



**Current awareness of experimental and commercial
releases of GM crops worldwide:**

**Quarterly summary report
July to September 2005**

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Provided for:
Plant Variety Rights Office and Seeds Division, Defra

1. Introduction

This is the second quarterly report in an ongoing series designed to monitor the number and type of GM crop releases worldwide. This report covers the period July to September 2005 and updates a baseline study presented in June 2005. As with the previous study, the report aims to highlight those areas where there is significant activity in terms of GM crop research and GM crop release (both experimental and commercial), on a worldwide basis, thus helping to inform decisions concerning the risk to conventional UK seed. Where the report determines an increase in activity in terms of number of experimental releases, additional GM species or traits, and/or GM commercialisation, this activity will be flagged up for possible further investigation. An additional section has been added to the format of the report which gives the latest news concerning GM crops (section 2). The report is intended to cover crops which are grown in the UK where there is a possibility of seed import for sowing. It includes the main agricultural crops, flowers, trees, and amenity crops, but is not intended to include crops such as cotton or rice where the seed is imported only for processing and not as seed for sowing.

2. News

The following GM-related articles have appeared in the news during this quarter:

2.1 Headline news -

US GM alfalfa deregulation

In June 2005 the USDA announced that the Monsanto Company and Forage Genetics International has gained approval for the deregulation (i.e. commercial release) of Roundup Ready alfalfa (Events J101 & J163). Approval follows a period of public consultation and an APHIS (Animal and Plant Health Inspection Service) Environmental Assessment "finding of no significant impact" (FONSI) on the environment from its unconfined cultivation and use. The formal status of RR alfalfa is now "no longer regulated by the USDA", which clears the crop for commercial planting in the USA. This makes it the first GM perennial crop in the world to be commercialised, and seed is expected to be available to US growers next spring. In addition the Canadian Food Inspection Agency and Health Canada have received a submission from Monsanto Canada Inc. seeking environmental safety approval, and livestock feed and food use approvals of alfalfa designated as Events J101 and J163, but these events are not intended for commercial planting or seed production purposes in Canada.

(<http://www5d.biglobe.ne.jp/~cbic/english/2005/journal0505.html>)

2.2 General news -

Report of GM alfalfa deregulation in Japan

The Citizens' Biotechnology Information Center (CBIC) based in Japan reports that in March 2005 the Ministry for the Environment approved Monsanto's application for three varieties of herbicide resistant alfalfa (J101, J163, and a hybrid of the two) for type one use (open cultivation) under Japan's Cartagena Protocol domestic laws. Also in March 2005 the Food Safety Commission confirmed the same alfalfa varieties as safe for food consumption. According to CBIC this means that "GM alfalfa may now for the first time be distributed in Japan as a foodstuff."

(<http://www5d.biglobe.ne.jp/~cbic/english/2005/journal0505.html>)

Biotech crop plantings continue in Europe

A number of information sources show that the planting of GM maize is gaining pace in Europe. In Spain the government continues to support use of biotechnology - currently there are 16 varieties of BT corn which can be planted in Spain, 5 based on event CG 00256-176 (Compa CB, Jordi CB, Brama, Sansone BT, and Escobar) and 11 on event Mon 810 (Aliacant Bt, Aristis Bt, DKC 6575, PR33P67, Campero, Cuartal BT, DKC 6550, Gambier BT, Jaral, Pr32P76 and Protec). In 2005 around 48,000 ha of Bt grain maize were cultivated commercially in Spain (down from 58,000 ha in 2004, presumably due to the widespread drought which depressed plantings overall). In 2005 Portugal is reported to be growing 780 ha of insect resistant grain maize, the Czech Republic 300 ha (for both countries it is the first year of commercial planting), and France 500 ha. In 2004 Romania is reported to have grown 70,000 ha of soyabeans.

(See, for example, <http://www.monsanto.com/monsanto/content/investor/financial/presentations/2005/09-20-05.pdf>)

GM maize found in sample grown in NZ

In July it was reported that New Zealand Ministry of Agriculture and Forestry (MAF) officials are tracing a complex mix of seed lines and growers in a bid to determine how a large maize consignment has tested positive for GM components. The maize which had been grown for food in one region of New Zealand was tested by a food manufacturer as part of quality assurance checks. Currently no GM maize has been approved for commercial crops in New Zealand, and tests before or at the border are designed to pick up adventitious GM presence in maize seed sent from overseas for planting. According to a senior MAF official it was the sixth such incident in the past three years - in 2004, for example, 4000 tonnes of maize with low levels of GM content was grown in 34 fields spread over nearly 400ha of land in the North Island. There is no indication as to the origin of the contaminated seed, although the article indicates that previous contaminated seed lots have come from the USA. [Note: The GMI is not aware of any maize seed currently being imported into the UK from New Zealand].

