MON88017 maize

Organisation: The European GMO-free Citizens
Country: The Netherlands
Type: Others...

a. Assessment:
Molecular characterisation

12.11.2008 | Cultivation of genetically modified maize line MON88017 (081112-02)

COGEM (the Dutch GM commission) was asked to comment on the possible risks to humans and the environment of the cultivation of the GM maize line MON88017. The gene cp4epsps has been incorporated into this maize line to make the plant tolerant to glyphosate-containing herbicides. This maize line also contains the gene cry3Bb1 to make the plant resistant to certain insects from the order Coleoptera such as the corn root worm (Diabrotica virgifera). The Netherlands has never had a case of maize plants reverting to a wild state, and the storage of maize plants in the Netherlands can be almost ruled out. There is no reason to assume that expression of the inserted genes will increase the potential of maize to revert to its wild state. Moreover, maize has no wild varieties in Europe, so out-crossing is not possible.

COGEM takes the view that the molecular characterisation has been performed satisfactorily. However, it considers that the information on the impact on non-target organisms provides insufficient evidence to conclude that no impact is to be expected, in particular as almost all the experiments were carried out using a different maize line which expresses a protein differing by one amino acid from the protein in MON88017 or with the purified protein of this variant. On this basis, COGEM considers that it is not in a position to give a favourable opinion on MON88017. It proposes that the applicant be asked to provide more information. That is all from COGEM.

b. Food Safety Assessment:
Toxicology

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From Bio Journal - September 2004

Trend: GMO compatible herbicides may affect children's brains

It has been suggested in Japan that herbicides which are applied to herbicide resistant GM crops can have an effect on children's brains.

Yoichiro Kuroda at the Tokyo Metropolitan Institute for Neuroscience (TMIN) reported (Science Journal KAGAKU Vol. 74, Aug. 2004) that agrichemicals can have effects on children's brains by mentioning the recent case of a murder by children. He also referred to an experimental study on animals conducted by Tomoko Fujii et al. at Teikyo University 10 years ago.

According to the study, rats that were administered "glufosinate", which is GM compatible herbicide's main component, showed increasing aggressive behaviour, such as biting others. Baby rats born from mother rats which were administered the glufosinate showed abnormal behaviour, such as damaging tails. Baby female rats that normally never bite, but who were born from mother rats which were administered high doses of glufosinate, became extremely aggressive, and started to bite each other until finally one of the fighting pair was killed.

Kuroda pointed out that although glufosinate is the main component of the herbicide "Basta," the main component of the herbicide "Roundup," called "glyphosate," has a similar chemical structure. Since GM crops have come onto the market, a broad range of food crops with these agrochemical residues has flooded the distribution system. Kuroda warned that, "People who are concerned about children's health should be careful about these agrochemicals." http://www5d.biglobe.ne.jp/~cbic/english/2004/journal0409.html

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Allergenicity

+ Scientists warn of serious risks associated with the widespread use of glyphosate

The researcher Don Huber, recently retired from Purdue University, has said that, according to his research, the widespread use of glyphosate has a negative impact on the soil, plants and animal and human health. He found a consistent increase in the presence of a particular kind of fungus on glyphosate-treated wheat. Glyphosate was also found to lead to a reduction in manganese, an essential part of a plant's defence against disease and environmental pressures.

"Glyphosate can tie up nutrients such as manganese, copper, potassium, iron, magnesium, calcium and zinc in plants so that they can no longer be used. It kills weeds by tying up certain essential nutrients for the plants' defence, killing them not directly but by disabling their immunity to pathogens in the soil. It weakens the plant to such an extent that it becomes susceptible to dangerous soil fungi," said Huber.

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4. Conclusions and recommendations

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5. Others

Conclusion: No cultivation and no food and feed!

Organisation: The European GMO-free Citizens
Country: The Netherlands
Type: Others...

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a. Assessment:
Molecular characterisation

Study by Hoechst (Dr Arno Schulz) concerning the substrates of phosphinothricin acetyltransferase (PAT).

Amsterdam, 7 November 1999. Two study designs, producing opposite conclusions, namely 1. Charles J. Thompson, 1987: Characterization of the herbicide-resistance gene bar from Streptomyces hygroscopicus: 2. Dr Arno Schulz, 1993: L-Phosphinothricin N-Acetyltransferase -Biochemical Characterization – a report incorporated into Wehrmann 1996 (Schulz is co-author). The subject is the characterization of the enzyme phosphinotricin acetyltransferase (PAT), and in particular the specificity of the substrates. The first study concerns the reaction of phosphinothricin with acetyl co-enzyme A under the influence of PAT and compares this with a number of structural analogues of phosphinothricin (PPT). One of the analogues was L-glutamate. The products of the reaction were identified via a mass spectrogram and the equilibrium constants (affinity) determined. In addition to phosphinothricin (PPT) a number of structural analogues were tested to determine whether there was an acetylation reaction. L-glutamic acid was one of the substances investigated. Compared with PPT the affinity of most of the substances was low: one substance did not react at all. In this test, where a numerically reportable reaction occurred to an identified product (the detection threshold is not an issue here) there does not appear to be any reason to doubt that glutamic acid is a substrate of PAT.

