VARIABILITY IN BLACK-GRASS HERBICIDE SENSITIVITY

Herbicide sensitivity can vary substantially between weed populations. However, direct comparison between populations is difficult as spraying practice and site conditions vary. At NIAB, pot-based studies are often used to control these factors and provide an assessment of herbicide sensitivity.

Key black-grass (*Alopecurus myosuroides*) populations across the east and south-east regions were assessed throughout 2018 to provide an updated understanding of existing sensitivities (Figure 1). Seed was harvested from each population and grown in pots in a glasshouse. After treatment, populations showed marked differences to several active ingredients at field rate, including flufenacet (e.g. System 50), sulfonylureas (e.g. Atlantis WG) and clodinafop (e.g. Topik) (Figure 2). When the average effect of the actives was determined (Figure 3), heightened levels of cross-tolerance were found in certain populations (e.g. Peldon, Clare and Hardwick), confirming field observations.

The results demonstrate how important it is to understand black-grass populations on your farm, and to tailor management strategies accordingly.

Ongoing research will monitor the spread of herbicide tolerance between populations. Pot-based studies are a valuable tool, and can help to inform best-management practice (e.g. cultivation control), as well as being a primary step in identifying the mechanisms behind tolerance.

Figure 1: Locations of tested black-grass herbicide sensitive populations

Population	County
Bradley	Lincolnshire
Broadbalk	Hertfordshire
Carlton	Lincolnshire
Clare	Suffolk
Hardwick	Cambridgeshire
Peldon	Essex
Wragby	Lincolnshire

Figure 2: Variations in black-grass control by different active ingredients

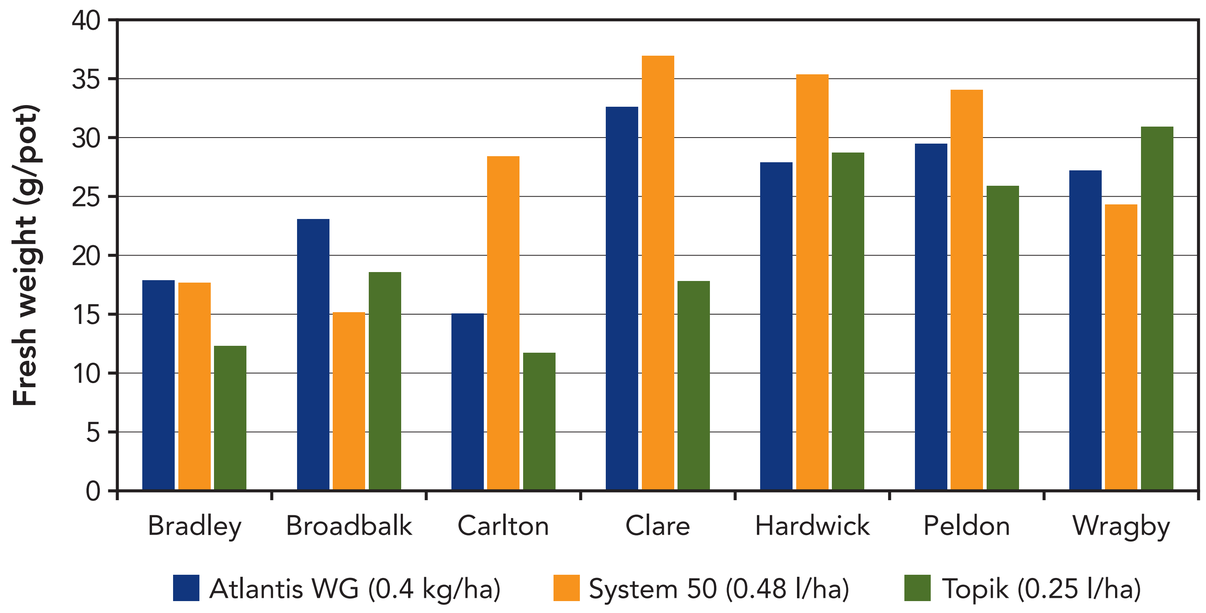
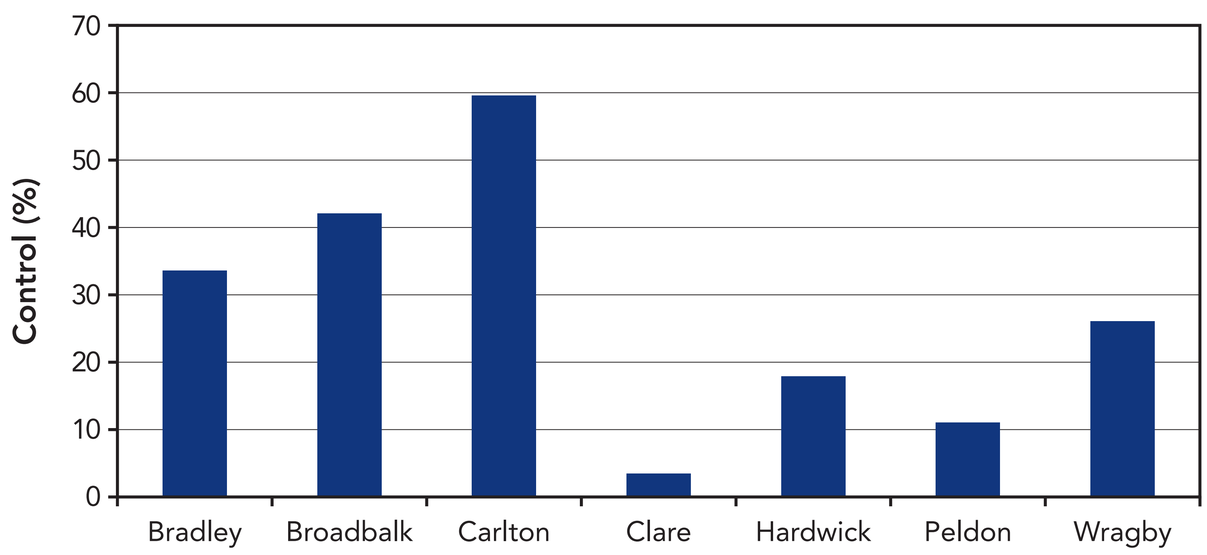


