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Implications of not controlling slugs in oilseed rape and wheat in the UK

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1. Abstract

Metaldehyde is the main pesticide used to control slugs in oilseed rape and wheat in the UK. It is, however, often detected in raw water above the drinking water standard, with peaks following rainfall. Unless action is taken, regulatory restrictions, or even withdrawal, may be enforced. The Metaldehyde Stewardship Group has, therefore, introduced a voluntary pilot scheme. Two selected pilot catchments represent the first phase of measures where zero metaldehyde is advocated on the identified, 'High Risk' fields.

In the UK, approximately 59% of the total area of oilseed rape is affected by slugs. The estimated annual yield loss caused by this pest is 4% of the area affected; in some instances, yield losses may be much higher. Without pesticides, the calculated annual tonnage lost is 54,354 tonnes, costing the industry approximately £18 million per year (2.4% of the total crop value).

Approximately 22% of the total area of wheat in the UK is affected by slugs. The estimated annual yield loss caused by this pest is 5% of the area affected; in some instances, again, yield losses may be much higher. Without pesticides, the calculated annual tonnage lost is 153,280 tonnes, costing the industry approximately £25.5 million per year (1.1% of the total crop value).

It is calculated that the total annual cost to the UK industry from not controlling slugs in oilseed rape and wheat is approximately £43.5 million.

In cereals, seed treated with the neonicotinoid, clothianidin, can help reduce seed kill but not later seedling damage. Cultural control options, including cultivation techniques and seed bed preparation, are already routinely carried out in most situations. Parasitic nematodes can provide a reduction in damage for about six weeks after application but success is dependent on wet conditions following application. This option is generally only economically viable for use in high value crops.

2. Introduction

Slugs are an important pest of oilseed rape and cereals. In oilseed rape, slugs are most damaging to seedlings because the growing point of a germinating oilseed shoot is above ground. Serious damage occurs up until the four true leaf stage (AHDB, 2013). In cereals, slugs are most damaging when they cause seed hollowing. A single slug can kill up to 50 seeds in the first week after sowing. Slugs will also cause damage to cereal crops by feeding on shoots and leaf shredding. Crops are most vulnerable up to GS14 (four leaves unfolded) but remain vulnerable up to GS21 (one main shoot and one tiller).

In oilseed rape and wheat, the main pesticide used to control slugs is metaldehyde (Garthwaite *et al.*, 2013). Metaldehyde is, however, often detected in raw water above the drinking water standard, with peaks following rainfall. While levels detected pose no danger to health or the environment, the UK's environment agencies and Defra are responsible for the implementation of the Water Framework Directive. Unless action is taken, regulatory restrictions, or even withdrawal, may be enforced (www.getpelletwise.co.uk). The Metaldehyde Stewardship Group has, therefore, introduced a voluntary pilot scheme. Two selected Pilot Catchments represent the first phase of measures where zero metaldehyde is advocated on the identified 'High Risk' fields (all year round) (www.getpelletwise.co.uk).

The chemical alternatives to metaldehyde are methiocarb and ferric phosphate; however, in December 2013 the European Commission voted to ban methiocarb slug pellets (<http://ec.europa.eu>).

This review outlines the potential implications to wheat and oilseed rape production, should slugs be left totally untreated.

3. Oilseed rape

3.1. Area treated with molluscicide and repellent actives

- The 5-year average harvest area of oilseed rape in the UK is 677,396 ha (Defra, 2014).
- The 5-year average area of oilseed rape treated by molluscicides and repellents in the UK is 428,398 ha (63.2% of the 5-year average harvest area). The breakdown for molluscicide and repellent active ingredients is:
 - Metaldehyde – 393,603 ha – 58.1% of the 5-year average harvest area.
 - Methiocarb – 25,123 ha – 3.7% of the 5-year average harvest area.
 - Other* – 9,672 ha – 1.4% of the 5-year average harvest area.

(Garthwaite *et al.*, 2009; Garthwaite *et al.*, 2011; Garthwaite *et al.*, 2013)

* Other molluscicides and repellents include calcium chloride, ferric phosphate and unspecified molluscicides.