(See <http://www.agbios.com/main.php?action=ShowNewsItem&id=6701>)

Australian oilseed rape trials contaminated with GM

In September it was revealed that a variety of non-GM oilseed rape grown in National Variety Trials (NVT) in New South Wales had tested positive for Monsanto's Roundup Ready trait. The affected variety is called 'Victory' and the level of contamination was about 20%. Victory has been developed by AgVic and Cargill, using local and North American imported breeding lines. According to the article this makes it likely that contaminated seed was imported from North America. All the seedlings were destroyed. At around the same time the Government of the state announced that its moratorium on commercial growing of GM crops was to be extended to 2008. In an apparently related incident in Western Australia tests of two OSR varieties showed GM contamination at around a 0.04% level. In this case the trials were not destroyed but are being managed as GM trial sites and will be destroyed upon completion. Western Australia also has a moratorium on the commercial growing of GM crops. [Note: The GMI is not aware of any OSR seed currently being imported into the UK from Australia].

(See <http://www.gmcontaminationregister.org/index.php?content=default>)

Greenpeace reports GM canola on Australian farm

Tests on canola grown at an Australian farm found it had been contaminated with genetically engineered material despite a ban on the cultivation of modified crops in that state, Greenpeace reported on October 7. Independent testing of the canola variety 'Grace', grown at a farm in the state of Victoria, found it had a 0.5 percent contamination with pharmaceutical company Bayer's Liberty Link gene. The discovery came after a shipment

of canola bound for Japan earlier this year was found with slight contamination. The farmer whose crop is affected said the finding could mean he has to accept a discounted price for his canola or that it could be rejected by the market. In addition he is technically breaching state law by cultivating a genetically engineered crop. [Note: The GMI is not aware of any OSR seed currently being imported into the UK from Australia]. (See <http://uk.news.yahoo.com>)

GM creeping bentgrass still awaits USDA approval

Monsanto's application for deregulation of glyphosate tolerant creeping bentgrass is still undergoing the approvals process. In January 2004, APHIS opened a 60-day period for public input, soliciting comments and information on whether GM bentgrass presents potential risks to the environment, including a plant pest risk. APHIS' request garnered over 480 remarks - of these around 339 expressed support for the deregulation petition, and 134 expressed concern or opposed the petition. In September 2004 APHIS announced its decision to prepare an environmental impact statement to examine potential environmental effects associated with a determination of non-regulated status for GM bentgrass. The agency identified issues that it proposed to explore and opened a 30-day period for public comment on the proposed scope of this study. On the day that APHIS released its notice about the proposed environmental document, the Proceedings of the National Academy of Sciences published the study of Watrud *et al.*¹ which showed that GM bentgrass' glyphosate-tolerance trait can cross-pollinate with plants up to 21km away. When APHIS completes its environmental document, the agency will make it available for public input. After evaluating these comments, APHIS will either approve the petition in whole or in part, or deny the petition. The agency will then publish a notice in the Federal Register announcing the regulatory status of the GM bentgrass. Most commentators seem to agree that GM bentgrass still has some way to go before it appears on US golf courses.

(e.g. http://www.aphis.usda.gov/lpa/news/2004/01/bentgras_brs.html)

Thailand - papaya contaminated

In September the Thai Government reported that at a number of farms in the country had been discovered growing GM-contaminated papaya trees. GM papaya is not grown commercially in Thailand and the origin of the trees is likely to be a Government breeding station. A spokesperson said that action was being taken to destroy the trees. In July 2005 Thailand's Human Rights Commission conducted tests which showed that one third of papaya orchards tested in the eastern province of Rayong and the northeastern provinces of Mahasarakham, Chaiyaphum and Kalasin had GM contaminated papaya seeds. The owners are reported to have said that they were given the seeds by a research station. The Commission has called for all the contaminated papaya to be destroyed and farmers compensated. Although the UK does not import and grow papaya seed, the report may be illustrative of a wider problem in the country. (See <http://www.gmcontaminationregister.org>)

