

DMH-11 & Its Parental Lines are
Herbicide Tolerant crops:
Our Objections to HT crops in the
Indian context

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DMH-11 & parents are HT Crops, trying to enter through a backdoor

“The presence of the Bar gene also allows for effective post emergent weed control with the glufosinate ammonium-containing herbicide”.

Siruguri, V., et al. (2015): Evaluation of Bar, Barnase, and Barstar recombinant proteins expressed in genetically engineered Brassica juncea (Indian mustard) for potential risks of food allergy using bioinformatics and literature searches, Food and Chemical Toxicology 83 (2015) 93-102
<http://dx.doi.org/10.1016/j.fct.2015.06.003>

“CaMV 35S double enhancer promoter: This promoter confers a 10-fold increase in expression levels over the corresponding single enhancer counterpart and has been used for expression of the selectable marker gene (bar) in barstar construct”.

This is of course a dead giveaway for the main purpose of DMH-11 especially given that bar was apparently mainly required for (in vitro selection &) maintenance of male sterile barnase line!

DMH-11 & its Parental Lines are Trojan Horses for HT crops

- *DMH-11 hybrid F1 is a 100% HT crop – So are the parental lines*
- ***BUT NOT DECLARED SO IN THE BIOSAFETY DOSSIER.***
- Saying coyly that “herbicide usage is not recommended for realising yield potential” does not mean anything in reality. HT trait will also be there in farm-saved seed and contaminated neighboring fields

Problems with HT Crops

1. (Increasing) Use of Herbicides

- Ecological impact
- Health Impacts

2. Super Weeds

3. Socio-Politico-Economic:

- Poor rural women's employment potential affected – Female Agri labour numbers swelled from Census 2001 to Census 2011
 - Weeds also fodder and food
 - Cost of seed & herbicide – loss of control & choices
 - IPRs and Patents
4. Multiple Cropping affected in the age of Climate Change!
5. Neighboring farmers and Organic farmers affected

Known Environmental & Health Impacts

Environmental:

- On Soils
 - On non-target organisms
- Strong & persistent selection pressure: Creation of superweeds
 - Reduction in biodiversity in general
 - Impact on multi-cropping systems

Health:

- Carcinogenicity
- Reproductive Health
 - Neurotoxicity
- Teratogenic effects
 - Many more...

Numerous studies compiled on this: <http://indiagminfo.org/wp-content/uploads/2013/11/Sci-ref-complete-book-2nd-edition.pdf>

Elsewhere with HT crops...

- **Herbicide drift damage is a leading cause of litigation between farmers** – in fact, farmers forced to grow HT crops to protect from drift injury!

Herbicide Resistant Crops — The Truth About the World's Most Widely Grown Genetically Engineered Plants, 2012. PANAP. http://www.panap.net/sites/default/files/rs_herbicide_resistant_crops.pdf

- Herbicide-resistant crop technology has led to a **239 million kilogram (527 million pound) increase in herbicide use** in the United States between 1996 and 2011

Charles M Benbrook (2012). Impacts of genetically engineered crops on pesticide use in the U.S.-- the first sixteen years. Environmental Sciences Europe. DOI: 10.1186/2190-4715-24-24

- Total volume of **glyphosate** applied to the three biggest GE crops — corn, cotton and soybeans — **increased 10-fold from 15 million pounds in 1996 to 159 million pounds in 2012**