The second study concerns the reaction of a large number of amino acids, including L-glutamic acid, which was also involved in the first study, in a reaction mix together with a 100% excess of PPT in relation to the acetyl source acetyl co-enzyme A and PAT. Products of the reaction were identified via chromatography. Even with a very large excess of L-amino acid no products of reaction with the amino acids were found. Only acetyl phosphinothricin was found. The authors concluded that PAT very specifically has only PPT as a substrate. The following criticisms can be made of this conclusion, which conflicts with that produced in the first study. (Incidentally, the first study is cited in the Bibliography to the second study): 1. No detection threshold was determined for acetylated L-glutamic acid. 2. The possibility of acetylated glutamic acid being a source of acetyl for the acetylation of PPT was ignored. This could have been tested in the study by adding acetylated glutamic acid to the reaction mix in a quantity above the detection threshold and examining whether this added quantity disappears during the reaction. Based on the results of the first study it could certainly be predicted to disappear!! 3. The study was conducted using a reaction mix in which a large excess of a competing substrate, PPT, was present. Observations with the pure amino acids were not conducted. 4. There is no discussion whatsoever of the results of the first study, in particular as to why these were so different. 5. Essentially, the authors of the second study accuse the authors of the first study of fabrication, of fraud (the first study contains a wealth of numerical data; in the second there are no figures). In the second study this aspect is not developed satisfactorily. The background to the conclusion that PAT has only one substrate - PTT – is as follows: in herbicide-resistant (i.e. PPT-resistant) crops, PAT is present. In order to get products approved for the market the toxicity of this gene-product must be examined. Could this gene product react with the content of our GUT, e.g. with the – important – amino acid L-glutamic acid? It would cost a fortune in research to demonstrate that the dangers were minimal. For HOECHST, it seems that total denial is a better strategy! We believe that the conclusion drawn in the second study is completely unfounded and that the so-called "study" is unworthy of the name. It is an incompetent study and those persons who cite it need to be told about its incompetence. J. van der Meulen, L. Eijsten. http://www.gentechvrij.nl/rvs9911.html

Comparative analysis (for compositional analysis and agronomic traits and GM phenotype)

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b. Food Safety Assessment:
Toxicology

From Bio Journal - September 2004

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Scientists warn of serious risks associated with the widespread use of glyphosate
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18/12/2004 COMMON PESTICIDE CAUSES AGGRESSION & BRAIN DAMAGE

Glufosinate, a pesticide used widely in the U.S. and whose residues have been found in the food and water supply, has been verified to cause brain and hormonal damage. Japanese government studies have confirmed previous research that glufosinate sets off violent behavior in lab animals. Male rats exposed to the chemical aggressively attack each other, while female rats remain peaceful. But female offspring of rats previously exposed to the pesticide "became aggressive and started to bite each other, in some cases until one died." said Yoichiro Kuroda, principle investigator of the study, adding, "That report sent a chill through me." Glufosinate, which is used as an herbicide on several varieties of genetically modified canola and corn, is also linked to neurological defects that increase the rate of hyperactivity and decrease IQs. The Japan Times, 7 December 2004 By YUMI WIJERS-HASEGAWA, Staff writer

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Allergenicity

See the Starlink affair http://www.foodallergyangel.com/documents/GMO/StarlinkReport.pdf

See the poisoning of a woman from Amsterdam by glufosinate ammonium. Her story (abridged, for the full story see http://www.gentechvrij.nl/rvs0110.html): a few years ago, my body absorbed some propandiol, ethylene glycol and alkyl ether sulfate etc. through the drift of Finale SL14 – similar to Basta or Liberty – during a period of warm weather. The damage is permanent. Whole swathes of the population could also be hit, so it is in the general interest to ban these substances. However, the public is unaware of these facts.

I am suspicious of arable crops which are genetically modified to be pesticide-resistant.

The companies introducing GM crops which are resistant against substances used in pesticides, are responsible for damage to health. The largest company in this field in the Netherlands has told me that it does not know the substances used in the herbicides against which they make their plants resistant. It's a matter for Hoechst, apparently. But Hoechst just passes the buck back.