Germany – illegal import and growing of GM zucchini

Seminis (a Monsanto-owned company) has admitted to erroneously importing and planting GM zucchini (courgette) seed in Germany. Greenpeace report that a total 90g of GM seed reached Germany via the Netherlands. About 100 of the approximately 1,000 seeds were then sent to Rheinland-Pfalz where they were planted. Details of where the remaining seed was sent are not available (although there have been reports that the seeds were distributed to members of staff to plant in their gardens). The GM zucchini seedlings of a variety called 'Judgement III' are ¹genetically modified to be resistant to three viral diseases. The error is

¹Watrud, L.S., Lee, E.H., Fairbrother, A., Burdick, C., Reichman, J.R., Bollman, M., Storm, M., King, G. and Van de Water, P.K. (2004). 'Evidence for landscape-level, pollen-mediated gene flow from genetically modified creeping bentgrass with CP4 EPSPS as a marker', Proceedings of the National Academy of Sciences of the United States of America, 101 (40), 14533-14538.

reported to have been detected before the plants flowered and the seedlings have now been destroyed. No GM zucchini are approved for marketing or growing in the European Union. The company says that the seeds were wrongly labelled leading to their accidental importation. (See <http://www.gmcontaminationregister.org>)

3. Crop Release Information

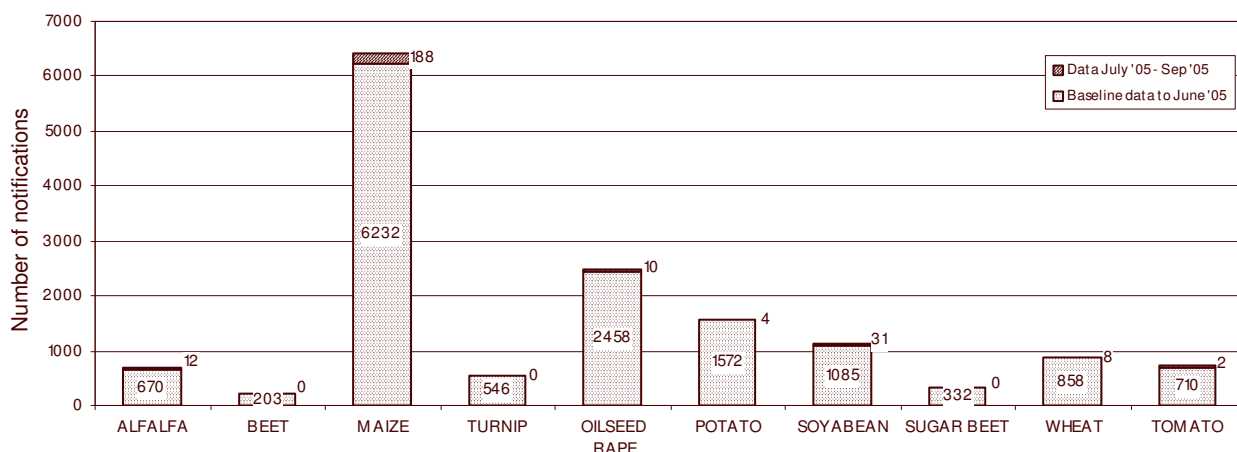
Below is a summary of the main agricultural crops which have undergone genetic modification and have been released either in experimental trials or commercially. The releases are separated into different categories based on the usage of the crop, and include both major and minor agricultural crops, vegetable crops, fruit crops, flowers and ‘miscellaneous’ crops. A stacked bar chart and accompanying table provide information on the number of GM releases on a country by country basis and show the major GM traits.

3.1 ‘Major’ Agricultural and Horticultural Crops.

The largest number of field releases of ‘major’ crops during the current reporting period have been for maize (see figure 1), with 188 experimental trials (but see note in table 1 regarding information from Argentina). Traits include herbicide tolerance and insect resistance traits, as well as less well known traits such as yield enhancement, drought tolerance, etc. (see table 1). Monsanto/Forage Genetics continue to conduct experimental releases of glyphosate tolerant alfalfa, with a total of 12 new releases in the USA. Other experimental releases include oilseed rape, potato, soyabean wheat and tomato.

NOTES to be used in conjunction with charts and tables: The numbers of experimental releases shown are based on the number of deliberate release trials that have been ‘approved’ worldwide for individual GM species. It should be noted that ‘approved’ refers to the fact that the regulatory authorities have given the go ahead for the release(s) to take place, it does not mean that the trials actually went ahead (although in the vast majority of cases they will have taken place). Another important point to note is that most individual approvals give authorization for separate releases at several different sites, therefore the actual number of trials will be greater than the number of notifications shown in the tables. This approach seems to apply to most GM regulatory systems, including the EU system.

