



supply chain initiative on
modified agricultural crops

Guidelines

for growing newly developed herbicide tolerant crops

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All Genetically Modified herbicide tolerant (GM/HT) crop varieties approved for commercial production have been thoroughly assessed for safety to humans and the environment. These guidelines aim to ensure best practice as regards agriculture and the environment. Specific consideration should also be given to the protection of biodiversity and farmland wildlife. Sources of advice in this area are listed at *Appendix 1*.

All crops have a varying degree of natural herbicide tolerance. Newly developed herbicide tolerant crops have been specifically bred to be tolerant to a specific herbicide or group of herbicides. This can be achieved in two ways: through traditional breeding and selection or through modern biotechnological techniques (genetic modification). This document deals with both types of herbicide tolerant plants.

The following guidelines have been developed to ensure the open and responsible integration of newly developed varieties of herbicide tolerant (HT) crops into practical agriculture. Establishing a co-ordinated and robust framework of information, advice and rigorous control will promote best practice along the primary supply chain, and ensure the safe and effective introduction of this new technology onto UK farms. Industry-wide stewardship, from initial seed stock to primary end product, will also help to underpin public confidence and provide consumers with an informed choice.

This document must be read in conjunction with the general *Code of Practice on the Introduction of Genetically Modified (GM) Crops*, available from SCIMAC, which establishes a consistent, industry-wide approach to information supply and best practice for GM crops from seed to primary end-product, and specifies how the following information should be made available to growers in relation to each GM crop variety.

- The variety is genetically modified
- The nature of the modification(s)
- Specific husbandry and management advice
- Contact details for further help and advice

These guidelines address the requirement to provide specific husbandry and management advice to growers in relation to HT crops.

Introduction

Recent advances in biotechnology have enabled plant breeders – both through genetic modification (GM) and conventional breeding techniques – to develop crop varieties tolerant to specific herbicides not normally selective on those crops.

The following guidelines summarise good agricultural practice when growing these crops, not only to ensure their safety and efficacy in use, but also to maximise the technology's potential benefits. They focus initially on the four arable crop species (oilseed rape, sugar beet, fodder beet and maize) first expected to be grown commercially in the UK. While much of the detail can be applied to any crop type, the guidelines will be subject to annual review by the Supply Chain Initiative on Modified Agricultural Crops (SCIMAC) in consultation with MAFF, DETR, ACRE and other interested organisations, allowing specific crop additions to be made.

Background Issues

These guidelines address the specific on-farm issues raised in relation to HT crops, namely:

Volunteers of the herbicide tolerant plants in subsequent crops: The herbicide tolerances developed are highly specific. Volunteers of the HT crops continue to be as susceptible to other herbicides and control methods as those from conventional varieties.

Cross-pollination with other crops and wild or weed relatives: Cross-pollination can only occur between varieties of the same crop or certain closely related species. Herbicide tolerance has not been found to change significantly any other characteristics of the plant species addressed in these guidelines (ie oilseed rape, sugar and fodder beet and maize).

Multiple tolerance, also known as gene stacking: The development of plants tolerant to more than one herbicide could occur through successive cross-pollination between crop varieties and/or wild / weed relatives. The occurrence of multiple tolerance in volunteers or weeds can be addressed by an integrated weed control programme, including the conventional use of other herbicides and cultivation methods.

Crops

Oilseed rape is largely (60-70%) self-pollinating but can be cross-pollinated, mainly by insects, with other varieties of winter or spring oilseed rape and, to a lesser extent, with other close relatives. In field conditions, rape does not readily cross with any other species.

Sugar beet and fodder beet are biennials which need vernalisation (exposure to cold) in order to flower. If allowed to flower, both sugar beet and fodder beet (*Beta vulgaris ssp vulgaris*) can cross by wind pollination with other flowering beet varieties, or with their close relative sea beet (*Beta vulgaris ssp maritima*). Sugar beet and fodder beet have not been shown to cross with any other species currently found in the UK.

Maize has no close relatives in Europe and will therefore not outcross with wild relatives. Volunteers of maize are extremely unlikely to occur since maize is not frost-hardy and will not survive the winter. Risk of cross-pollination with other maize varieties can be minimised through careful crop planning, including the establishment of appropriate separation distances where necessary.