3.2. Area affected by slugs

- Typically, 59% of the total area of oilseed rape is affected by slugs (Clarke et al., 2009), although this area may vary from year to year depending upon climatic conditions. The 5-year average harvested area of oilseed rape is 677,396 ha (Defra, 2014).
- It is, therefore, assumed that 399,664 ha are affected by slugs annually.
- The typical area affected is, therefore, approximately 28,735 ha less than the typical area treated.

3.3. Implications

- The estimated annual yield loss caused by this pest is 4% of the area affected (Clarke et al., 2009). In years favourable to slugs, such as 2012, losses may be much higher.
- The 5-year average annual yield of oilseed rape is 3.4 t/ha (Defra, 2014).
- 4% of 399,664 ha at 3.4 t/ha is, therefore, 54,354 tonnes lost due to slugs annually.
- The 2008/09 to 2012/13 average delivered Erith oilseed rape price is £332 per tonne (AHDB/HGCA Market Intelligence, 2014).
- 54,354 tonnes at £332 per tonne is, therefore, £18,045,613 (~£18M) loss due to slugs if untreated annually.
- To put this in context, the 5-year average production of the whole crop is 2,303,146 tonnes (Defra, 2014), a calculated value of £764,644,605 using the 5-year average oilseed rape price.
- It is, therefore, assumed that, from an average yield loss of 4%, 2.4% of the total value of the crop could be lost as a result of slugs in untreated crops annually.

4. Wheat

4.1. Area treated with molluscicide and repellent actives

- The 5-year average harvest area of wheat in the UK is 1,857,937 ha (Defra, 2014).
- The 5-year average area of wheat treated by molluscicides and repellents in the UK is 512,623 ha (27.6 % of the 5-year average harvest area). The breakdown for molluscicide and repellent active ingredients is:
 - Metaldehyde – 467,294 ha – 25.2% of the 5-year average harvest area.
 - Methiocarb – 38,099 ha – 2.1% of the 5-year average harvest area.
 - Other* – 7,230 ha – 0.4% of the 5-year average harvest area.

(Garthwaite et al., 2009; Garthwaite et al., 2011; Garthwaite et al., 2013)

* Other molluscicides and repellents include calcium chloride, ferric phosphate and unspecified molluscicides.

4.2. Area affected by slugs

- Typically, 22% of the total area of wheat is affected by slugs (Clarke et al., 2009), although this area may vary from year to year depending upon climatic conditions.
- The 5-year average harvested area of wheat is 1,857,937 ha (Defra, 2014).
- It is, therefore, assumed that 408,746 ha are affected by slugs annually.
- The typical area affected is, therefore, approximately 103,877 ha less than the typical area treated.

4.3. Implications

- The estimated annual yield loss caused by this pest is 5% of the area affected (Clarke et al., 2009). In years favourable to slugs, such as 2012, losses may be much higher.
- The 5-year average annual yield of wheat is 7.5 t/ha (Defra, 2014).
- 5% of 408,746 ha at 7.5 t/ha is, therefore, 153,280 tonnes lost due to slugs annually.
- The 2008/09 to 2012/13 average of both Liverpool delivered full spec bread wheat and Erith Anglia feed wheat is £166 per tonne (AHDB/HGCA Market Intelligence, 2014).
- 153,280 tonnes at £166 per tonne is, therefore, £25,444,447 (~£25.5M) loss due to slugs if untreated annually.
- To put this in context, the 5-year average production of the whole crop is 13,934,528 tonnes (Defra, 2014), a calculated value of £2,313,131,565 using the 5-year average wheat price.
- It is, therefore, assumed that, from an average yield loss of 5%, 1.1% of the total value of the crop could be lost as a result of slugs in untreated crops annually.