Figure 1 – Total number of experimental releases of ‘major’ agricultural and horticultural crops.



Numbers within the bars indicate the number of prior releases for each crop (i.e. baseline data); numbers adjacent to bars show the number of releases this quarter (July – Sept 2005).

NOTES to be used in conjunction with tables: The column ‘current commercialisation status’ highlights those GM crops for which approval for commercialisation has been granted, or is being sought, in the specified country. New approvals that have been granted within the reporting period are shown in **bold** within a greyed-out cell.

Table 1 – GM releases of ‘major’ agricultural and horticultural crops showing trait, country of release, etc.

CROP TYPE	MAIN TRAITS	COUNTRY	TOTAL RELEASES THIS QUARTER	CURRENT COMMERCIALISATION STATUS
ALFALFA (<i>Medicago sativa</i>)	Glyphosate tolerance	USA	12	USA – 1 notification APPROVED
MAIZE incl. sweetcorn	Herbicide tolerant, Coleopteran resistant, Lepidopteran resistant Unknown Coleopteran resistant, Lepidopteran resistant, Herbicide tolerant, Yield enhancement, Drought tolerant, Animal feed quality improved, Seed composition altered, Ear mould resistant	Argentina S. Africa USA	92* 3 93 *Note: data for Argentina only recently made available. Most of the 92 releases are likely to have been prior to July 2005.	EU – 3 notifications APPROVED (cultivation); 4 notifications PENDING (cultivation) USA – 17 notifications APPROVED; 4 notifications PENDING Other countries with approval for commercialisation incl.: Argentina Canada South Africa Japan Philippines Uruguay
OILSEED RAPE (<i>Brassica napus</i>)	Unknown Environmental stress reduced, Glyphosate tolerant, Lepidopteran resistant, Oil profile altered	South Africa USA	1 9	Canada – 4 notifications APPROVED EU – 3 notifications APPROVED (1 for seed for breeding activities only; 2 for cultivation for which France has not issued the consent); 4 notifications PENDING (cultivation). USA – 7 notifications APPROVED
POTATO (<i>Solanum tuberosum</i>)	Increased starch levels. Unknown	Spain South Africa	2 2	USA – 5 notifications APPROVED
SOYABEAN (<i>Glycine max</i>)	Unknown Oil profile altered, Glyphosate tolerant, Seed composition altered, Isoxazole tolerant, Nematode resistant, Phosphinothricin tolerant, Altered amino acid composition, Omega-3 fatty acids produced	Argentina USA	13 18	Numerous notifications APPROVED for Roundup Ready soybean, incl.: Argentina Brazil Canada Japan Mexico South Africa USA Uruguay

WHEAT (<i>Triticum aestivum</i>)	Unknown	Argentina	2	USA – 2 applications withdrawn (Glyphosate tolerant)
	Unknown	South Africa	2	
	Starch level increased, Fusarium resistant, Storage protein altered	USA	4	
TOMATO (<i>Lycopersicon esculentum</i>)	Unknown	South Africa	1	USA – 11 applications APPROVED (Lepidopteran resistant, Fruit ripening altered) Other approvals include: Japan Mexico
	Photosynthesis enhanced	USA	1	

3.2 ‘Minor’ Agricultural Crops.

There has been very little deliberate release activity concerning the so-called ‘minor’ agricultural crops. The only deliberate release has been that of a herbicide tolerant mustard (*Brassica juncea*) in Australia.

Figure 2 – Total number of experimental releases of ‘minor’ agricultural crops.

