducing the incidence of drain and groundwater contamination.

Avoiding weed competition

Post emergence, volunteer cereals and susceptible grassweeds should be controlled as early as possible from the 1 to 2 leaf stage of the weed, before they begin to compete with the crop. Effective products include a number of established graminicides such as fluazifop, propaquizafop, tepraloxydim or cycloxydim. A relatively recent addition to the armoury of grass weed actives is clethodim which has performed well in Hutchinsons' trials, particularly on black grass. However it should be remembered that this product has major restrictions on tank mixing and sequence gaps, as well as a cut off for application at the end of October in order to avoid potential crop damage.

Where grassweeds in a particular field are known to suffer from a high degree of resistance to fops and dims, an alternative to graminicides is to apply a low rate of carbetamide in combination with a silicon based wetter from mid-September, at the 3 to 4 leaf stage of the crop, to keep the grassweeds in check, followed by an application of propyzamide when soil conditions are suitable, normally from the start of November.

The strength of our work at Brampton is that field based issues are demonstrated and, as many growers are now aware, late February germinating black grass is becoming a very real issue in WOSR crops. Sequencing planned applications of carbetamide into February is having a noticeable impact on the development of these late winter emerging plants.

Complete absence of emerging weeds is always the preferred outcome, but our work is highlighting the fact that black grass emergence will occur in peak germination periods and we must expect and plan for that. Minimising the impact of direct competition and seed return are sound objectives in a long term control strategy, whereas 100% control is not.

Early weed control in oilseed rape is a vital part of the strategy to maintain the profitability of this key break crop and is also crucial in reducing the weed burden in following cereals. Your local agronomist will be able to guide you as to the most cost effective approach on your farm and keep you updated on product developments, as well as ensuring minimum impact on the environment.

For more information on any of our products or services please contact your local Hutchinsons agronomist or contact us at:

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