Anyone introducing a new strain is responsible for its consequences. Even Monsanto claims that it bears absolutely no responsibility for the potential consequences of using its products in crop production. And that’s ok?

A little aside: Foray 48B, a Bt-insecticide,– contains methylparaben as an "active ingredient". This was listed by the EPA back in the day as an active ingredient. This stuff can also be found in ointments, etc., which you spread on your skin to prevent chapping. Can anyone explain that to me? ----------

What do allergens taste like?

The advertisement in various newspapers (including the NRC 10/10/01) about your senses really took the biscuit! I would never have thought that the government would take supernatural advice from a medium to determine how safe our food is! Neither did I imagine that you would play on the feelings of the ignorant majority. A very weak and irresponsible way to behave.

Is your sixth sense supposed to guarantee our safety? The policymakers are constantly changing. What does your "guarantee" actually mean? Is it some kind of contract, with government guaranteeing your recovery to health if your sixth sense runs amuck? Or are there some kind of financial arrangements? For example, in the case of a lifelong allergy triggered by sensitivity to herbicides (e.g. Liberty/Basta/Finale, or by a substance in a pesticide. I could go on).

What happens if we

1. consume Bt-maize sprayed with Btk delta endotoxin, or

2. have inhalation problems as a result of the use of Bt spray in organic agriculture?

Bt (thuringiensis), Bc (cereus), and Ba (Anthracis) are closely related and I have read that the transfer of genetic material has occurred. The chances of this happening are no doubt very small but where does the anthrax come from? Since time immemorial, there have been anthrax spores here and there in the soil. Vondel even wrote a poem about it. Worms and mice can bring it to the surface.

What about the pH value in insects' intestinal tract? At a pH of more than 7, insects fall victim to delta-endotoxins. Differences in pH in various insects have an impact on the effectiveness of toxins. (A certain toxin kills a specific group of insects, according to what I've read).

I have also read that the excessive use of pesticides is making certain insects resistant. That is something else. Has enough research been done on this?

"Each of the more than 800 strains of Bacillus thuringiensis may exhibit toxicity to insects, rodents and humans". The Bt-sprays in GM maize apparently cause their own problems in the long run, each in their own way. We do not yet know what may happen tomorrow, as a result of a multiplicity of interactions.

Bt. israelensis has been shown to kill rats if injected into the abdomen and the brain, and "the irritancy of Bt.i. to eyes depends on the physical characteristics of the formulation".

Delta-endotoxins from Bt. israelensis "also caused destruction of rat, mouse, sheep, horse and human blood cells" and so on.

Regarding Bt. Kurstaki, users have reported all sorts of trouble in the event of contact with the face. Another interesting case concerns the scientist who accidently injected himself with Bt. israelensis "and another kind of bacteria commonly found on human skin".

It is also nice that the Oregon Health Division suggested before a Bt.k. spray program that "individuals with ... physician-diagnosed causes of severe immune disorders may consider leaving the area during the actual spraying".

And "The 1991 Material Safety Data Sheet for Foray 48B" states that "Repeated exposure via inhalation can result in sensitization and allergic response in hypersensitive individuals."

Enough misery for the time being. I'll just leave you with the fact that Bt.i. formulations are especially unhealthy because "inerts" in the product deplete the dissolved oxygen in water. The Bt.i formulation Teknar was acutely toxic to brook trout fry, probably because of xylene used as "inert" in the product.

There is so much in the literature about Bt and other pesticides, the formulations and their effects, that I already have a nasty taste in my mouth: the taste of allergies, sickness and death.

Yours sincerely,

L. Eijsten. (This lady has since died. I gained her permission to use her papers.) http://www.gentechvrij.nl/rvs0107.html ----------

Concerning the article: Farmers turning against GM maize.

I recently read your article in the Volkskrant of 10 March. I consider it necessary to write to you to clarify this matter.

A comment. If there really are too many weeds (in a field of maize), then that in itself means you need less herbicide, because of the umbrella effect of the maize with its larger leaves.

Aventis goes on about the impact of Liberty on the surrounding flora and fauna but conveniently forgets the impact on humans, who may be affected as a result of drift (and residues of the herbicide in the food chain).

It is inaccurate to talk about Liberty as an agent in itself. Rather, the active agent in Liberty is GLA technical (phosphinothricin or glufosinate ammonium), a product – like Roundup – developed from a phosphorous compound.

This GLA technical is the active ingredient in other herbicides made by Hoechst, including Basta, Finale, Finale SL (SL14, amongst others). All these herbicides have the active agent GLA technical in common.

Various "auxiliary materials" are added to the active agents, such as propandiol, fungicide and – what is really serious – alkyl ether sulfate (AES), which has cardiovascular effects (vasodilating or vasoconstrictive - depending on the dose) and affects blood pressure, etc. The overall product (product as sold) is known as the formulation. GLA technical is often used in laboratory tests.