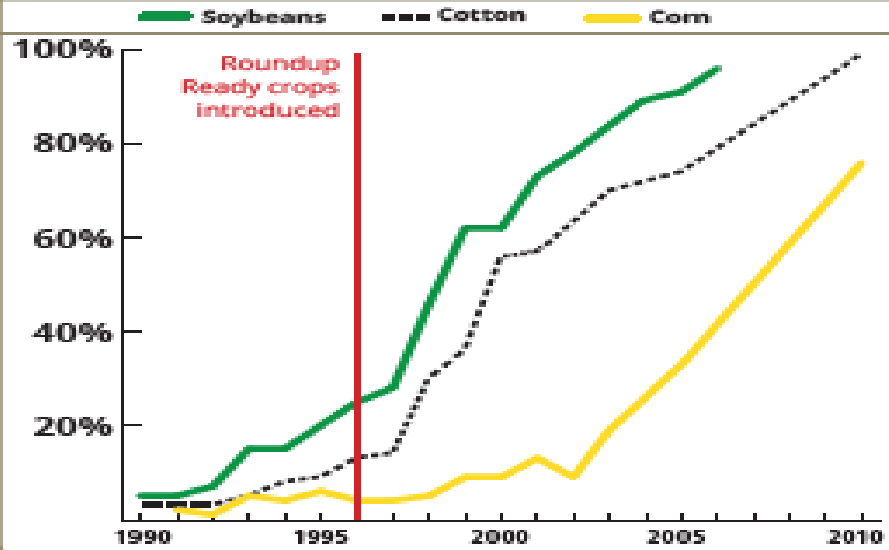
Superweeds-How Biotech Crops Bolster the Pesticides Industry, Food & Water Watch, Washington DC. July 2013
<http://www.foodandwaterwatch.org/sites/default/files/Superweeds%20Report%20July%202013.pdf>

- **Two thirds of total volume of glyphosate** applied in the US from 1974 to 2014 (40 years) has been **sprayed in just the last 10 years.**

Charles M Benbrook (2016). Trends in Glyphosate Herbicide Use in the United States and Globally. Environmental Sciences Europe. DOI 10.1186/s12302-016-0070-0

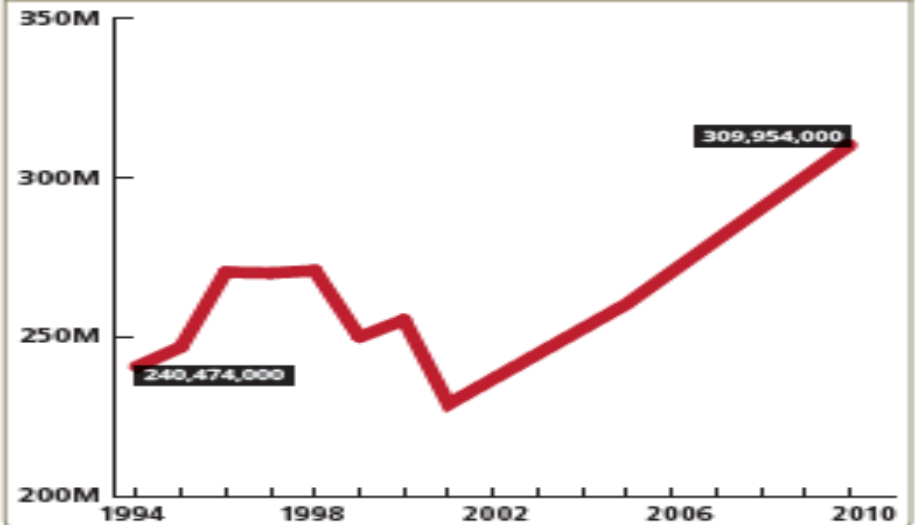
“Superweeds” a reality

Figure 2. Percentage of U.S. Acres Sprayed With Glyphosate



SOURCE: USDA-NASS. Quickstats: Survey, Environmental, Corn, Cotton, Soybean, Application Percent Area Planted (Average) (Glyphosate).

Figure 5. Total Herbicide Volume Applied to Corn, Cotton, Soybeans (MILLIONS OF LBS PER YEAR)



SOURCE: USDA-NASS. Quickstats. Agricultural Survey, Chemical Applications, Herbicide Use on Corn, Cotton and Soybeans (Total).

