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Winter Oilseed Rape – Integrated Weed Management

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Summary

- **Pre-emergence herbicides generally give the most cost-effective weed control**
- **Early post-emergence is a prudent option if there is a risk the crop will fail to establish**
- **There are some new early post-emergence herbicides**
- **Control volunteer cereals early to remove competition and optimise crop establishment**
- **Consider Clearfield® technology if there may be yield or quality issues due to contamination by volunteer oilseed rape or cruciferous weeds**
- **Product stewardship for metazachlor, quinmerac, propyzamide and carbetamide is important to prevent contamination of water**
- **Avoid cultivation straight after harvest as this can increase volunteers in future crops**

Introduction

Winter oilseed rape is particularly well suited to northern UK. It is an excellent break crop for wheat and barley. It can give a tonne/ha or more yield benefit to a following winter wheat crop compared with an equivalent second wheat.

Volunteer cereals are a common issue. They compete with establishing oilseed rape plants leading to a weaker crop less able to survive pest damage and winter weather. This can be a particular issue if volunteer cereals are in combine swaths. Using a chaff spreader may help prevent the intense competition that can occur in combine swaths.

Problem grass weeds resistant to a number of herbicides are an increasing threat to arable farms in Scotland, particularly those that are endeavouring to improve efficiency and sustainability through adoption of reduced cultivation. Winter oilseed rape fits well to a reduced cultivation system and can help prevent a grass weed problem developing by adoption of an integrated approach to grass weed control across the whole rotation.

Timely sowing is essential to achieve strong plants that will survive the winter. Band sowing directly into stubble speeds up crop establishment and helps ensure timely sowing. Method of crop establishment needs to be considered when planning weed control strategy.

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Increasingly stringent quality requirements can lead to deductions when selling the crop, particularly due to erucic acid exceeding limits. This may be due to contamination by volunteer oilseed rape or cruciferous weeds. Clearfield technology can help in these circumstances.

Contamination of water courses by herbicides is an on-going issue with oilseed rape herbicides metazachlor, quinmerac, propyzamide and carbetamide. Their movement into water is due to their autumn/early winter application commonly coinciding with peaks of high rainfall. Water Protection Advice Sheets for these herbicides are available on the Voluntary Initiative web site https://voluntaryinitiative.org.uk/resources/wpas/

Crop Establishment

There are several different approaches to crop establishment, from a traditional plough then one-pass cultivator/drill to a reduced cultivation or strip seeding system establishing the crop in wide rows (figure 1). There are numerous approaches to strip seeding. Many are based on a sub-soiler, the crop being drilled behind each sub-soiler leg. Simple systems use a bolt-on seeder behind each leg, others are more sophisticated and have various tines, discs or rollers that ensure the seed is at optimum depth in a good tilth. It is important that the seed is covered by soil and not left exposed to residual herbicide.

The traditional plough then one-pass cultivator/drill is a reliable method of establishing winter oilseed rape. It generally leaves a fine seedbed suitable for residual herbicides. There tend to be fewer pest problems at establishment when using this method, but it can bring up weed seeds leading to high levels of weed germination. Also it is slower and more labour-intensive than strip seeding, and can have an additional drawback that in a dry year germination of the crop may be affected and also performance of residuals may be adversely affected by lack of soil moisture. Any delay in sowing delays germination of the crop and reduces it's competiveness in the autumn.

Sub-soiler strip seeding should get the crop established earlier leading to strong crop plants that compete well with weeds within the rows. The reduced cultivation benefits soil structure and as there is less soil disturbance fewer weeds germinate, particularly between the rows. However care is needed because selectivity of pre-emergence metazachlor is reliant on 15 mm of settled soil above the seed. For clomazone, 20 mm of settled soil is required. Seeding depth needs to be accurate to ensure crop safety. Additionally, some drills may leave cracks that increase the risk of contamination of water. If the seedbed isn't ideal or the soil is dry and there are cracks then early post-emergence treatment is preferable to pre-emergence.

