

**Project number:** 5618  
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## Weed control with herbicides in forage maize in Ireland



### Key external stakeholders:

Maize growers, advisers and agronomists, ag-chem companies

### Practical implications for stakeholders:

Since atrazine, which provided a simple and effective means of weed control in maize, was banned alternative herbicide strategies using new and/or existing herbicides that provided consistent control under Irish conditions were required.

- Allows maize growers to effectively deploy new and existing herbicide products to achieve acceptable levels of weed control in forage maize in Ireland.
- Provides independent assessment of available herbicides in maize to growers and advisers/agronomists
- Provides information to support registration in Ireland of new herbicide products

### Main results:

- Good weed control is essential to achieving high yields of good quality forage maize.
- Excellent weed control can be achieved using a combination of existing herbicides and new herbicides introduced to replace atrazine
- Herbicides applied at sowing will give good weed control under the plastic in crops sown with a plastic mulch.
- Weed control in the uncovered areas between the plastic, where unsuitable conditions for residual herbicides are experienced can be poor, requiring a follow-up herbicide application.
- An alternative strategy is to apply herbicide under the plastic at sowing and apply a post-emergence herbicide in the uncovered areas.
- In crops sown without a plastic mulch, a post emergence herbicide with both contact and residual activity gives consistently good results

### Opportunity / Benefit:

The results have been incorporated into Teagasc advisory recommendations for weed control in maize.

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**External collaborators:** Samco Agricultural Manufacturing Ltd

### 1. Project background:

Control of broadleaved and annual grass weeds is one of the critical factors in successful forage maize production. Some 50% of the maize crop in Ireland is grown under plastic mulch. This provides the ideal micro-climate for maize germination and early growth but also provides ideal conditions for weed growth. Weed competition can severely stunt the growth of maize seedlings making early control of weeds vital for high yields. The presence of the plastic mulch requires that effective weed control under the plastic must be achieved by herbicide application at the time of sowing. Weed control in maize grown without a plastic mulch can be achieved through pre-emergence and/or post emergence herbicide applications.

Atrazine, an effective pre-emergence residual herbicide, had filled an important role in maize weed control for decades but the European Union banned its use in Ireland after 2007. Therefore effective alternative strategies were required. A number of new herbicides had become available to replace atrazine but little was known regarding their use for pre and post emergence weed control and their effects on the crop under Irish conditions.

This study aimed to examine how these herbicides could be best deployed to achieve effective weed control under Irish conditions in both maize crops grown with and without a plastic mulch.

### 2. Questions addressed by the project:

Can new and existing herbicides be used to achieve acceptable weed control in forage maize, sown both with and without plastic, in Ireland in the absence of atrazine?

How do pre-emergence and post emergence herbicide strategies compare for maize sown with and without plastic?

### 3. The experimental studies:

Four trials examining weed control in maize crops sown with a plastic mulch were carried out between 2008 and 2010. Three of the trials were located at Knockbeg, Co. Laois, where the site had a history of maize production and presented a high weed challenge and one at Kildalton College, Co. Kilkenny, where maize was only grown occasionally and which presented a low weed challenge. All trials with plastic were sown, and herbicides applied, using the Samco drill system (Samco Agricultural Machinery, Co. Limerick, Ireland), with the exception of one treatment in 2010 where herbicide was applied under the plastic at sowing and then a post emergent herbicide was applied in the uncovered areas.

Five trials examining weed control in maize crops sown without a plastic mulch were carried out between 2008 and 2010. Three of the trials were located at Knockbeg, Co. Laois and two at Kildalton College, Co. Kilkenny. These trials included both pre-emergence and post emergence herbicide applications.

A range of herbicides, including those commercially available in Ireland and products not yet available were included in both the plastic and open sown trials. Weed control was assessed 1-3 months after herbicide application and for a selection of the trials yield was assessed.

### 4. Main results:

The trials demonstrated that where poor weed control was achieved silage yields and grain content can be reduced significantly, reinforcing the need to achieve effective weed control. In crops grown without plastic silage yield where no herbicide was applied was reduced by between 15% and 95% compared to the best herbicide treatments depending on season. In crops grown with a plastic mulch silage yield where no herbicide was applied was reduced by between 50% and 85% compared to the best herbicide treatments depending on season. As well as reducing silage yield the grain content of the silage was also significantly reduced where there was no weed control

However the trials also indicated that total weed control is not necessary to achieve maximum yields and the presence of a low level of weeds, as indicated by control levels greater than approximately 80%, but less than 100%, in these trials generally does not have a significant negative effect on yield. However, where

weeds with potential deleterious effects on livestock production such as nightshade exist full control should be the objective. Additionally where weeds are not fully controlled they can produce seeds which can add to the soil weed seed bank and lead to increased weed populations in future crops.

