

“Some broadleaf weeds produce seeds that can remain viable for decades.”

# Get the better of broadleaf weeds

## Innovation Research Briefing

Spring is often the time to mop up the survivors of the residual herbicide programme and spring-emerging weeds. *CPM* looks at the research that has been carried out on broadleaf weeds and how this can help underpin better herbicide strategies for their control.

By Lucy de la Pasture

Understandably many growers have their primary focus on grassweed control, particularly as blackgrass and ryegrass have become more prevalent and tricky to control. Planning herbicide strategies around the broadleaf weed species present on the farm is an integral part of overall weed control, and that's where a good understanding of the weeds present helps decision-making, says Corteva Agriscience's Dr Alex Nichols.

"It's easy to get fixated on having a completely weed-free crop but low populations of some weeds, such as pansy, in a competitive crop aren't going to rob yield and are of value to biodiversity. So walking fields to gain knowledge of the weed spectrum and asking how competitive those

weeds are is a good starting point," he says.

According to work done in several different studies, weeds vary greatly in competitiveness, measured as their competitive index (CI). Cleavers have been shown to be severely competitive, while at the other end of the scale, scarlet pimpernel, field pansy and parsley piert are only weakly competitive (CI = 0.02–0.05).

### Competitive index

But this factor alone doesn't tell the whole story, adds Alex. "Competitiveness is useful but other things, such as the number of weeds/m<sup>2</sup> will often be more important in determining crop losses. It follows a high number of a moderately competitive weed species may cause larger losses than low populations of a highly competitive species."

Some broadleaf weeds will mainly emerge in the autumn, others in the spring and some weeds aren't fussy and will germinate at either timing. What's important is that the time of emergence will influence the number of weeds which come through any autumn-applied residuals, says Alex.

"Pansy and speedwell are often effectively controlled by diflufenican (DFF) but even where heavy stacks have been applied, some broadleaf weeds will still come through.

"The main culprits are autumn-germinating groundsel, cleavers, brassica weeds, volunteer beans, cranesbill, poppy, mayweeds and some of the umbelliferous weeds, such as wild carrot and bur chervil.

Spring and late-germinating weeds that



Alex Nichols explains the factors that affect how competitive weeds are with the crop.

will come through when residuals have run out of steam include cleavers, brassica weeds, black bindweed and other polygonums, black nightshade, fat hen, fool's parsley and fumitory.

"In spring cereals residuals can be effective for broadleaf weed control, but often don't do the whole job. They need to be applied early and dry conditions can limit their efficacy, as well as the spectrum of weeds covered," says Alex.

Ease of harvesting and the potential for contamination of the grain sample are other considerations when it comes to deciding whether a spring herbicide is justified or not, he adds.

With broadleaf weeds, prevention of seed return is particularly important, says ADAS weed scientist Lynn Tatnell. "Most grassweed species produce seed that can only persist in the soil for about three to five

years, whereas some broadleaf weeds produce seeds that can remain viable in the soil for much longer, especially poppy seeds which are viable for decades.

"This means they can take a very long time to decline in the seedbank if the parent weed has set seed, for example just one poppy can produce 20,000 seeds and these have known to still be viable after 50 years," she explains.

Because of this and the fact that broadleaf weed seeds are also capable of emerging from depth (depending on their seed size), the seedbank isn't easy to manage using the cultural methods that have become the mainstays in grassweed control, she adds.

Infestations of broadleaf weeds usually consist of a mixture of many different species, at varying densities and often in patches, which also makes management more complex than is often the case with grassweeds, which often involve a single dominant species, such as blackgrass.

One of the things that can influence the competitiveness of any broadleaf weeds is the density of the crop, says Corteva Agriscience herbicide specialist, Stuart Jackson.

In HGCA-funded trials at Long Ashton in the 1980's, the yield losses in wheat due to poppy infestation doubled as the crop density halved. "The trials showed that for a competitive weed like poppy, 9 plants/m<sup>2</sup> could be tolerated for an acceptable yield loss of 2% in a crop with 206 wheat plants/m<sup>2</sup>. This reduced to six poppies when the crop was thinner (114 plants/m<sup>2</sup>) and just 1-2 poppies in areas where the crop had just 40 plants/m<sup>2</sup>."