In crops sown in wider rows there may be potential for inter-row weeding either mechanically or by band spraying. As technology develops using vision guidance, machines are becoming more accurate and faster. This technology could be particularly useful when integrated with herbicides for control of problem weeds.

Figure 1 Crop established with wide row spacing

Herbicides

There are a number of options when treating winter oilseed rape for weeds. Many products have flexible timing and can be applied pre-emergence or early post-emergence. Pre-emergence treatment is generally most cost-effective because at this timing the broadest spectrum of weeds is controlled, and post-emergence treatment generally requires a higher dose. Some weeds such as shepherd's purse and poppy are not controlled by metazachlor post-emergence. However conditions need to be right for pre-emergence treatment – always check the product label. Product profiles are given in table 4.

Pre-emergence treatments have restrictions on what can be sown following crop failure. If there is a risk of crop failure for any reason, it may be prudent to wait until the crop has successfully established before treating.

Pre-emergence or very early post-emergence of crop and weeds

Pre-emergence herbicides

Pre-emergence treatments are generally based on metazachlor, either as the straight product or in co-formulation. At the pre-emergence timing, metazachlor based products should be applied before the crop seed chits which is generally within 48 hours of drilling, although it may be longer in a dry seed bed. Metazachlor gives a good start to annual meadow-grass, chickweed, mayweed, shepherd's purse and groundsel control. Dose of metazachlor depends on timing, soil type (the lighter the soil the lower the dose) and weed species expected (higher doses are needed for shepherd's purse and poppy, for example).

Metazachlor may be tank mixed or used as a co-formulated product with clomazone to improve shepherd's purse, cleavers and fool's parsley control. Note that clomazone requires 20 mm of settled soil to ensure crop safety. It cannot be applied post-emergence.

Other co-formulations with quinmerac, dimethenamid-p, aminopyralid, or picloram enhance the spectrum of weeds controlled, particularly when used early post-emergence (see table 2).

Restrictions when using residual herbicides

Always check the product label as there are restrictions on pre-emergence application – for instance treatment pre-emergence is not generally recommended in sands or very light soils, soil types that are stony in nature, dry, cloddy or open seedbeds, late sown crops, broadcast crops or if heavy rain is forecast. With metazachlor products, seed must be covered by 15 mm of settled soil, clomazone requires 20 mm of settled soil. Do not apply to soils prone to waterlogging.

Water protection advice for metazachlor and quinmerac is given on Water Protection Advice Sheets. Take care to follow these stewardship guidelines detailed at https://voluntaryinitiative.org.uk/resources/wpas/

Post-emergence of crop and weeds

If conditions are unsuitable at the pre-emergence timing, or if it is preferred to treat post-emergence, then there are an increasing range of options early post-emergence.

Metazachlor or co-formulations with quinmerac, dimethenamid-p, aminopyralid, or picloram can generally be applied once the crop has two fully emerged cotyledons. They control weeds when they are very small – see table 4. Metazachlor acts by root uptake, quinmerac, dimethenamid-p, aminopyralid, or picloram which are available in co-formulation have shoot or leaf uptake which enhances post-emergence performance compared with straight metazachlor.

Halauxifen-methyl is a synthetic auxin that is used in the product Belkar co-formulated with picloram. This product has a much stronger foliar action than the metazachlor-based products and can be applied slightly later in the autumn to slightly larger weeds. It controls a broad spectrum of weed species. Further post-emergence products containing halauxifen-methyl are expected in the future.

Clearfield® technology

Standards for erucic acid are becoming tighter with most contracts now being set to 2%. It is becoming more common for deliveries to exceed the 2% limit, leading to deductions in the value of the crop. Weed contamination is one possible cause - charlock, runch, black mustard, hedge mustard and crane's-bill are potential contaminants leading to raised erucic acid. Volunteer oilseed rape, particularly HEAR varieties is another possible cause.