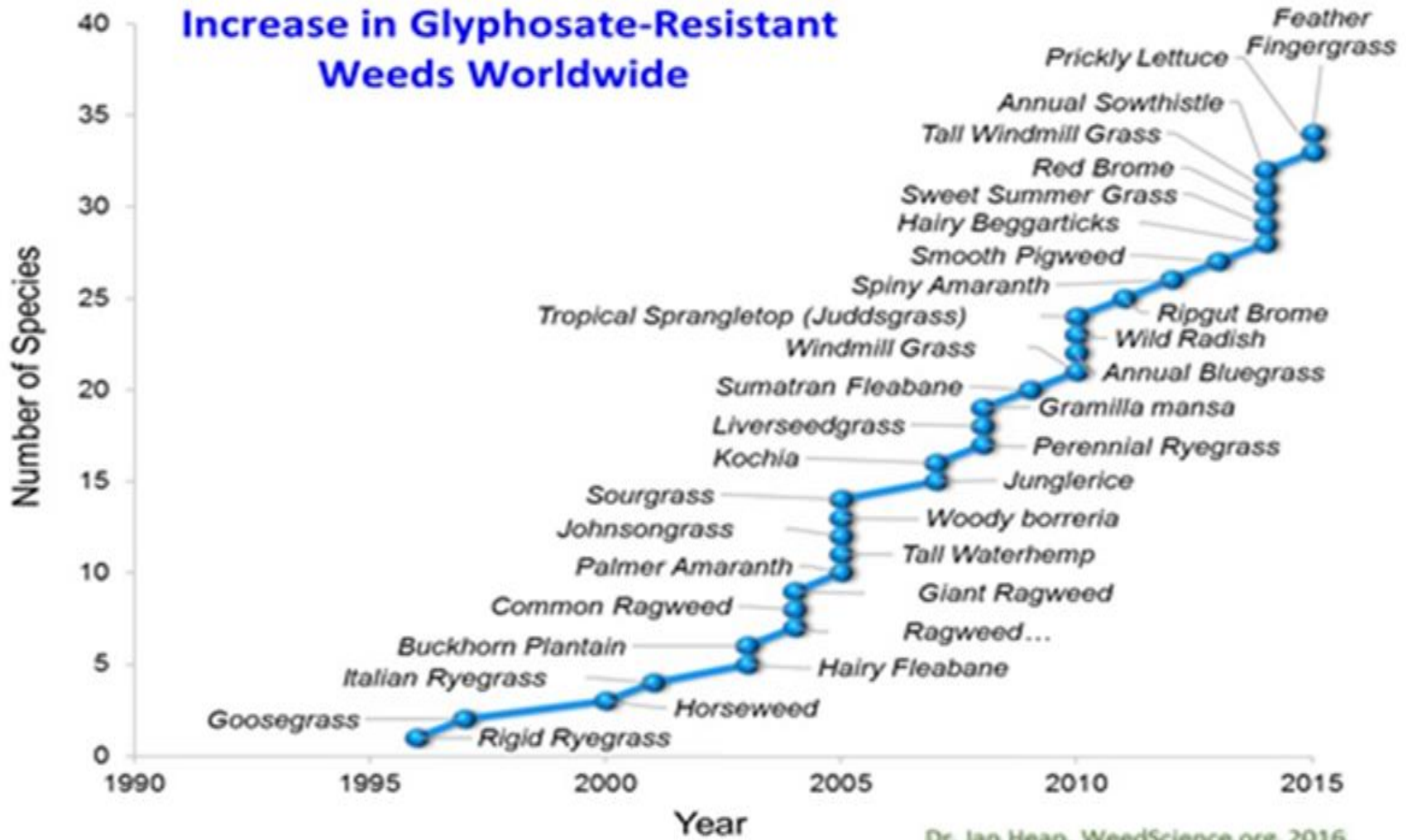
Superweeds-How Biotech Crops Bolster the Pesticides Industry, Food & Water Watch, Washington DC. July 2013

<http://www.foodandwaterwatch.org/sites/default/files/Superweeds%20Report%20July%202013.pdf>

GMO Crops Mean More Herbicide, Not Less. Forbes, July 2nd 2013 <http://www.forbes.com/sites/bethhoffman/2013/07/02/gmo-crops-mean-more-herbicide-not-less/#450ea79aa371>

**HT crops increase chemical use: Can we afford more chemical use in this country with its more direct exposure possibilities?
HOW DOES THIS FIT INTO A SUSTAINABLE AGRICULTURE APPROACH OR EVEN THE ORGANIC FARMING PUSH OF GOVTS?**

Won't we learn lessons from elsewhere?



Environmental health crisis of HT crops

Numerous anecdotal reports from Argentina, Brazil, Paraguay etc. covered by BBC, Al Jazeera and others....