5. Alternative control options

In cereals, seed treated with the neonicotinoid, clothianidin, can help reduce seed kill, but not later seedling damage. On 24 May 2013, a restriction on the use of three pesticides belonging to the neonicotinoid group (clothianidin, imidacloprid and thiamethoxam) was adopted by the European Commission. The restriction came into force as of 1 December 2013. It targets pesticides used in the treatment of crops attractive to bees and for cereals; however, the use of clothianidin to control slugs in cereals is unaffected as it only affects cereal crops sown between January and June.

5.1. Cultivation and seedbed preparation

Slug populations can be reduced by ploughing and, compared to direct drilling, minimum tillage can also give a considerable reduction in slug damage. A fine, consolidated seedbed will protect

seeds and prevent slugs accessing seedlings before emergence. In wheat, to decrease the risk of slug damage, sowing depth can be increased to 4–5 cm if the seedbed is cloddy. It is worth noting that the optimum sowing depth for good establishment is, however, 4 cm as sowing too deep can delay or decrease establishment (HGCA, 2008).

In oilseed rape, consolidation (rolling) after sowing is already recommended in the most situations to retain moisture, reduce slug risk by restricting movement through soil and allow optimal performance of soil-applied herbicides (HGCA, 2014).

The calculations in sections 3 and 4 are based on a loss of chemical control, not chemical and cultural control.

5.2. Biological control

Phasmarhabditis hermaphrodita is a parasitic nematode that enters the slug’s shell sack (mantle), where it reproduces, causing the mantle to burst and the slug to die. Unlike pellets, nematodes can target soil-dwelling slugs, not only surface-active slugs. However, the success is dependent on wet conditions following application. In ideal conditions, nematodes will provide a reduction in damage for about six weeks after application (AHDB, 2013). This is an expensive option and is generally only economically viable for use in high value crops.

6. Conclusion

Table 1 summarises the crop protection implications resulting from the restrictions including the area affected, potential yield losses, and costs to the industry. It is calculated that the total annual cost to the UK industry from not controlling slugs in oilseed rape and wheat is approximately £43.5 million.

Table 1. Summary of crop protection implications of growing oilseed rape (OSR) and wheat if slugs were not controlled.

| | OSR | Wheat |
|---|--------------------|--------------------|
| Total area of UK crop affected | 59% | 22% |
| Total area of UK crop affected* | 399,664 ha | 408,746 ha |
| Average annual yield loss from affected area | 4% | 5% |
| Total annual yield loss using no molluscicide treatments | 54,354 t | 153,280 t |
| Cost to UK industry using no molluscicide treatments* | £18,045,613 | £25,444,447 |
| | £43,493,060 | |
| Proportion of total crop value* | 2.4% | 1.1% |

* Based on 5-year (2008/09–2012/13) average areas and prices.

7. References

AHDB (2013) Integrated slug control. Autumn 2012. AHDB Information Sheet 02.

AHDB/HGCA Market Intelligence (2014) Market Data Centre.

<http://data.hgca.com/?WTbannerId=Markets;UseFulTools;MDC>

Clarke J, Wynn S, Twining S, Berry P, Cook S, Ellis S, Gladders P (2009) Pesticide availability for cereals and oilseeds following revision of Directive 91/414/EEC; effects of losses and new research priorities. HGCA Research Review No. 70

Defra (2014) Statistical data set. Structure of the agricultural industry in England and the UK at June. www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june

Garthwaite D, Barker I, Parrish G, Smith L, Chippindale C, Pietravalle S (2011) Arable crops in the United Kingdom 2010. Pesticide usage survey report 235.

Garthwaite D G, Hudson S, Barker I, Parrish G, Smith L, Pietravalle S (2013) Arable crops in the United Kingdom 2012 (Version 2). Pesticide usage survey report 250.

Garthwaite D G, Thomas M R, Parrish G, Smith L, Barker I (2009) Arable crops in Great Britain 2008. Pesticide Usage Survey Report 224.

HGCA (2008) The wheat growth guide. Spring 2008, second edition. HGCA Guide 39.

HGCA (2014) HGCA Oilseed Rape Guide. Winter 2014. HGCA Guide 55.