Basta, for example, contains 30% AES. And that's a fair amount!

Around half a year ago, my attention was drawn to the fact that the *Bestrijdingsmiddelenwet* (Pesticides Act) refers only to "active agents" and their breakdown products, and not other substances in the product, the formulation.

(For the record: I have only once seen "auxiliary materials" referred to in the Pesticides Act).

I have asked for the Act to be supplemented with the following phrase: "additives, for example surfactants and solvents, jointly known as 'the formulation'".

In early April, all this is being dealt with by the Standing Parliamentary Committee for Agriculture, Nature and Food, and I have tried to obtain information about additives to the active agent (also applies to other herbicides), but information about this is reserved for the CTB (*College Toelating Bestrijdingsmiddelen* – Pesticide Authorisation Committee), and guidelines prevent the provision of information about the precise composition. Through reduction and deduction, I can identify just 60% of the substances in Basta. Neither does the RIKILT Institute of Food Safety know the composition of herbicides. Seriously. That is the reason that I reject Liberty (and other herbicides!)

The herbicides are acetylated in the plant and then deacetylated in the intestinal tract, transformed back into the original herbicide.

It is claimed that this is fully broken down, but this is not the case. 6% is not broken down, and has a half-life of 6 minutes. The other 94% has all the time available to permeate the intestine wall.

No chronic toxicity tests have ever been done! I have reliable information about residues being found in meat, milk and eggs.

For all these reasons, I appealed to the *College van Beroep voor het Bedrijfsleven* (Administrative court of the last instance in matters of trade and industry) against the decision of the CTB to authorise the use of Liberty – until June 2003, because I believe that citizens are entitled to know about the health-damaging substances in herbicides. There is no room for confidentiality considerations here!

I am therefore the happy recipient of a large file from the attorney-general. The crazy thing is that no one has ever stuck their neck out about this before! I have submitted around 55 complaints, comments and appeals to the Council of State.

My hair stood on end when I read the Opinion of the Scientific Committee on Plants on the authorisation of maize GA 21 following an application by Spain. As far as I can see, feed tests from 1986 are being used for the assessment today. How is that possible? It shouldn't be allowed!

Yours sincerely,

L. Eijsten

http://www.gentechvrij.nl/rvs0101.html

Nutritional assessment

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Others

First a remark. You can see in the following article that Monsanto is once again promising castles in the air: "As a life sciences company, Monsanto is committed to finding solutions to the growing global needs for food and health by sharing common forms of science and technology among agriculture, nutricion and health. The company's 30,000 employees worldwide make and market high-value agricultural products, pharmaceuticals and food ingredients.

This press release contains certain forward-looking statements, including those related to the market for and sales of Roundup Ultra herbicide. These forward-looking statements are based on past experience and current expectations, but actual results may differ materially from those anticipated and there can be no guarantee that future results will be similar to those of

the past. Certain factors which could cause actual results to differ materially from expected and historical result include: weather; price; new use; patent expiration; local farming practices; local economic conditions; the type of crops planted; and the availability, price and desirability of competitive, governmental, intellectual property, technological and other factors indentified in Monsanto Company's Form 10-K and Form 10-Q filings with the Securities and Exchange Commission." http://www.gentechvrij.nl/EijstenIndex.html

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3. Environmental risk assessment

Monsanto's popular GM maize is supposed to be resistant against greedy insects, thanks to a modification. However, the farmers' nightmare has come true in some fields in Iowa, in the American Midwest, with insects evolving their own resistance to the GM maize.

This development is being viewed with dismay. The fear is that farmers using these GMO crops are unwittingly generating super-bugs.

Aaron Gassmann (entomologist at Iowa State University) discovered that maize root worm in four fields in the northeast of Iowa had become resistant to the "natural" pesticide in Monsanto's GM maize. He explained that, although currently these were just isolated cases, it was unclear just how quickly the resistance would spread. But it is an early warning that agriculture will have to change. The results of the study were published by PloS one. http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0022629

Original article: http://online.wsj.com/article/SB10001424053111904009304576532742267732046.html

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4. Conclusions and recommendations

Don't give the green light for this crop,to plant as a crop, it will be a disaster for the whole of Europe!

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5. Others

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6. Labelling proposal

NONE, it should not be used at all. We don't want it, we don't need it. We favour organic agriculture.