And research has shown that there's a double whammy where thinner crops

are concerned. As well as being less tolerant of some weeds, herbicide efficiency is also affected by their lack of competitiveness.

## Competitive crop

"According to the findings of Irish studies, a competitive crop has the ability to suppress weeds which helps herbicides be more efficient at weed control. In a more gappy, open crop then the herbicide gets no help from the crop and has a bigger job to do. Consequently, in these crops doses need to be kept closer to full label rates," he explains.

Very few studies have quantified yield loss due to broadleaf weeds. Corteva Agriscience took a herbicide trial to yield last season at Wellesbourne, and the results showed a significant reduction in yield where the



*Resistance in broadleaf weeds is potentially more difficult to manage than in grassweeds, says Lynn Tatnell.*

herbicide was applied in April compared with an early treatment in Feb.

"The site had a background population of chickweed, poppy, cranesbill and cleavers. ▶

Relative competitiveness of weeds	
	Most competitive
wild oats	↓
charlock	
corn marigold	
poppy, fat-hen, fumitory, mayweeds, chickweed, redshank, knotgrass	
deadnettles, speedwells, field pansy, annual meadow-grass	
	Least competitive

Source: Corteva Agriscience

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*Herbicide rates need to be kept up in thinner crops to compensate for the lack of help from the crop in suppressing weeds, explains Stuart Jackson.*

► Zypar (halauxifen-methyl+ florasulam) was applied on 24 Feb and yielded 1.75t/ha more than when applied on 24 April,” says Alex.

And according to Alex, the reason is a very simple one. “Studies throughout the world demonstrate that in cereals, removing weed competition early results in more productive tillers, more grains per ear and a higher thousand grain weight,” he says.

And there’s another reason to consider removing weeds while they’re small. “Herbicides such as Arylex are broader spectrum when applied to smaller weeds. If weeds are smaller, this means a better kill, lowering any risk of resistance developing,” he adds.

Often early in the season, or when conditions are dry, some weeds can be well waxed up and it can be a challenge

## Flexibility aids spring weed control

In the past, growers have limited flexibility with herbicide timings in the spring, with the major groups available — hormones such as CMPP, HBN, fluroxypyr and SU’s — all dependent on warmer conditions or little diurnal variation to work well.

Andrew Gilchrist, managing director of Scottish Agronomy, says they’ve been struggling with control of some weeds in the spring for some time now. The agronomy company provides independent advice on 60,000ha of arable crops in Scotland, as well as conducting extensive field trials.

“The problems with weed control are mostly related to resistance issues with SU’s, in chickweed and mayweed in particular. We’re also seeing some other species have become more difficult to control, although this hasn’t officially been defined as showing ‘resistance’. A good example of this is fumitory, which is now difficult to manage in the spring using hormone, SU or HBN chemistry.

“We first had Arylex in trials three years ago and were particularly impressed by its activity on fumitory — which is a major weed for us. We used a limited amount of Pixaro commercially in 2016, and again we noticed how well it worked on fumitory, particularly in colder conditions. When Zypar became available last season, we could see how useful the extended spectrum of weed control would be, particularly as mayweed and vol OSR would be controlled.

“We subsequently used a significant amount



*As well as SU resistance in poppy, mayweed and chickweed, Andrew Gilchrist reports difficulties in controlling other weeds such as fumitory.*

of Zypar, both in winter crops as a spring tidy-up, and in spring barley as the main weed control component. We found we achieved good control of cleavers and fumitory during the very dry and stressy April period. It seems to tank-mix well with a range of other products, and significantly reduces our dependence on SU herbicides, which traditionally have formed the backbone of our spring weed control strategy. It also reduces our dependence on hormone chemistry and subsequently reduces the stress from heavyweight tank-mixes.”

Andrew says the Arylex range has reduced dependency on older chemistry, which has been struggling. “We now have the flexibility to either go early in colder conditions or we can wait with the knowledge we can knock down larger problem weeds like cleavers and fumitory.”

## Be mindful of broadleaf weed resistance

Herbicide resistance has been identified in a few species of broadleaf weeds, but should this be a concern? Lynn believes that even though the numbers are currently low, resistance is always something to be aware of — particularly as it is potentially much more difficult to manage in the broadleaf weed population than in blackgrass because of the longevity of seeds in the seedbank.