Clearfield® technology makes it possible to control both volunteer oilseed rape and cruciferous weeds such as charlock and runch. Clearfield® varieties have been developed to be resistant to the imidazolinone herbicide imazamox, a foliar and soil-acting herbicide not otherwise used in oilseed rape. Volunteers of non-Clearfield varieties are controlled by imazamox as are cruciferous weeds. There are a number of Clearfield® varieties, including PT279CL which is on the 2019/20 AHDB Recommended List. PT279CL is a relatively early maturing restored hybrid with good stem stiffness.

Imazamox is available in mixtures applied from the crop fully expanded cotyledon stage to 8 true leaves. Imazamox + metazachlor (Cleranda) controls weeds up to the 2-4 true leaf stage depending on species. Imazamox + quinmerac (Clentiga/Cleravo) controls weed up to the 2-9 true leaf stage depending on species.

Herbicides for grass weeds and volunteer cereals

The most common issue is volunteer cereals which may be in swaths or spread out across the field. Volunteer cereals can give rise to early competition with establishing oilseed rape plants, particularly if the cereal volunteers are in swaths. In extreme cases they can lead to bare areas where crop plants have failed to establish. Using a chaff spreader on the combine may be a good idea to prevent the intense competition in swaths, although if problem grass weeds are present there is the drawback that the chaff spreader will also spread the problem grass weed seeds.

If volunteer cereals and grass weeds are emerging in the stubble prior to drilling, a glyphosate spray 2 days before drilling will help reduce early weed competition. In the establishing crop, a good approach is to control volunteer cereals early with a reduced dose early post-emergence graminicide (see table 1). This should allow strong crop plants to establish and overwinter.

If there are problem grass weeds, then an early graminicide is still a good option. If the problem is black-grass, then clethodim is a good choice as it has been shown to have greater effect on ACCase resistant black-grass than other ACCase graminicides. An alternative is carbetamide which can be applied pre-emergence of early post-emergence, it has the benefit of being active on ACCase resistant grass weeds.

A follow-up in late October / early November with a propyzamide-based product can help tidy up any remaining grass weeds. This works particularly well in crops established by min-till, because propyzamide acts by root uptake. It forms a layer in the top 20 mm of the soil and controls grass susceptible weeds that are rooting in this treated zone.

Table 1 Herbicides for grass weed control

Herbicide	propyzamide	carbetamide	propaquizafop	fluazifop-p-butyl	cycloxydim	quizalofop-P-ethyl	quizalofop-P-tefuryl	clethodim
Barley	S	S	S	S	S	S	S	S
Wheat	S	S	S	S	S	S	S	S
Oats			S	S	S	S	-	S
Annual meadow-grass	S	S	MR	R	R	R	R	S
Barren brome	S	S	S	S	S	S	-	S
Black-grass	S	S	-	S*	-	-	-	S*
Wild oat	S	S	S	S	S	S	S	S
Italian ryegrass	S	S	MS	S*	S*	S*	S*	S*
Perennial ryegrass	S	S	S	S	S	S	S	S

* Non-ACCase resistant population

Chemical residues and following crop restrictions

Product labels give advice on following crops either after a normal harvest, or in the event of crop failure. This is particularly relevant if it is intended to follow the oilseed rape with a crop established by min-till because with some herbicides ploughing is a requirement before some following crops (table 2)

Table 2 Following crop restrictions when using residual herbicides (always check the product label for full information on following crop restrictions)