Guide

for growing newly developed herbicide tolerant crops

Good Agricultural Practice for Growing Herbicide Tolerant Crops

The following guidelines summarise good agricultural practice when growing herbicide tolerant crops. To ensure robust, independent verification of on-farm standards, operator competence and record-keeping, access to all HT varieties and compliance with these guidelines will be subject to formal obligations specified in the terms of a series of Inter-Professional Agreements. These in turn will be subject to random independent inspection by an approved third party auditor. All those involved in growing, harvesting and handling the crop, including contractors, are responsible for observing these guidelines. Failure to comply will result in sanctions, and may include the indefinite withdrawal of access to the technology and its benefits.

1. General

Existing principles of 'Good Agricultural Practice', including all relevant pesticide regulations and codes of practice (see *Appendix 2*), must be followed when growing and harvesting herbicide tolerant crops, but weed control methods may have to be modified and other management controls reinforced to maximise the benefits of the technology.

Checklist – when growing herbicide tolerant crops you must:

- Observe the requirements of the SCIMAC 'Code of Practice on the Introduction of Genetically Modified Crops'.

- Possess and be aware of the contents of existing Codes of Good Agricultural Practice listed at *Appendix 2*.
- Ensure that all farm staff are adequately informed and trained in Good Agricultural Practice, hold appropriate levels of competence in machinery operation, and are aware of the additional considerations required when growing herbicide tolerant crops. Review the performance of workers and seek improvements. Key procedures must be documented.
- Ensure that agronomists or advisers are adequately trained (ie BASIS approved) to provide advice on the management of herbicide tolerant crops.
- Ensure that routine, formal records of crops and cropping are maintained for at least seven years. Records must detail the whole production process from initial seed purchase to final sale and dispatch of the harvested crop. Records must be kept secure in a place where they can be easily accessed for independent inspection by the recognised auditing body and minimise the risk of destruction.
- Notify any problems or unexpected occurrences (as defined under section 9.1) through the appropriate reporting channels. The environmental release of GM herbicide tolerant crops is subject to regulatory approval under EC Directive 90/220. Under this legislation it is a statutory requirement for the consent holder to notify DETR of any new

relevant information which may affect the original consent. Helplines, monitoring and reporting systems will be operated by individual companies to record any suspected or apparent adverse occurrences from individual farmers. An annual summary of feedback received will be published.

(eg HEAR scheme in the case of oilseed rape) and best scientific knowledge, and may be subject to review.

2. Crop planning

-  Before placing an order for a particular herbicide tolerant variety ensure that due consideration is given to subsequent cropping/rotation and implications of volunteers tolerant to this specific herbicide, if the latter is used as a major component of weed control on the farm.
-  Develop a formal, documented weed control strategy, incorporating conventional and new technologies throughout the rotation.
-  As part of the rotational strategy for any field, growers must not plant any two GM/HT crops in immediate succession. The only exception is GM/HT maize which can be grown in continuous maize rotations (and does not over-winter in this country).
-  Observe all statutory separation distances and recommendations issued by bodies such as DETR as a minimum, including pre-existing arrangements under the AAPS scheme. Separation distances for each HT crop by type and under different conditions are specified opposite. These separation distances are based on current regulation, established practice

Crop type	Certified seed crops (same species)	Registered organic crops (same species)	Non-GM crops (same species)
Oilseed rape	200m	200m	50m
Sugar beet	600m	600m	6m
Fodder beet	600m	600m	6m
Forage maize	200m	200m	200m sweetcorn 50m forage maize

These separation distances will be observed:

- (i) voluntarily by GM growers within their own holding, in which case there is no obligation to notify neighbouring farms;
- (ii) through consultation with neighbouring farms. In this situation the onus lies with the GM grower to notify neighbouring farms in writing of his planting intentions – as soon as possible and at the latest by 1st August for autumn-sown crops and by 1st March for spring-sown crops. There is a responsibility on both parties to act in good faith in reaching agreement on planting strategies;
- (iii) failure to reach agreement between neighbouring growers must be notified to SCIMAC at the latest within 7 days of the specified notification date for consultation with the appropriate representative body (eg UKROFS). Any failure at this stage will be resolved through normal legal channels.

3. Preparation for planting

- Ensure seed of all HT varieties is stored separately upon receipt, and that label information is retained with the seed. Steps must be taken to protect seed integrity, for example by keeping seed in its original packaging to ensure safe and leakproof storage, and by maintaining records of label information.
- Surplus seed must be stored separately and clearly identified or transferred to sealable containers for appropriate disposal by the grower/ merchant. Production from surplus seed in following seasons will continue to be subject to the SCIMAC Code of Practice.