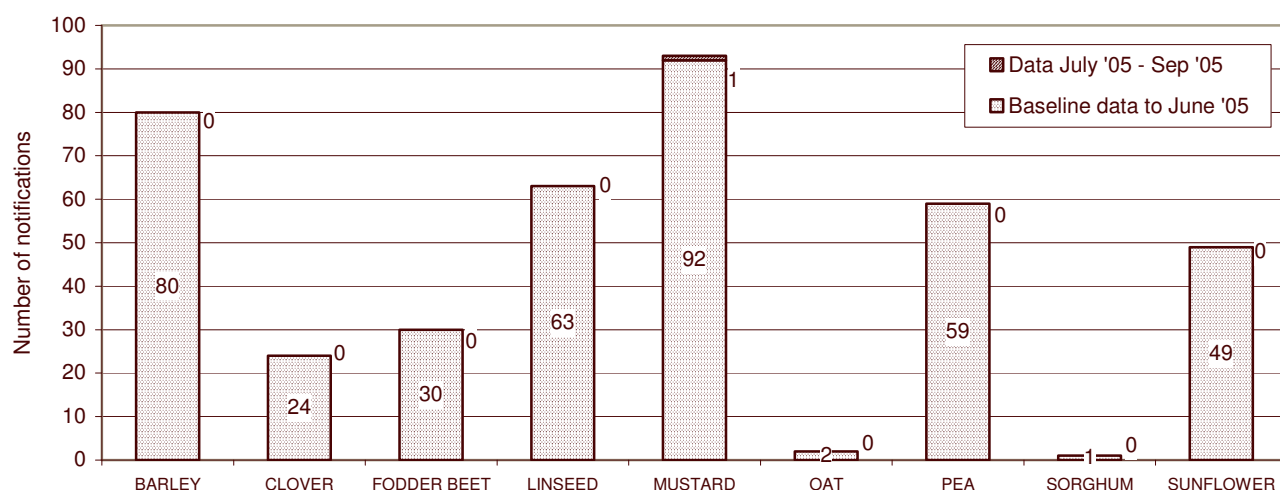


Table 2 – GM releases of ‘minor’ agricultural crops in the last quarter.

CROP TYPE	MAIN TRAITS	COUNTRY	TOTAL	CURRENT COMMERCIAL-ISATION STATUS
MUSTARD	Herbicide tolerance and hybrid breeding system	Australia	1	None

3.3 Vegetable Crops.

A general web-based search indicates that, as far as vegetable crops are concerned, the only release has been that of a GM sweet potato in South Africa. This information, along with information for other crops, was made available following a court victory by GM pressure group Biowatch South Africa, whereby the Registrar of GMOs was ordered to release information about GM crops in South Africa. Up until now the South African Government has not been obliged to release this type of information. Even now, the data available for S. Africa is very limited, with no indication of the type of genetic modification carried out on each crop.

Figure 3 – Total number of experimental releases of vegetable crops.

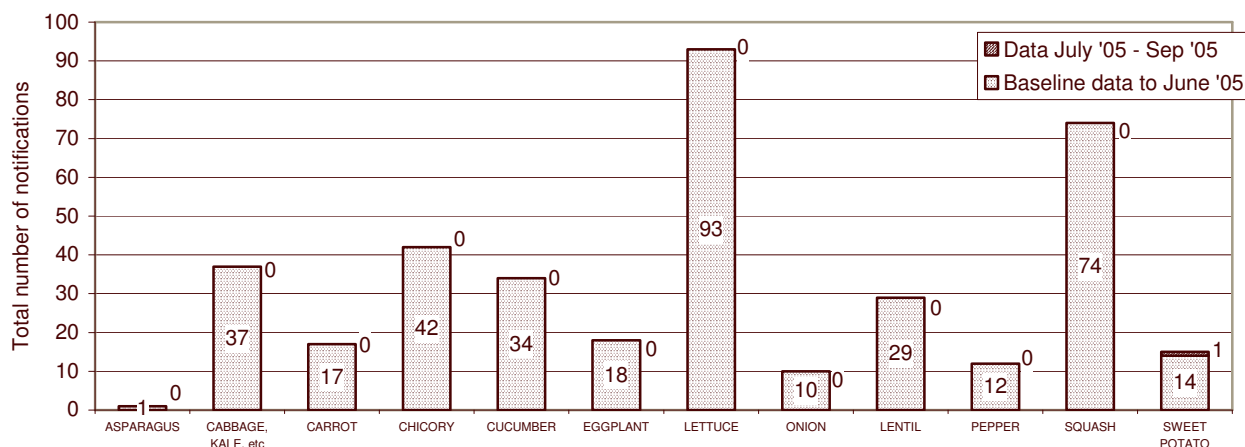


Table 3 – GM releases of vegetable crops in the last quarter.

CROP TYPE	MAIN TRAITS	COUNTRY	TOTAL	CURRENT COMMERCIAL- ISATION STATUS
SWEET POTATO (<i>Ipomoea batatas</i>)	Unknown	South Africa	1	None

3.4 Fruit Crops.

During the reporting period a single GM apple release has been approved. This has taken place in South Africa and there are no details of the type of modification.