Products containing	Following crops, after a normal harvest	Following crops, after crop failure
metazachlor	Any crop can be drilled	Land must be ploughed to a depth of 150 mm. Brassica, field beans, linseed, maize, oilseed rape, peas or potatoes can be sown the following spring.
quinmerac	Any crop can be drilled from 4 months from application	Land must be ploughed to 150 mm then any crop can be drilled, but not until 4 months have elapsed from application
clomazone	Land should be ploughed and cultivated to a minimum of 150 mm. cereals, oilseed rape, field beans, combining peas, maize, turnip, linseed or sugar beet may be sown	Soil should be ploughed to a minimum depth of 250 mm. In the autumn, winter cereals or winter beans may be sown, provided six weeks have elapsed since application.
dimethachlor	Any crop may be drilled	Winter oilseed rape may be re-drilled following cultivation to 150 mm. winter cereals may be drilled following ploughing to 200 mm.
imazamox	Wheat, barley, oats, oilseed rape, field beans, combining peas can be drilled	Clearfield winter oilseed rape can be re-drilled after 4 weeks provided soil is well mixed by cultivation. Winter wheat or barley can be sown after 8 weeks provided land is ploughed.
picloram	Wheat, barley, oats, maize and oilseed rape can be sown after 4 months. All other crops 3 years must have elapsed.	Only spring oilseed rape, spring wheat, spring barley, spring oats, maize or ryegrass may be planted (provided ploughing or thorough cultivation is undertaken prior to replanting).
propyzamide	Peas and beans may be sown after 10 weeks without ploughing, brassicas and some listed vegetable crops may be sown after 25 weeks without ploughing. Land must be ploughed before cereals or grasses and 30 weeks must have elapsed. For other crops not listed on the label land must be ploughed and 40 weeks have elapsed.	

Post-harvest control of volunteer oilseed rape

Oilseed rape seeds lost at harvest can lead to a volunteer oilseed rape problem. Volunteer oilseed rape can:

- Be difficult to control in high value vegetable crops
- Become infected with clubroot and carry over this soil-borne disease
- Contaminate future oilseed rape crops leading to possible yield or quality issues and reduction in value of the crop – particularly excessive erucic acid

Shed oilseed rape seeds generally have very low dormancy and given adequate moisture will germinate if left on the soil surface (figure 2). It can be a mistake to undertake light cultivation to stimulate germination because this can bury some seeds below the germination depth leading to enforced dormancy. These dormant seeds can survive in the soil for several years, leading to volunteer oilseed rape problems in future crops.

Figure 2 Re-growth in stubble

Table 3 Weed susceptibility to residual and post-emergence herbicides (always check the label)

Herbicides / Weeds	clomazone	metazachlor + clomazone	metazachlorr	napropamide	metazachlor + quinmerac		metazachlor + dimethamid-p		metazachlor + dimethamid-p + quinmerac		dimethachlor
Weed emergence stage	Pre	Pre	Pre	Pre	Pre	Post	Pre	Post	Pre	Post	Pre
Annual meadow-grass	S	MS	S	S							
Black-grass		S	MS	MS	S		MR		MS	MR[1]	
Charlock											MR
Chickweed, Common	S	S	S		S	S	S	S[1]	S	S[2]	S
Cleavers	S	S	MR	S	S	S	S		S	S[2]	
Corn marigold											
Cranesbill species [CSP]		S	MR		MR/R		S	S[C]	S	S[C]	
Dead nettle, Red	S	S	S		S	S			S	MS[C]	S
Fat Hen	MS			MS	MR	MR			S		
Fool's parsley					S	S					
Forget-me-not	S	S	S		S		MS	S	MS		S
Fumitory											
Groundsel	S	S	S	MS	S				S		S
Hedge mustard	S										
Hemp nettle / Day nettle											MS
Mayweed , scentless	S	MS	S	S	S	S					
Mayweed, scented		S		S	S	S	S		S		S
Mustard, hedge / white											
Nettle, Small				MS	S				MR		
Pansy, Field							MR				
Parsley piert		S	S		S	S					
Penny-cress, Field	S										
Poppy, Corn		S	MS		S	S	S		S		MR
Runch											
Shepherd's purse	S	MS	S		S	S	S		S	MS[2]	MS
Sowthistle [FS]	S				S				S		MR
Speedwell, Common field	S		S		S	S	S	MS[1]	S	S[2]	
Speedwell, Ivy-leaved	S	MR	S		S	S			S		MR
Spurrey, Corn					S	MS					
Thistle, creeping [FS]											
Volunteer cereals											
Volunteer oilseed rape											

Table 3 cont.