#### **Weed control in crops grown without plastic**

Excellent control of both broadleaved and grassweeds in maize crops sown without a plastic mulch can be achieved with products available currently on the market. Control can be achieved using either a pre- or post emergence herbicide or a mixture of herbicides.

Products containing pendimethalin tank-mixed with Cadou Star, applied at sowing, gave good control of a range wide range of weeds but should be avoided where either redshank or bindweed are likely to be prevalent. Where a pre-emergence herbicide is used a follow-up post emergence application may be required, particularly where conditions during the period after sowing are not suitable for the activity of residual herbicides applied at or soon after sowing.

However in these trials the most consistent weed control in crops grown without plastic was achieved where a herbicide with both contact and residual activity was applied post emergence, when the crop had reached the 3-4 leaf stage. In this regard Calaris applied at 60-100% label rate gave excellent and consistent control of broadleaved weeds and gave reasonable control of the low populations of grassweeds encountered in the trials. In these trials there was little evidence of reduced efficacy on broadleaved weeds where reduced rates of Calaris were used. Other options for post-emergence use include Callisto or Bromotril, although these options require careful timing to achieve season long control. Where scutch or large populations of other grassweeds are present a graminicide will need to be included as part of a tank mix. Options include either Titus or Accent both of which are post-emergence herbicides.

#### **Weed control in crops grown with plastic**

Achieving good weed control consistently in crops sown with a plastic mulch with a single herbicide application at sowing remains difficult especially when conditions during the period after sowing are not suitable for the activity of residual herbicides. While very good control can be achieved under the plastic mulch using a pendimethalin formulation applied alone, where the weed challenge is low, or tank-mixed with either Calaris or Cadou Star for high weed challenge situations, persistency of control in the uncovered area between the plastic mulch is often less than satisfactory. The poor control in the uncovered area would appear to be as a result of an uneven and sometimes cloddy surface that makes persistent control using pre-emergence residual herbicides difficult. A follow-up post-emergence treatment may be required to give control of these weeds in the uncovered area although note needs to be taken as to the maximum number of applications in a season of the herbicides being used; in some cases a product may only be used once in a season.

As an alternative to attempting to achieve season long control in the uncovered areas in crops sown with a plastic mulch with a single herbicide application at sowing, a two spray strategy that applies herbicide under the plastic at sowing and in the uncovered areas after crop emergence can be effective. Such a strategy gave very good control in 2010 when control in the uncovered areas following herbicide application at sowing was poor.

Problematic weeds such as knotgrass and wild oats did not occur at high enough levels in these trials to provide information as to the most effective way to achieve good control.

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#### **5. Opportunity/Benefit:**

The results will support maize growers and their advisers in the decision making process regarding herbicide use in maize crops. It provides independent assessment of the products currently on the market. The work can also be used to support the registration and introduction of new herbicides onto the Irish market, thereby increasing the range of herbicides available to Irish growers.

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#### **6. Dissemination:**

O'Donovan, T. Maize weed control update 2008. Irish Farmers Journal Crop Protection Supplement April 2008

Oak Park Crops Research Open Day 2009

Burke, J.I. Maize – weed control options for 2009. Irish Farmers Journal April 11 2009

Maize Field Event, October 1 2009 Kildalton College, Co. Kilkenny

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Hackett, R., Burke, J.I. and O'Donovan, T. 2010. Weed control in maize. Irish Farmers Journal Crop Protection Supplement April 2010

O'Donovan, T. and Hackett, R. Maize weed management strategies and variety update for 2010 Teagasc National Maize seminars 2010 February 2 and February 4 2010.

<http://www.teagasc.ie/publications/2010/20100205/>

Teagasc Tillage Crop Reports 2008-2010 – Recommendations for weed control in maize

**Popular publications:**

O'Donovan, T. Maize weed control 2008. Irish Farmers Journal Crop Protection Supplement April 2008

Burke, J.I. Maize – weed control options for 2009. Irish Farmers Journal April 11 2009

Hackett, R., Burke, J.I. and O'Donovan, T. 2010. Weed control in maize. Irish Farmers Journal Crop Protection Supplement April 2010

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