Figure 3: Average black-grass control across each location



HERBICIDE PERFORMANCE IN WINTER CEREALS

One of the biggest factors in determining the success, or otherwise, of a herbicide programme for black-grass is the level of rainfall preceding the pre-emergence application. By tracking the interaction between the performance of Crystal (flufenacet + pendimethalin) at 4.0 l/ha, relative to rainfall, the poor performance of herbicides last season can be attributed to low soil moisture in autumn 2017 (Figure 1). The gold point is last year's performance.

Black-grass is costly to manage, however, changing crops may help some growers reduce herbicide spend. Winter barley has a very competitive canopy, which can allow less herbicide to be used for the equivalent level of control in winter wheat (Figure 2). Spending less than £100/ha in barley can achieve acceptable control, whilst in winter wheat nearly £150/ha is required.

Two applications of residual herbicides is a now common approach to control black-grass in autumn sown crops. NIAB TAG data demonstrates that with this approach, sequencing the applications with just a short gap between the pre-emergence and peri-emergence application balances consistent control, without the risk of crop damage (Figure 3). All treatments received Liberator (flufenacet + diflufenican) at 0.6 l/ha + Defy (prosulfocarb) at 3.0 l/ha, with Crystal at 4.0 l/ha + Hurricane (diflufenican) at 0.25 l/ha added at each timing.

Figure 1. The effect of rainfall on herbicide efficacy (1999-2018)