Herbicides / Weeds	metazachlor + aminopyralid + picloram		carbetamide	dimethenamid-p + quinmerac		metazachlor + Imazamox	imazamox + quinmerac	bifenox (EAMU)	halauxifen-methyl + picloram	clopyralid	clopyralid + picloram	propyzamide	propyzamide + aminopyralid	pyridate
Weed emergence stage	Pre	Post	Post	Pre	Post	Post	Post	Post	Post	Post	Post	Post	Post	Post
Annual meadow-grass			MS									S	S	
Black-grass			MS									S	S	
Charlock						S	S							
Chickweed, Common	S	S	S	MS	MS	S	S		MS			S	S	S
Cleavers	MR	MS		S	S[2]	MS	S	MR[3]	S		MS	MR	MR	S
Corn marigold										S				
Cranesbill species [CSP]				S	S[C]	MS	S	S	S	S				
Dead nettle, Red	S	S		S	S[2]	S	S	S	S					S
Fat Hen	MS	S				MS	S					S	S	S
Fool's parsley											S			
Forget-me-not				MS				MS				MS	MS	
Fumitory						S			S[1]		S			S
Groundsel						S	S			S	S			
Hedge mustard														
Hemp nettle / Day nettle														
Mayweed , scentless						S	S			S	S		S	
Mayweed, scented				S		S	S		S	S	S		S	
Mustard, hedge / white		S		S		S	S		S					
Nettle, Small		S										S	S	
Pansy, Field	MR	MR				MS		S						
Parsley piert				S		S								
Penny-cress, Field	MS	S					S		MS					
Poppy, Corn	S	S		S		S	MS	MS	S				S	
Runch						S	S							
Shepherd's purse	MS	MS		S		S	MS	MR	S					
Sowthistle [FS]				S			MS				S			S
Speedwell, Common field	MS		S	S	S[2]	S	S					S	S	
Speedwell, Ivy-leaved	MR	MR	S	S	S[2]	S	S	S				S	S	
Spurrey, Corn														
Thistle, creeping [FS]										S	S			
Volunteer cereals			MS			MS	S					S	S	
Volunteer oilseed rape						S	S							

FS - grown from seed CSP – check label for species controlled C - cotyledons
1 – 1 true leaf or whorl
2 - 2 true leaves or whorls