Figure 4 – Total number of experimental releases of fruit crops.

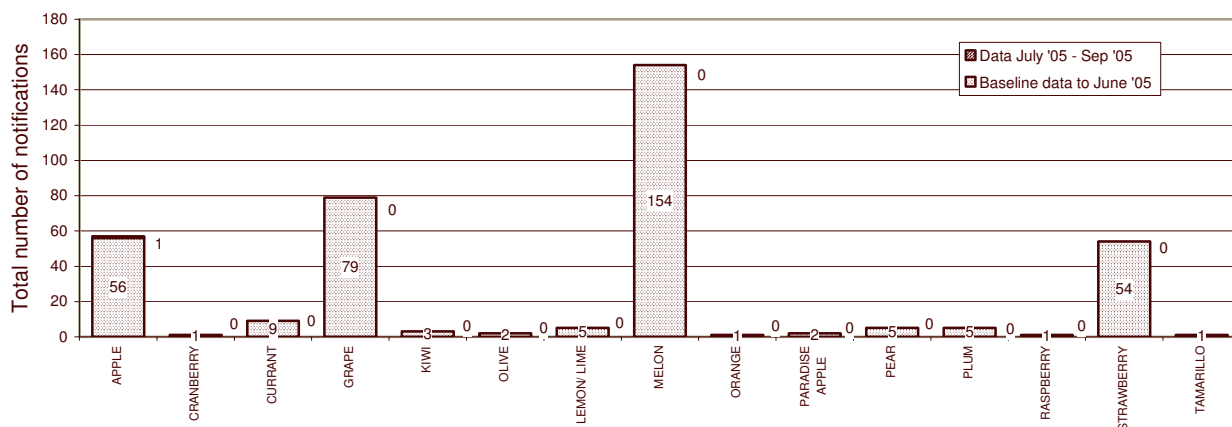


Table 4 – GM fruit releases in the last quarter.

CROP TYPE	MAIN TRAITS	COUNTRY	TOTAL	CURRENT COMMERCIAL- ISATION STATUS
APPLE (<i>Malus domestica</i>)	Unknown	South Africa	1	None

3.4 Flowers.

There have been 2 approvals for Geranium trials in the USA during the reporting period, both for altered flower colour and glyphosate tolerance.

Figure 5 – Total number of experimental releases of flowers.

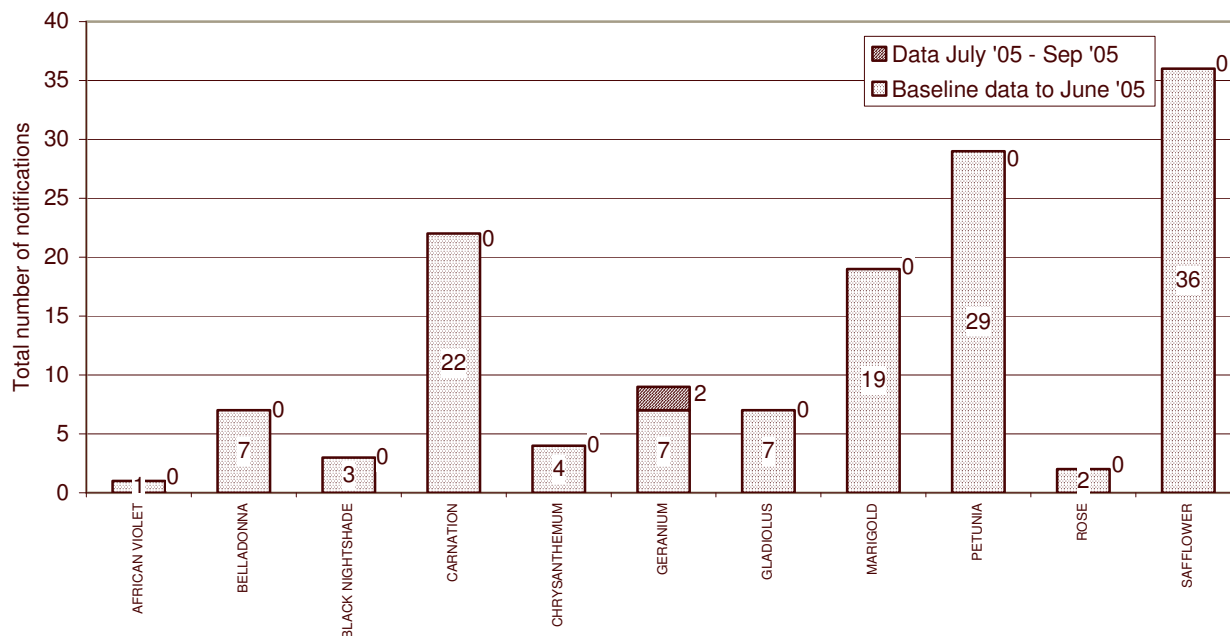


Table 4 - GM flower releases in the last quarter.