“Resistance to ALS-herbicides has been identified in poppy (approx. 70 samples), chickweed (40 samples) and mayweed (12 samples). We’re seeing a steady rise in cases, but it hasn’t become widespread in the population since first reported nearly two decades ago,” she comments.

One of the reasons for this may be because of the biology of the weeds themselves which makes seed collection far from simple, she suggests. “It’s difficult to collect the seed from mayweed and

chickweed and, unlike for blackgrass, there’s a very protracted collection period. These factors may mean the incidence of resistance is underestimated,” she says.

Lynn recommends using chemistry with different modes of action to help reduce the risk of resistance developing. “Broadening the rotation is one way of doing this but the introduction of Arylex-based products (halauxifen-methyl) now means cereal growers have another alternative to sulphonyl-ureas (SUs) in the spring, and one that can be used early when weeds are smaller,” she says.

Weed size is a very important consideration when making herbicide decisions, stresses Lynn, with trials showing a considerable drop off in levels of control from SUs when weeds are bigger than label recommendations.

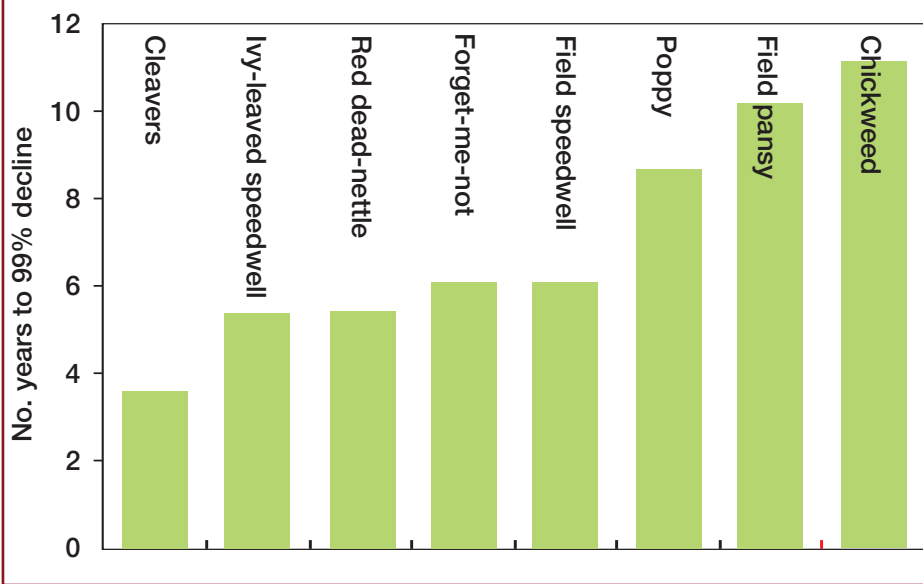
“In one trial a spring herbicide treatment was delayed because of a cold winter and spring,

which meant conditions weren’t suitable for spraying an SU until the first week of May. By that time the weeds were too big and control was poor as a result,” she recalls.

Incomplete kill of weeds is a major factor in selecting for a herbicide resistant population, explains Lynn. “In cases like this the weed has had exposure to the herbicide and then recovered. It will go on to set seed which goes into the seedbank and has the potential to be less sensitive to the herbicide than the generation before.”

The majority of resistant chickweed has been found in Scotland, which may be linked to continuous spring barley cropping and a reliance on SU herbicides for spring weed control. “There’s also traditionally been a tendency to use low rates in Scotland which increases the risk of resistance developing,” she adds.

## Broadleaf weed seed longevity



Source: Cost effective weed control AHDB Project Report 107 1995

to get the herbicide across the waxy layer and into the leaf, says Alex. "In trials the addition of an adjuvant to Pixxaro ('Arylex'+ fluroxypyr) has helped control of poppy, chickweed, polygonums and volunteer potatoes under these conditions."

Water volume and spray quality also have

an effect, with low water volumes often giving the best control, he adds. "We recommend applying Arylex products in 100-200 l/ha and a medium spray quality. You're not trying to cover the entire leaf and as long as a spray droplet hits the target, it will move into the plant and do its work." ■

## Research Briefing

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