Organisation: the European GMO-free Citizens
Country: The Netherlands
Type: Others...

a. Assessment:
Molecular characterisation

see 3

Comparative analysis (for compositional analysis and agronomic traits and GM phenotype)

see 3

b. Food Safety Assessment:
Toxicology

see 3

Allergenicity

see 3

Nutritional assessment

see 3

Others

See also our earlier comments

3. Environmental risk assessment

----- Forwarded Message ----- From: TWN Biosafety Info Sent: Tuesday, December 6, 2011 12:14 AM

Title : Studies on GMO Risk Assessment Date : 06 December 2011

Contents: THIRD WORLD NETWORK BIOSAFETY INFORMATION SERVICE Dear Friends and colleagues, RE: Studies on GMO Risk Assessment We wish to highlight two recent scientific studies which critically scrutinize the practice and approach taken by the authorities in conducting risk assessments on GMOs in the European Union. Recommendations are also put forward to improve the practice of assessing GMOs as well as to change regulations where necessary in order to require more comprehensive risk assessments to be carried out. Both studies can be downloaded for free at their respective links provided below. Third World Network 131 Jalan Macalister, 10400 Penang, Malaysia Email: twnet@po.jaring.my Website: www.biosafety-info.net and www.twnside.org.sg To subscribe to other TWN information lists: www.twnnews.net ---------- ---------- Item1 Full document at: http://www.enveurope.com/content/23/1/33

Scrutinizing the current practice of the environmental risk assessment of GM maize applications for cultivation in the EU

Marion Dolezel (1)*, Marianne Miklau1, Angelika Hilbeck (2), Mathias Otto (3), Michael Eckerstorfer (1), Andreas Heissenberger (1), Beatrix Tappeser (3) and Helmut Gaugitsch (1)

* Corresponding author: Marion Dolezel marion.dolezel@umweltbundesamt.at

Author Affiliations

1 Umweltbundesamt GmbH, Spittelauer Laende 5, 1090 Vienna, Austria 2 Ecostrat GmbH, Hottingerstrasse 32, 8032 Zurich, Switzerland 3 Bundesamt für Naturschutz, Konstantinstrasse 110, 53179 Bonn, Germany

Environmental Sciences Europe 2011, 23:33 doi:10.1186/2190-4715-23-33

Abstract Purpose The prevailing controversies on the potential environmental risks of genetically modified organisms [GMOs] still fuel ongoing discussions among European Union [EU] member states, risk assessors, applicants and scientists, even several years after the commercial introduction of GMOs. The disagreements mainly derive from the current risk assessment practice of GMOs and differences in the perceived environmental risks. Against this background, the aim of this study was to scrutinize the current practice of environmental risk assessment [ERA] of several GMO applications currently pending for authorisation in the EU. Methods We analysed the data presented for three assessment categories of the ERA of genetically modified [GM] maize applications for cultivation in the European Union: the agronomic evaluations and the assessments of the effects of GM maize on target organisms and of its potential adverse effects on non-target organisms. Results Major shortcomings causing considerable uncertainties related to the risk assessment were identified in all three categories. In addition, two principles of Directive 2001/18/EC are largely not fulfilled - the consideration of the receiving environment and the indirect effects, as mediated, e.g. by the application of the complementary herbicide in the case of herbicide-tolerant GM maize. Conclusions We conclude that the current practice of ERA does not comprehensively fulfil the scientific and legal requirements of Directive 2001/18/EC, and we propose improvements and needs for further guidance and development of standards. The recommendations address likewise applicants, risk assessors as well as decision makers. ----------

---------- Item 2 Full document at: http://www.enveurope.com/content/23/1/7

Systemic risks of genetically modified crops: the need for new approaches to risk assessment

Hartmut Meyer

Correspondence: Hartmut Meyer hmeyer@ensser.org

Author Affiliations

Federation of German Scientists (Vereinigung Deutscher Wissenschaftler, VDW), In den Steinäckern 13, Braunschweig, 38116, Germany

Environmental Sciences Europe 2011, 23:7 doi:10.1186/2190-4715-23-7

Abstract Purpose Since more than 25 years, public dialogues, expert consultations and scientific publications have concluded that a comprehensive assessment of the implications of genetic engineering in agriculture and food production needs to include health, environmental, social and economical aspects, but only very few legal frameworks allow to assess the two latter aspects. This article aims to explain the divergence between societal debate and biosafety legislation and presents approaches to bring both together. Main features The article reviews the development of biosafety regulations in the USA and the EU, focussing on diverging concepts applied for assessing the risks of genetically modified organisms (GMOs). Results The dominant environmental risk assessment methodology has been developed to answer basic questions to enable expedient decision making. As a first step, methodologies that take into account complex environmental and landscape aspects should be applied. Expanding the scope of risk assessment, more holistic concepts have been developed, for example the Organisation for Econonomic Co-operation and Development (OECD) concept of systemic risks which includes socio-economic aspects. International bodies as the OECD, the Convention on Biological Diversity (CBD) and the European Union (EU) have developed the Strategic Environmental Assessment (SEA) as an instrument that includes the additional aspects of risk assessment as demanded by many stakeholders. Interestingly, there had been no attempts yet to link the existing frameworks of GMO risk assessment and SEA. Conclusions It is recommended to adapt current models of SEA to assess the systemic risks of GMOs. It is also suggested to revise the EU GMO legislation to promote the inclusion of SEA elements.