4. Planting the crop

- Ensure that seed drills are thoroughly cleaned before use to prevent carry over of seed from previous operations.
- Clean drills thoroughly after use before leaving the field to prevent the introduction of herbicide tolerant seed into unplanned areas of the farm.
- Take appropriate measures to prevent spillage of seed when travelling to and from the field and on field boundaries.
- Where spillage occurs, carefully and thoroughly sweep or shovel the seed into sealable containers for appropriate disposal. Monitor the site of spillage in subsequent years and destroy all volunteers.

5. Managing the crop

- Closely follow the guidelines for weed

control recommended by BASIS qualified advisers.

- Follow existing principles of good agricultural practice to ensure protection of field margins and hedgerow bottoms.
- Where crop losses occur during the growing season, any 'patching' (reseeding) must only be done with seed of the same variety or trait.
- Do not rely entirely on the same herbicide for weed control and subsequent stubble clean up. Select an alternative herbicide or mixture, or combination of herbicides and cultivations.
- Optimise procedures which encourage even maturity – such as swathing and desiccation – to minimise seed loss at harvest.

Oilseed rape

– ensure that cross-pollination with non-herbicide tolerant varieties or those tolerant to a different herbicide is minimised by maintaining an appropriate distance between the crops as specified in the table on page 6 of this document.

Sugar and Fodder beet

– to minimise bolters do not sow prior to recommended dates

– destroy all bolters before flowering to prevent pollen release or seed production

– control any volunteer plants before flowering in cropped and uncropped land using cultivation or a suitable herbicide.

6. Harvesting the crop

- Optimise harvest timing, for example by using seed maturity guides, to minimise seed shedding and so prevent volunteer build-up.
- Pay close attention to combine settings to optimise harvesting efficiency and minimise seed shedding.
- At all times, both on and off the farm, take appropriate measures to avoid spillage during transport of the harvested crop.
- Ensure harvesting machinery is thoroughly cleaned in the field – between fields and between varieties – to prevent the introduction of herbicide tolerant seed into unplanned areas of the farm.

7. Post-harvest management

- At all times the identity of harvested HT crops must be preserved. If the buyer specifies, this shall involve physically segregating harvested HT crops and avoiding the bulking together of HT crops from different sources or mixing with non-HT varieties. Where GMHT and other varieties are mixed together, whatever the proportion of mixture, they must be treated as a GM crop in accordance with the *Code of Practice on the Introduction of Genetically Modified Crops*.
- Ensure maximum germination before completing weed and volunteer control measures (eg shallow cultivation or application of appropriate herbicide). With oilseed rape, do not use deep soil inversion (mould board ploughing) as

the first cultivation for at least three weeks post-harvest in order to maximise germination of seed shed.

- HT plant material remaining after harvest must be incorporated back into the soil in accordance with normal post-harvest management procedures.
- Where harvested HT fodder beet or sugar beet is stored outside, it must be kept separately in a confined area on the farm. Clean up storage areas thoroughly after use, ensuring all remaining material is removed and destroyed according to normal plant hygiene practices.
- Whilst it is recognised that farmers have the right to save seed for resowing, such crops must be grown in accordance with these guidelines and notified to BSPB in respect of farm-saved seed remuneration. In all other circumstances seed must be sourced from a registered seed supplier. To preserve the management of herbicide tolerance on-farm, it is strongly recommended that seed of crops of the same species from adjacent fields should not be saved. Seed of hybrid crops must not be saved without the permission of the variety owner.
- Monitor subsequent crops for evidence of agronomic problems (eg incomplete control of volunteers) which may have resulted from cross-pollination.
- Control any volunteers with cultivations, an alternative non-selective herbicide or as a mixture with the selective herbicide.

8. Monitoring and record-keeping on the farm

The importance of good agricultural practice, including record-keeping, applies equally to HT crops as to all other agricultural and horticultural crops. Particular attention must be paid to the following when maintaining records for HT crops:

- Identification of fields in which HT crops have been sown, including field reference numbers, varieties sown and the specific HT characteristics of those varieties.
- Detailed crop operations diary from date of sowing up to and including harvest.
- Full details of storage, including post-harvest treatment.
- Post-harvest volunteer monitoring to include sketch mapping of volunteer incidence and details of action taken to control volunteers. This must continue throughout the rotation.

9. Monitoring and record-keeping in the supply chain

There is significant scope to extend the effective monitoring processes already in place within the crop protection industry to cover HT crops.

- Pesticide manufacturers are required to report any new relevant information to the Pesticides Safety Directorate, and the developers of GMHT crops must report similar information to DETR, eg
 - (i) any increase in volunteer populations in cropped or uncropped land;
 - (ii) difficulties in controlling volunteers;
 - (iii) unexpected environmental effects.