Table 4 Winter Oilseed Rape Herbicide Product Profiles

Active Ingredient	Product	Company	Crop growth stage	Weed size	Timing and notes
Pre-emergence of crop and weeds					
clomazone	Blanco, Centium, 360 CS, Cirrus CS, Mohawk CSand others	FMC, Headland, Adama, Sipcam and others	Pre-em	Pre-em	Tank mix with metazachlor to add cleavers and improved shepherd's purse control. Ensure seed is well covered by 20 mm of settled soil – can give transitory bleaching of emerging crop. See note on restrictions when using residual herbicides.
metazachlor + clomazone	Circuit Syntec, Nimbus SC	BASF, FMC	Pre-em	Pre-em	Co-formulations of metazachlor and clomazone. Good on cleavers and shepherd's purse, speedwells & groundsel. See note on restrictions when using residual herbicides.
dimethachlor	Teridox	Syngenta	Pre-em	Pre-em	Similar weed spectrum to metazachlor, but mainly shoot and hypocotyl uptake. See note on restrictions when using residual herbicides.
napropamide	Devrinol	UPL	Pre-em	Pre-em	Used in vegetable crops at higher dose than that used in oilseed rape. Reduced weed spectrum at lower OSR dose. Napropamide is also available in a number of co-formulations. See note on restrictions when using residual herbicides.
Pre-emergence or very early post emergence of crop and weeds					
metazachlor	Butisan S, Fuego, Rapsan Solo, Stalwart and others	BASF, Belchim, Adama, UPL and others	Prior to chitting (generally within 48 hours of drilling) or from the fully expanded cotyledon stage to 8 true leaves	Pre-em	Gives cost-effective control of a range of weeds pre- or early post-emergence. Weaker on cleavers, poppy and shepherd's purse. See note on restrictions when using residual herbicides.
metazachlor + quinmerac	Katamaran, Legion, Naspar Extra and others	BASF, Adama, Globachem mv and others	Prior to chitting (generally within 48 hours of drilling) or from the fully expanded cotyledon stage to 8 true leaves	Pre-em to 1-4 leaves depending on species	Quinmerac adds cleaver control to two whorls and mayweeds to 4 leaves. See note on restrictions when using residual herbicides.
metazachlor + dimethenamid-p	Springbok, Muntjac, Sika	BASF, HMpG GmbH	Prior to chitting (generally within 48 hours of drilling) or from the fully expanded cotyledon stage to 6 true leaves	Cotyledon to 1 true leaf depending on species	Dimethenamid-p improves shepherd's purse control compared with straight metazachlor. Weed control is best pre-em. See note on restrictions when using residual herbicides.
metazachlor + dimethenamid-p + quinmerac	Shadow, Elk, Katamaran Turbo, Medirac	BASF, Euro Chemicals s.r.o.	Prior to chitting (generally within 48 hours of drilling) or from the fully expanded cotyledon stage to 6 true leaves	Cotyledon to 2 true leaf depending on species	Good post emergence control of chickweed, small shepherd's purse, red deadnettle and speedwells. See note on restrictions when using residual herbicides.

metazachlor + aminopyralid + picloram	Ralos	Corteva	Prior to chitting (generally within 48 hours of drilling) or at the fully expanded cotyledon stage	Up to early post-emergence of weeds	Exclusive to Agrii. Residual and foliar acting and has a useful weed spectrum at the higher dose rate. See note on restrictions when using residual herbicides.
dimethenamid-p + quinmerac	Butisan Pro, Tanaris, Topkat	BASF	Prior to chitting (generally within 48 hours of drilling) or from the fully expanded cotyledon stage to 8 true leaves	Cotyledons – 2 leaves	Controls a range of weeds, although chickweed is only moderately susceptible. See note on restrictions when using residual herbicides..
carbetamide	Crawler, Kartouch 60 WG	Adama, Aako BV	Pre-em or from crop emerging until the 3 leaf stage	Seedling to 4 leaves depending on species	Acts primarily by root uptake. Useful product for black-grass control in cereal / oilseed rape rotation. For black-grass control it can be used in sequence – it is applied pre-emergence or early post-emergence then followed by propyzamide.
Post-emergence of crop and weeds					
imazamox + metazachlor	Cleranda	BASF	Post-em from 2 expanded cotyledons to 8 true leaves	Cots to 6 leaves depending on species	Only for use with Clearfield varieties. Gives broad spectrum weed control including control of non-Clearfield oilseed rape volunteers. Improved control of some species can be achieved by using with Dash Adjuvant. Note that volunteers of Clearfield oilseed rape need to be treated in following crops using a non-ALS herbicide. See note on restrictions when using residual herbicides.
imazamox + quinmerac	Cleravo	BASF	Post-em from 2 expanded cotyledons to 8 true leaves	2 – 8 leaves depending on species	Only for use with Clearfield varieties. Gives broad spectrum weed control including control of non-Clearfield oilseed rape volunteers. Improved control of some species can be achieved by using with Dash Adjuvant. Note that volunteers of Clearfield oilseed rape need to be treated in following crops using a non-ALS herbicide. See note on restrictions when using residual herbicides.
halauxifen-methyl + picloram	Belkar	Corteva	Post-em from 2-8 leaves	1-15 cm high/across depending on species	Substantial foliar activity with some residual effect. Best to apply to small weeds, it can be applied as a sequential 2 x ½ dose or a single full dose from 15 September to 31 December.
propyzamide	Kerb Flo, Solitaire, Judo and others	Corteva, Certis, Headland and others	Post-em from 1 October after 3 leaf stage once soil temperature is below 10ºC	Pre-em to established plant depending on species	Can be used to control volunteer cereals and problem grass weeds such as black-grass in sequence following early post-em application of another graminicide. See note on restrictions when using residual herbicides.
propyzamide + aminopyralid	AstroKerb, Clayton Propel Plus and others	Corteva, Clayton and others	Post-em from 1 October after 3 leaf stage once soil temperature is below 10ºC	Pre-em to established plant depending on species	Similar to propyzamide, but added control of mayweed species. See note on restrictions when using residual herbicides.
Active Ingredient	Product	Company	Crop growth stage	Weed size	Timing and notes