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4. Conclusions and recommendations

see 3

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5. Others

see 3

6. Labelling proposal

see 3

Organisation: Testbiotech
Country: Germany
Type: Non Profit Organisation

a. Assessment:
Molecular characterisation

There is a complete lack of metabolomic data as well as data showing to which extent the gene activity of plant genes is affected by the artificial introduction of the gene constructs.

These data would be highly relevant, since it cannot be denied that there are significant unintended changes in the composition of components (such as Vitamin B1, fatty acids, amino acids, zinc and lignin) and significant unexpected differences in phenotype (such as height, seedling vigour and yield).

Comparative analysis (for compositional analysis and agronomic traits and GM phenotype)

The comparative assessment is flawed because of biased interpretation of the existing data. There were significant differences in plant components (such as Vitamin B1, fatty acids, amino acids, zinc and lignin) that clearly indicate unintended and unexpected changes in plant metabolism and plant composition in comparison with the isogenic lines. Given these findings, a detailed study of changes in gene activity and plant metabolism should be performed under various and defined environmental stress factors to examine genetic stability of the plants, and to investigate to which extent unintended compounds can emerge in the plant tissue. This is also relevant for the expression data of the newly introduced gene constructs.

The EFSA opinion stating that the changes in plant composition are within the range of historical data is not a sufficient indication for the safety of these crops. Instead, there must be more investigation into why there are significant differences in plant composition in comparison with the isogenic lines to avoid major uncertainties (Hilbeck et al 2011). Only after further detailed examination can these data be interpreted regarding potential risks. It also has to be stated that there is no reference to the historical data mentioned by EFSA.

References: Hilbeck A.,Meier M.,Römbke J.,Jänsch S.,Teichmann H.,Tappeser B., (2011) Environmental risk assessment of genetically modified plants concepts and controversies.EnvironmentalSciences Europe.2011;23(13).

b. Food Safety Assessment:
Toxicology

Assumptions of EFSA about the mode of action of Bt toxins that are not sufficiently based on scientific evidence. There are several modes of action described and not just one theory about how these toxins function. Some of these publications show that selectivity cannot be assumed without detailed testing. Others show that synergistic interactivity has to be taken into account.

In general, the mode of action of Bt toxins is not fully understood. This is even a matter of controversial debate (Pigott & Ellar, 2007). Strict selectivity of the Bt toxins is not shown by empirical evidence but deduced from its mode of action as described previously. More recent research (Soberon et al., 2009) shows that there are mechanisms that might cause toxicity even in mammals. As Pardo Lopez et al. (2009) and Pigott et al. (2008) show, synthetically derived and modified Bt toxins can show much higher toxicity than native proteins. Even small changes in the structure of the proteins can cause huge changes in toxicity. Thus, risks for human health cannot be excluded by assumptions or considerations but only by empirical testing before market authorisation.

EFSA did not elaborate on these partially contradictory theories on the mode of action of Bt toxins. No detailed study was performed on the potential impact of Cry3Bb1 on mammalian cells. No assessment of synergies and accumulated effects was presented. The only synergy that is discussed is between the enzyme EPSPS that confers resistance to glyphosate and the Cry3Bb1 toxin. But from perspective of toxicology, the potential synergies between the Cry3Bb1 toxin and the formulations (and metabolites) of glyphosate used for spraying the plants are much more relevant. There were no tests carried out to examine potential synergies.

Synergistic effects can become highly problematic for non- target organisms. Interaction of the toxins with each other or with other compounds can cause higher toxicity and lower selectivity (Then, 2010). These effects may impact human and animal health as well as the protection of the ecosystems. Some plant enzymes that diminish the digestion of proteins (protease inhibitors) can strongly enhance the toxicity of Bt toxins (Pardo Lopez et al., 2009). Even the presence of very low levels of protease inhibitors can multiply the insecticidal activity of some Cry toxins. It is known that maize produces such inhibitors (Shulmina et al., 1985).