CROP TYPE	MAIN TRAITS	COUNTRY	TOTAL	CURRENT COMMERCIAL- ISATION STATUS
GERANIUM (Pelargonium sp.)	Colour altered, Glyphosate tolerant	USA	2	None

3.5 Miscellaneous species.

There have recently been several GM grass releases in the USA, all involving creeping bentgrass. The traits being tested are mainly herbicide tolerance, but fungal resistance and male sterility traits are also undergoing trials. There has also been quite a number of GM tree releases, with a large number of different constructs, mostly carried out in the USA (see table 6).

Figure 6 – Total number of experimental releases of miscellaneous crops.

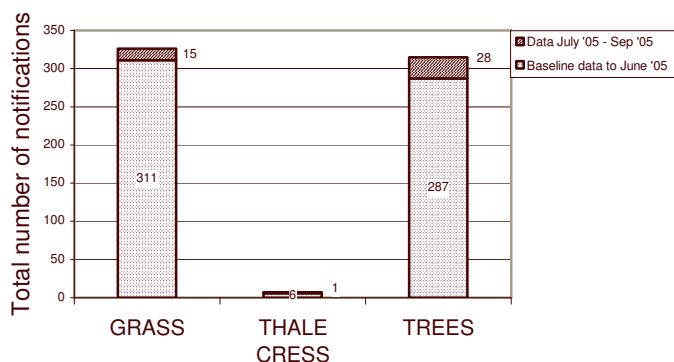


Table 6 – GM releases of miscellaneous crops in the last quarter.

CROP TYPE	MAIN TRAITS	COUNTRY	TOTAL	CURRENT COMMERCIAL- ISATION STATUS
GRASS (various incl. Ryegrass, Tall fescue, Canary grass, etc.)	Phosphinothricin tolerant, Glyphosate tolerant, Fusarium resistant, Male sterile (Creeping bentgrass);	USA	15	USA – 1 application PENDING (Creeping bentgrass, Glyphosate tolerant, Monsanto).
THALE CRESS (<i>Arabidopsis thaliana</i>)	Flowering time altered	USA	1	None
TREES (various)	Unknown (Eucalyptus) Fungal resistance (American Chestnut); Cold tolerant, Altered lignin biosynthesis, Growth rate altered, Fertility altered (Eucalyptus); Growth rate altered, Visual marker (Loblolly pine); Dwarfed, Altered lignin biosynthesis, Growth rate altered, Drought tolerant (Poplar)	South Africa USA	1 27	None

4 Additional Information

The GM Inspectorate continue to routinely gather information of the latest developments in biotechnology, including new GM crop types, GM traits and technical data relating to the genetic inserts of new GM crop lines (where available). This latter information is essential in order to ensure that any analytical testing carried out by seed companies and testing laboratories is capable of detecting the new GM line(s). It is also essential for ensuring that the Inspectorate's testing capabilities are fully up to date in the event that enforcement sampling and testing is required.

It is still the case that there are quite a number of countries around the world where access to GM deliberate release information is severely lacking. Many of these countries are in SE Asia, but others are S. America and Eastern Europe. China, is a prime example of such a country: from general information the Inspectorate are aware that GM deliberate releases are taking place in China, but there does not appear to be any official website showing which crops are in trials and what type of modification is involved. Certainly there is no English-language website. Despite the lack of verifiable information it is well known that China has conducted GM rice, cotton, soya, poplar, pepper and tomato releases, amongst others. In addition GM cotton, tomato, pepper and petunia are now grown commercially and rice may follow shortly. Unfortunately the problem of data gathering is not restricted to the less-developed countries. For example, even though Canada publishes detailed information on its GM releases, it only does so on an annual retrospective basis, making it difficult to keep a track on any new trends that may be developing in the field of biotech research. An added difficulty in data gathering has been the suspension of the OECD's 'Biotrack' database of field trial information which has been a useful source of difficult-to-

obtain trials information. The database is suspended whilst it is under revision, but there is not indication of when it will be updated.