- The Health and Safety Executive conduct spot checks on-farm to ensure safe practice in areas such as machinery use, spraying and storage – these procedures will apply equally to HT crops.

- Adverse incident reporting procedures are already in place, via medical practitioners in the case of public health, and via the appropriate environment agency (eg DETR) for environmental incidents.

- An annual summary of the performance of HT crops will be published, as described on page 6 of this document. This will focus on issues such as the incidence of multiple tolerance, cross-pollination with other crops and volunteers of herbicide tolerant plants.

- The technology's developers will continue to conduct their own extensive monitoring programmes to assess the performance of their products in commercial use. This information will supplement the findings of independent scientific programmes currently taking place within the UK to monitor the performance of GMHT crops. These programmes include FACTT (Familiarisation and Acceptance of Crops incorporating Transgenic Technology), BRIGHT (Biological and Rotational Implications of GMHT Crops) and specific post-approval monitoring work commissioned by DETR.

- When transported off the farm, each HT crop consignment must be accompanied by a post-harvest declaration which must include the name of the variety.

Further Information

Further detailed information is available from individual companies and organisations as required. SCIMAC member organisations are:

British Society of Plant Breeders

Woolpack Chambers
Market Street
Ely CB7 4ND
Tel: 01353 653200
Fax: 01353 661156

National Farmers Union

164 Shaftesbury Avenue
London WC2H 8HL
Tel: 0171 331 7200
Fax: 0171 331 7313

British Agrochemicals Association

4 Lincoln Court
Lincoln Road
Peterborough PE1 2RP
Tel: 01733 349225
Fax: 01733 562523

United Kingdom Agricultural Supply Trade Association

3 Whitehall Court
London SW1A 2EQ
Tel: 0171 930 3611
Fax: 0171 930 3952

British Sugar Beet Seed Producers Association

23 New Road
Spalding
Lincs PE11 1DH
Tel: 01775 722261
Fax: 01775 767525

Appendix 1 –

Sources of advice on conservation of biodiversity and farmland wildlife

Farming and Wildlife Advisory Group (FWAG)

National Agricultural Centre
Stoneleigh Park
Warwickshire CV8 2RX
Tel: 01203 696699
Fax: 01203 696760

LEAF (Linking Environment and Farming)

National Agricultural Centre
Stoneleigh Park
Warwickshire CV8 2LZ
Tel: 01203 413911
Fax: 01203 413636

British Trust for Ornithology

The Nunnery
Thetford
Norfolk IP24 2PU
Tel: 01842 750050
Fax: 01842 750030

English Nature

Norminster House
Peterborough PE1 1UA
Tel: 01733 455190
Fax: 01733 455188

Royal Society for the Protection of Birds

The Lodge
Sandy
Bedfordshire SG19 2DL
Tel: 01767 680551
Fax: 01767 692365

Game Conservancy Trust

Burgate Manor
Fordingbridge
Hants SP6 1EF
Tel: 01425 652381
Fax: 01425 655848

Appendix 2 –

Relevant Codes of Good Agricultural Practice

Code of Good Agricultural Practice for the Protection of Water,
MAFF PB0587

Code of Good Agricultural Practice for the Protection of Soil,
MAFF PB0617

Code of Good Agricultural Practice for the Protection of Air,
MAFF PB0618

These documents provide practical guidance to help farmers and growers avoid causing water, soil and air pollution. In each case, they highlight the main risks of causing pollution from different agricultural sources, and set out good agricultural practice in a way which minimises the risk of pollution while allowing economic agricultural practice to continue.

Code of Practice for Suppliers of Pesticides to Agriculture, Horticulture and Forestry,
MAFF PB3529 (Yellow Code)

This document, known as the Yellow Code, provides guidance for those involved commercially in the sale, supply and storage for sale of pesticides approved for agricultural use. The Code provides practical guidance on meeting the obligations imposed on individuals and companies involved in these activities under UK and EC legislation.

Code of Practice for the Safe Use of Pesticides on Farms and Holdings,
MAFF PB3528 (Green Code)

This document, known as the Green Code, provides practical guidance to farmers and growers engaged in commercial crop production in respect of Part III of the Food and Environment Protection Act 1985 (FEPA) and in particular the regulations controlling the use of pesticides under that part of the Act.

Copies of all these documents are available free of charge by writing to MAFF Publications, ADMAIL 6000, London SW1A 2XX, or by telephoning 0645 556000.

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