In this case, resistance to glyphosate (brand names such as Roundup) is combined with the insecticide. This leads to a combination of potentially hazardous residues from spraying. In this context, the additive POEA also has to be taken into account because it is even more toxic than glyphosate in the plants (BVL, 2010). The toxicity of glyphosate is currently under revision by the EU. Several experts are warning that toxicity could be higher than expected (Antoniou, et al., 2010; Benachour et al. 2007; Paganelli et al., 2010; PAN AP, 2009). Since the revision of glyphosate under pesticide legislation is not finalized, cultivation of these plants cannot be allowed.

In general, basic prerequisites have to be met to enable proper risk assessment. If these data are not available, hardly any feeding trial or other toxicological test can be designed, performed and interpreted in a meaningful way.

One of these prerequisites is sufficient data on the expression of the newly expressed proteins. But in the case of Bt toxins, standardized protocols to achieve results that can be reproduced by other laboratories are largely missing (Székács et al., 2011). Further, it is not clear how these plants and the expression rate of the newly introduced proteins will be influenced by more extreme weather conditions such as drought or other environmental factors. There are also no data on gene expression in volunteers that can remain after cultivation. Further, the impact from the genetic background of certain varieties has to be taken into account. Several investigations show that genetically engineered plants can exhibit unexpected reactions under stress conditions (see for example: Matthews et al., 2005). This can also impact the Bt content in the plants (Then& Lorch, 2008).

Another basic prerequisite for risk assessment in this context are reliable data on residue loads from spraying with glyphosate formulations. The amount of these residues depends on the specific agronomic management being used in the cultivation of the herbicide resistant plants. The fact is that reliable data covering the actual range of residue load in the plants are not available (Kleter et al., 2011; Then 2011, EFSA 2011).

It also has be taken into account, that these plants will be cultivated and fed and might be eaten by mixing them with other genetically engineered plants. Tests have to be performed to find potential combinatorial or accumulated effects.

Residues from spraying and from insecticidal toxins can result in permanent long term exposure of humans and animals and therefore relevant studies to examine chronic effects have to be performed. This has become especially relevant because MON863, which also produces the toxin Cry3Bb1, has since shown several significant effects in animal feeding trials that were classified as signs of toxicity (Seralini et al., 2007). So far, there have been no feeding studies over the whole lifetime of animals and none including following generations.

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Allergenicity

There are several proteins in maize that can cause allergic reactions. The newly introduced gene construct might, for example, enhance an immune response to endogenous plant protein(s).Targeted studies on potential impact on the immune system are necessary to exclude risks for animals, farmers and consumers as it is known that some Bt proteins react with the immune system.

Nutritional assessment

The outcome of the study as presented by industry showed significant differences that should have been explored further.

Others

Monitoring plan is not sufficient

The protocols used for conducting the measurements of the Bt toxins have not been fully published or evaluated by independent laboratories. As a result, independent institutions can hardly monitor the actual content of Bt concentration in the plants during cultivation or in food and feed products.

No plan for surveillance as required by European regulation was made available that would allow identification of particular health impacts that might be related to the use of these genetically engineered plants in food and feed.

Monitoring of health and environmental effects has to include the risks associated with the spraying of glyphosate formulations and their residues in the plants.

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3. Environmental risk assessment

EFSA has made assumptions about the mode of action of Bt toxins that are not sufficiently based on scientific evidence. There are several modes of action that are described and not just one theory on how these toxins work. Some of these publications show that selectivity cannot be assumed without detailed testing. Others show that synergistic interactivity has to be taken into account.

In general, it is not fully understood how Bt toxins work. It is a matter of controversial debate (Pigott & Ellar, 2007). Strict selectivity of the Bt toxins is not shown by empirical evidence but deduced from its mode of action as described previously. More recent research (Soberon et al., 2009) shows that there are mechanisms that might cause toxicity in other species and even in mammals.

The EFSA did not elaborate on these partially contradictory theories of mode of action of Bt toxins. No systematic overview was performed concerning the potential impact of these toxins on various non- target organisms (Dolezel et al., 2011). Despite the fact that several studies on non- target organisms have been published more systematic screening of relevant organisms, including wild life species, is necessary to design, perform and evaluate studies on potential impacts on specific non- target organisms. It also should not be left to the applicant to choose the most relevant organisms related to the ecosystems in various geo-climatic regions.

No assessment of synergies and accumulated effects was presented. The only synergy that is discussed is the one between the enzyme EPSPS that confers resistance to glyphosate and the Cry3Bb1 toxin. Much more relevant from perspective of toxicology are the potential synergies between the Cry3Bb1 toxin and the formulations (and metabolites) of glyphosate used for spraying the plants. Since this is not part of the assessment under pesticide regulation, it has to be assessed during risks assessment of the genetically engineered trait.