Whilst the majority of GM traits noted in this report are fairly standard, including such qualities as herbicide tolerance and insect resistance, there has been a notable increase in the number of novel traits in recent years. This is symptomatic of a broadening of the scientific outlook concerning GMOs, with researchers increasingly looking for GM applications beyond food production. Several of the new traits do apply to food crops, such as drought tolerance or omega-3 fatty acids production, but an increasing number are aimed at industrial production, e.g. transgenic potatoes as bioreactors for spider silk production (approval for trials in Germany granted as recently as February 2005) and pharmaceutical applications, e.g. transgenic maize used to produce vaccines, drugs or antibodies (various approvals for US trials). With an increasing number of these trials there is a concern that contamination of conventional (or approved GM seed) could occur, and 1) the novel sequences would be difficult to detect (many are considered confidential business information) and 2) there could be serious consequences if the material entered the human food and/or animal feed chain.

ANNEX 1 – Sources of information

The information contained in this report is considered correct at the time of publication. The GM Inspectorate rely on a wide range of data sources to ensure the information presented is up to date, and whilst every care is taken to verify this information the nature of the data sources means that authentication is not always possible. Experimental GM crop releases are not recorded in publicly available databases in a number of countries and the GM Inspectorate cannot, therefore, account for these.

General databases consulted in this study

<http://www.agbios.com/main.php>
<http://www.genewatch.org/>

<http://biosafety.ihe.be/>

International Field Test Sources: databases consulted in this study

Argentina:	http://www.sagpya.mecon.gov.ar/0-0/index/programas/conabia/index_conabia.htm
Australia:	http://www.health.gov.au/ogtr/index.htm
Austria:	http://biotech.jrc.it/deliberate/gmo.asp
Belgium:	http://biotech.jrc.it/deliberate/gmo.asp
Bolivia:	http://webdomino1.oecd.org/ehs/biotrack.nsf
Brazil:	http://www.ctnbio.gov.br/ctnbio/Sistema/LIBERACOESogm.asp
Bulgaria:	http://webdomino1.oecd.org/ehs/biotrack.nsf
Canada:	http://www.cfia-acia.agr.ca/english/plaveg/pbo/pbobbve.shtml
Czech Republic:	http://webdomino1.oecd.org/ehs/biotrack.nsf
Denmark:	http://biotech.jrc.it/deliberate/gmo.asp
Egypt:	http://binas.unido.org/binas/trials.php3
Finland:	http://biotech.jrc.it/deliberate/gmo.asp
France:	http://biotech.jrc.it/deliberate/gmo.asp
Germany:	http://www.rki.de/GENTEC/GENENG/GENTEC_E.HTM
Greece:	http://biotech.jrc.it/deliberate/gmo.asp
Hungary:	http://biosafety.abc.hu/biosafe_eng.html
Iceland:	http://biotech.jrc.it/deliberate/gmo.asp
India:	http://webdomino1.oecd.org/ehs/biotrack.nsf
Irish Republic:	http://biotech.jrc.it/deliberate/gmo.asp
Italy:	http://biotech.jrc.it/deliberate/gmo.asp
Japan:	http://www.s.affrc.go.jp/docs/sentan/eguide/edevelp.htm
Luxembourg:	http://biotech.jrc.it/deliberate/gmo.asp
Mexico:	http://www.senasica.sagarpa.gob.mx/pagconasag/svtransgen.htm#ensayo
Netherlands:	http://biotech.jrc.it/deliberate/gmo.asp
New Zealand:	http://www.ermanz.govt.nz/no/index.asp
Norway:	http://biotech.jrc.it/deliberate/gmo.asp
Portugal:	http://biotech.jrc.it/deliberate/gmo.asp
Russian Federation:	http://webdomino1.oecd.org/ehs/biotrack.nsf
South Africa:	http://www.nda.agric.za/docs/GeneticResources/Geneticcontrol.htm
Spain:	http://biotech.jrc.it/deliberate/gmo.asp
Sweden:	http://biotech.jrc.it/deliberate/gmo.asp
Switzerland:	http://webdomino1.oecd.org/ehs/biotrack.nsf
Thailand:	http://biodiversity.biotech.or.th/biosafety/doa/m_impymo.asp
United Kingdom:	http://biotech.jrc.it/deliberate/gmo.asp
United States:	http://www.isb.vt.edu/cfdocs/fieldtests1.cfm