clopyralid	Dow Shield 400 SC, vivendi 200 and others	Corteva, UPL and others	Applied in the spring before flower buds are visible	2-10 leaves depending on species	No autumn application. Useful to control sow thistles, creeping thistle from seed, mayweeds and groundsel in the spring. Leaves residues in oilseed rape straw that can affect following crops, or contaminate manure if straw is used for bedding.
clopyralid + picloram	Galera	Corteva and others	From 1 March until before flower buds are visible above the canopy	150 mm high/across	No autumn application. Useful if there are mayweeds and cleavers. Leaves residues in oilseed rape straw that can affect following crops, or contaminate manure if straw is used for bedding.
cyloxydim	Laser	BASF	From 2 expanded cotyledons until the canopy prevents spray penetration	2 leaf to 3 tillers	Volunteer barley requires lower rate than volunteer wheat. Grass weeds that have ACCase resistance will not be fully controlled. Use with an approved adjuvant.
fluazifop-p-butyl	Fusilade Max and others	Syngenta, Nufarm and others	From 1 leaf stage to before flower buds are visible	1 leaf to fully tillered	Best applied when weeds are small. Grass weeds that have ACCase resistance will not be fully controlled.
propaquizafop	Falcon, Shogun and others	Adama and others	From 2 expanded cotyledons to before flower buds are visible	2 leaves to tillered	Best applied when weeds are small. Grass weeds that have ACCase resistance will not be fully controlled.
clethodim	Centurion Max and others	Arysta, Interfarm	4 leaves until end October	3 leaves to fully tillered	Apply when crop and weeds are actively growing. Grass weeds that have ACCase resistance may not be fully controlled, however clethodim may control some populations that have ACCase resistance to other graminicides.
quizalofop-p-ethyl	Leopard 5 EC,	Adama	From 2 expanded cotyledons until the canopy prevents spray penetration	2 leaves to tillered	Best applied early to actively growing weeds. Grass weeds that have ACCase resistance will not be fully controlled.
quizalofop-p-tefuryl	Panarex	Arysta,	From 2 expanded cotyledons until the canopy prevents spray penetration	2 leaves to end of tillering / 1st node depending on species	Apply to actively growing weeds. Grass weeds that have ACCase resistance will not be fully controlled.
pyridate	Lentagran WP (EAMU)	Belchim	6-9 leaved to before stem elongation	Cotyledons – 4 leaves	Useful control of cleavers, groundsel, speedwells small chickweed, bindweed and shepherd's purse. An expensive option.
bifenox	Fox, Cleancrop diode, Clayton Belstone (EAMUs)	Adama, United Agri Products, Clayton	Apply before flower buds visible	Up to 50 mm across/ high	For control of crane's-bill, field pansy, red-dead nettle, poppy and speedwells. For crop safety reasons may be best to split dose

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