Synergistic effects can become highly problematic for non- target organisms. Interaction of the toxins with each other or with other compounds can cause higher toxicity and lower selectivity (Then, 2010). These effects may impact the ecosystems on various levels. For example, it has been shown that slugs incorporate the Cry3Bb1 toxins. It is also known that co-stressors such as cadmium and nematodes can cause toxicity of Cry toxins in slugs (Kramarz etl al., 2007, Kramarz et al., 2009). Nevertheless, this issue was not included in risk assessment. In general, a systematic screening of synergistic or accumulated effects on a sufficiently broad range of organisms has to be performed. This should also include the cultivation of other genetically engineered crops.

In general, to run proper assessment on toxicology, basic prerequisites have to be met. If these data are not available, hardly any assessment of environmental risks can be designed, performed and interpreted in a meaningful way.

One of these prerequisites is sufficient data on the expression of the newly expressed proteins. But in the case of Bt toxins, standardised protocols to measure the content of Bt toxins in a way that the results can be reproduced by other laboratories are largely missing (Székács et al., 2011). Further, it is not clear how these plants and the expression rate of the newly introduced proteins will be influenced by more extreme weather conditions such as drought. There are also no data on gene expression in volunteers that can remain after cultivation. Further, the impact from the genetic background of certain varieties has to be taken into account. Several investigations show that genetically engineered plants can exhibit unexpected reactions under stress conditions (see for example: Matthews et al., 2005). This can also impact the Bt content in the plants (Then& Lorch, 2008).

Since the cultivation of these plants will lead to a long term and large scale exposure of various organisms, adequate studies to examine long chronic effects have to be performed. But in the case of MON88107 most studies were only performed for one year.

Further, most studies were not performed on MON88107 but on other genetically engineered plants that also produce Cry3Bb1. EFSA considered these tests as being comparable because of nearly identical structures of the insecticidal proteins. However, as Saeglitz et al. (2006) show, Bt toxins with identical structure but derived from differing sources can vary extensively in their toxicity. Therefore, major uncertainties remain about whether data derived from traits such as MON863 can really be used in the risk assessment of MON88017.

Large-scale cultivation will bring many wildlife species into contact with these plants. Detailed empirical investigations of the organisms in the receiving environments must be conducted and include several tiers of the food web. Bt toxin can accumulate in the food web, reaching higher content than in the genetically engineered plants. But even the risks for most relevant non- target organisms (Coleoptera) were mostly assessed by modeling and not by empirical investigations. The tiered approach as it is applied in risk assessment is too narrow to really exclude risks for ecosystems. For example, risks for wildlife species were not included in risk assessment. The impact on rodents, birds and other animal species should be assessed carefully.

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4. Conclusions and recommendations

The opinion of EFSA has to be rejected.

5. Others

(1) Monitoring plan is not sufficient The protocols used for conducting the measurements of the Bt toxins have not been fully published or evaluated by independent laboratories. As a result, independent institutions can hardly monitor the actual content of Bt concentration in the plants during cultivation or in food and feed products.

A case specific monitoring should be requested concerning risks for non- target organisms such as Coleoptera species.

The usage of existing networks that are not specifically designed to monitor the impact of genetically engineered plants and the introduction of questionnaires to be filled in by farmers are not sufficient to fulfill requirements of general surveillance as foreseen by EU regulations.

(2) MON88017 cultivation does not accord with the aim of sustainable agriculture The introduction of these plants is likely to foster the spread of rootworm in maize growing areas. The plants do not produce enough toxin in their roots to kill the pest insects with a >99% likelihood. Instead around 4% of the pest insects can be expected to survive. Further, there will be refugee zones covering around 20% of the maize growing areas where no measures will be taken to diminish the population of rootworms. In result, this is very likely to cause the establishment of rootworm populations. Under these conditions, any strategies to extinguish rootworm by crop rotation and other means are bound to fail. So after some years, the pest insects will have developed resistances (as expected by EFSA), and the rootworm will have been established within regions that could have been protected more efficiently by other strategies. In conclusion, the overall strategy behind the introduction of MON88017 does not support sustainable agriculture in the long run.

A similar argument is relevant for the impact of large scale application of glyphosate in maize growing regions. Cultivation of these herbicide resistant plants poses risks to biodiversity, plant health, soil fertility and enables the emergence of herbicide resistant weeds (Benbrook, 2009). The massive usage of glyphosate in herbicide resistant crops endangers the health of rural communities, aquatic systems as well as impacting biodiversity and soil fertility (PAN AP, 2009). It can cause plant diseases e.g increased infestation with fungal diseases (Johal & Huber, 2009). The negative impact on plant growth and plant health can even be transmitted to other plants cultivated in the same field in the following year (Bott et al., 2011, Bott et al., 2007).

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