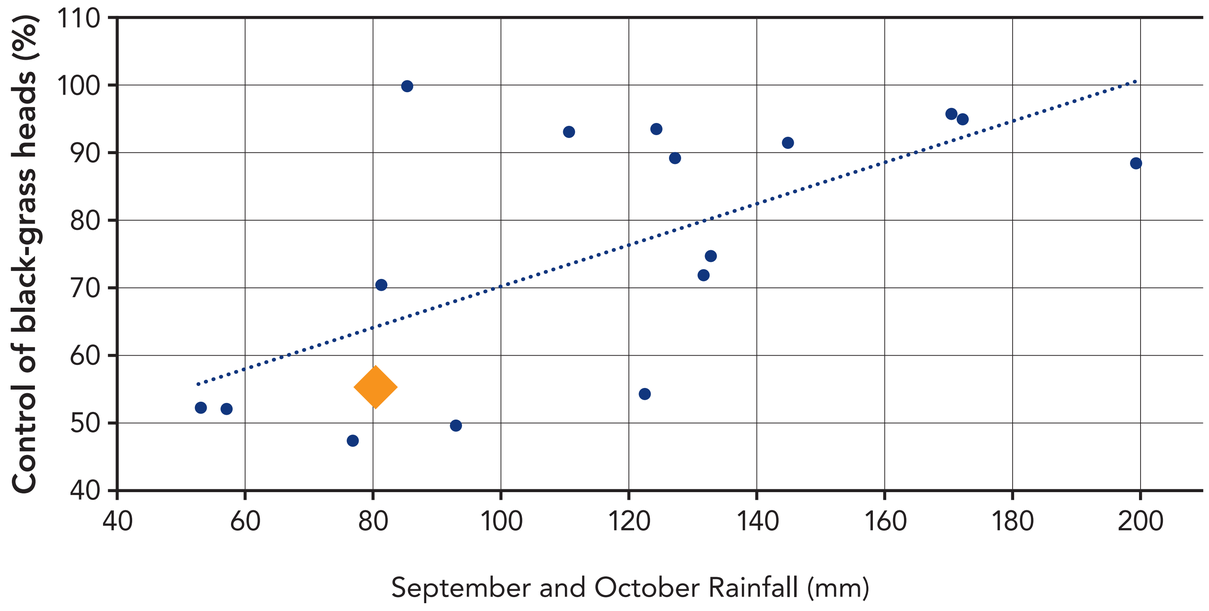


Figure 2. Cost of herbicide programmes in winter barley

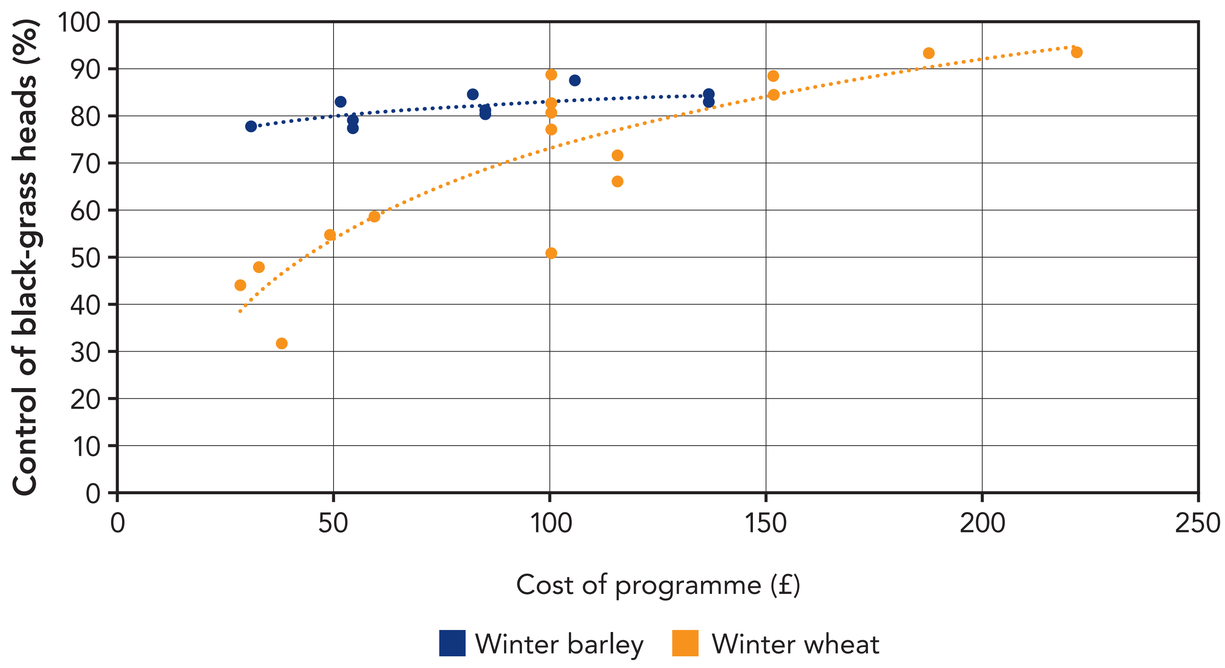
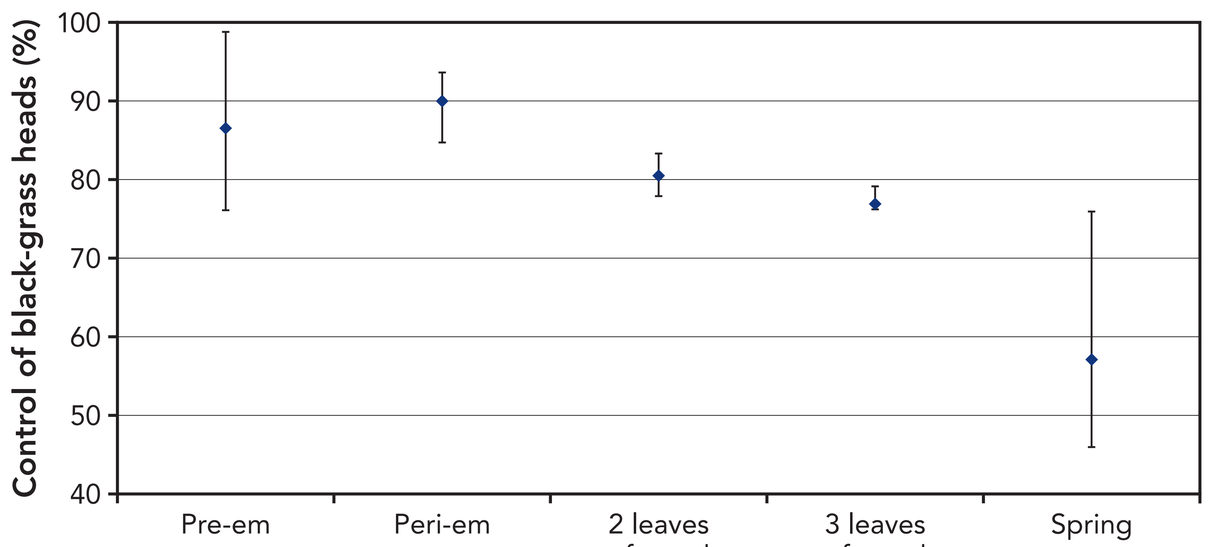


Figure 3. A wave of residual chemistry



GETTING THE MOST OUT OF BREAK CROPS FOR BLACK-GRASS CONTROL

A break crop is an opportunity to achieve extremely high levels of black-grass control, making them an essential component to a sustainable weed management system. Across several years, NIAB TAG has explored how the high potential for control can be transferred into high efficacy in practice.

Establishment approach

Adopting a low disturbance establishment technique can significantly improve control from the key active ingredient propyzamide (Kerb Flo 500™). The level of weed emergence within each system is highly dependent on seasonal factors (Figure 1).

Crop choice

The control in winter beans is higher, and more consistent, than the equivalent approach in oilseed rape. The efficacy of propyzamide is closely linked to high soil moisture and low soil temperatures, which align with a typical drilling date for winter beans. A later drilling slot enables stale seedbeds to be produced, reducing the in-crop weed burden.

Adding robustness

Integrating Kerb Flo 500™ into a programme that includes a pre-em and a follow-up graminicide provides the ultimate robustness in an oilseed rape crop. The choice of early graminicide e.g. clethodim, was the third most influential driver of black-grass control in these trials.

POTENTIAL PITFALLS

Poor (or absent) crop competition

Producing a competitive canopy is vital in both these break crops. It is taken for granted that the oilseed canopy will suppress black-grass, reducing the growth of surviving plants and preventing seed return. Poor crops, or areas within a field establishment where growth is inhibited, fail to provide this suppression.

Drilling date

Earlier drilling dates tend to be favourable to boost yields in both of these crops. However, this has the potential to put more pressure on weed control programmes. Conditions for pre-emergence herbicides may be poor, and black-grass plants are larger and better established when post-emergence herbicides are applied. The *raison d'etre* of the break crop for black-grass management is to reduce weed pressure within the rotation.

Figure 1. The impact of cultivation method on black-grass control in break crops