Are pesticides linked to health problems in Argentina? BBC

<http://www.bbc.com/news/magazine-27373134>

Argentina's Bad Seeds, Al Jazeera english

<http://www.aljazeera.com/programmes/peopleandpower/2013/03/201331313434142322.html>

Argentina's Bitter Harvest, New Scientist

<https://www.newscientist.com/article/mg18224436-100-argentinas-bitter-harvest/>

The health risk behind Argentina's soya paradise, France 24

<http://www.france24.com/en/focus/20150504-argentina-glyphosate-pesticide-cancer-gmo-soya-health-risk>

Brazil's National Institute of Cancer blames GM crops:

http://www1.inca.gov.br/inca/Arquivos/comunicacao/posicionamento_do_inca_sobre_os_agrotoxicos_06_abr_15.pdf

Some studies and reviews validate this:

- Alejandra Paganelli, Victoria Gnazzo, Helena Acosta, Silvia L. Lopez, Andres E Carrasco (2010). Glyphosate based herbicides produce teratogenic effects on vertebrates by impairing retinoic acid signaling. Chem. Res. Toxicol, 2010. 23 (10). Pp 1586-95.
<http://pubs.acs.org/doi/abs/10.1021/tx1001749>
- Laborde A, Tomasina F, Bianchi F, Bruné MN, Buka I, Comba P, Corra L, Cori L, Duffert CM, Harari R, Iavarone I, McDiarmid MA, Gray KA, Sly PD, Soares A, Suk WA, Landrigan PJ. 2015. Children's health in Latin America: the influence of environmental exposures. Environ Health Perspect 123:201–209; <http://dx.doi.org/10.1289/ehp.1408292>

AND WORLD HEALTH ORGANISATION DECLARES GLYPHOSATE A PROBABLE HUMAN CARCINOGEN IN 2015

HT Crops: What Executive, Legislative & Judicial Committees Said

Such areas of biotechnological applications which can reduce employment and impinge on the livelihood of rural families should be avoided.

Report of the Task Force on Application of Agricultural Biotechnology, chaired by Dr MS Swaminathan, MoA, GoI 2004

“8.123. Even a miniscule degree of insensitivity on this matter (ethical dimensions of transgenics in the extant socio-cultural milieu in India) can lead to avoidable discontent which apart from causing societal tensions would also have grave socio economic repercussions....

8.125. In case of transgenics in agriculture crops in India, the experience of last decade has conclusively shown that while it has extensively benefitted the industry, as far as the lot of the poor farmers is concerned, even trickle down is not visible. **THE COMMITTEE THEREFORE, UNANIMOUSLY RECOMMEND THAT TILL ALL THE CONCERNS VOICED IN THIS REPORT ARE FULLY ADDRESS AND DECISIVE ACTION IS TAKEN BY THE GOVERNMENT WITH UTMOST PROMPTITUDE, TO PUT IN PLACE ALL REGULATORY, MONITORING, OVERSIGHT, SURVEILLANCE AND OTHER STRUCTURES, FURTHER RESEARCH AND DEVELOPMENT ON TRANSGENICS IN AGRICULTURAL CROPS SHOULD ONLY BE DONE IN STRICT CONTAINMENT AND FIELD TRIALS UNDER ANY GARB SHOULD BE DISCONTINUED FORTHWITH.**

“Cultivation of Genetically Modified Food Crops – Prospects and Effects”, 37th Report of (Parl. Standing) Committee on Agriculture, Fifteenth Lok Sabha, August 2012

....Supreme Court's Technical Expert Committee Report

The TEC has examined the issues in relation to HT, particularly with regard to sustainability and the likely socioeconomic impact on major sections of rural society. On both these counts, based on the reasons presented in the section on Herbicide Tolerance, the conclusion of the TEC is that HT crops would most likely exert a highly adverse impact on sustainable agriculture, rural livelihoods, and environment. The TEC finds them completely unsuitable in the Indian context and **RECOMMENDS THAT FIELD TRIALS AND RELEASE OF HT CROPS NOT BE ALLOWED IN INDIA.** (Page 71, Report of the majority 5 Independent Biosafety Experts of TEC, July 2013, along with the Corrigendum)

THIS MATTER IS SUB-JUDICE – BOTH ON BAN ON HT CROPS, AND ALSO ENTIRE RISK ASSESSMENT REGIME DEPLOYED

Glufosinate Toxicity

Significant body of evidence on Glufosinate and secondary compounds:

- Embryonic Development Effects in mice and pregnant rats
- Glufosinate and its metabolite MMPA 3 are neurotoxins
- Glufosinate (low doses) affects central nervous system development in baby rats
- Teratogenic effects of Glufosinate include growth retardation and deformities of the brain in rats & mice
- Reproductive health adversely impacted
- Glufosinate is persistent and mobile in soils
- Glufosinate is toxic to beneficial soil micro-organisms incl. nitrogen fixing bacteria
- Glufosinate is toxic to some aquatic organisms
- Glufosinate is toxic to some beneficial insects/predators
- Glufosinate is a threat to wild plant communities
- Glufosinate may increase nitrate content in soils and increase risks of nitrate leaching

HAS NOT BEEN ASSESSED FOR CARCINOGENECITY BY IARC.

**EU REGULATION RESTRICTS USAGE GIVEN HIGH RISK TO MAMMALS & NON TARGET ARTHROPODS
(Regulation (EC) No 1107/2009 by Nov 13, 2013)**

INSUFFICIENT ASSESSMENT IN INDIA!

Health & Environmental Impacts of Glufosinate Ammonium, Friends of the Earth UK, 2001
https://www.foe.co.uk/sites/default/files/downloads/impacts_glufosinate_ammon.pdf
Glufosinate Ammonium Monograph, Pesticide Action Network Asia & the Pacific. October 2008
http://www.panap.net/sites/default/files/monograph_glufosinate.pdf

Impacts on Honeybees?

- This aspect has not been studied in the context of HT crops resistant to glufosinate.
- Potential Implications for:
 - mustard yields
 - pollination in other crops
 - general ecosystem

OVERALL FOOD SECURITY & FARM LIVELIHOOD IMPLICATIONS FROM FARM PRODUCTIVITY IMPACTS, BESIDES IMPACTS ON HONEY INDUSTRY – HAVE THE REGULATORS STUDIED THIS?

Glufosinate in India

- Registered for Use by CIBRC (Min. of Agri & Farmers' Welfare) Only for Cotton & Tea (<http://cibrc.nic.in/mup.htm>)
- Developer used Glufosinate in Mustard even though it is not registered for it – Applicant is also recommending it to be used in seed production. How?
- How will Glufosinate use in Mustard be monitored and restricted?
- There is no responsible agency to monitor illegal use.
- Patent on Bar gene is with Bayer group, and Glufosinate's only brands in India also with Bayer! Given the restrictions elsewhere, India becomes the dumping ground for a toxic technology? And Bayer to buy up Monsanto??

Lessons from Glyphosate Story

- Promoted as safe herbicide (“Safer than Table Salt”)
- Data related health effects suppressed over 30 years
- 2015 : IARC / WHO declared possible carcinogen
- Following countries have restricted the use
 - Ban** : Srilanka, El Salvador, many towns in USA
 - Restricted** : Netherlands, France, Canada
 - Under evaluation** (jul.2016): EU – Extension of approval for limited period (18 months, till end of 2017) conditionally, pending ECHA review.

In India applications for RR crops (FTs) being processed by GEAC.... WILL WE BECOME THE DUMPING GROUND?

Environmental Health Crisis unfolding..

We conclude that:

- (1) GBHs (Glyphosate Based Herbicides) are the most heavily applied herbicide in the world and usage continues to rise;
- (2) Worldwide, GBHs often contaminate drinking water sources, precipitation, and air, especially in agricultural regions;
- (3) The half-life of glyphosate in water and soil is longer than previously recognized;
- (4) Glyphosate and its metabolites are widely present in the global soybean supply;

...Environmental Health Crisis unfolding

(5) Human exposures to GBHs are rising;

(6) Glyphosate is now authoritatively classified as a probable human carcinogen;

(7) Regulatory estimates of tolerable daily intakes for glyphosate in the United States and European Union are based on outdated science.

John Peterson Myers, Michael N. Antoniou, Bruce Blumberg, Lynn Carroll, Theo Colborn, Lorne G. Everett, Michael Hansen, Philip J. Landrigan, Bruce P. Lanphear, Robin Mesnage, Laura N. Vandenberg, Frederick S. vom Saal, Wade V. Welshons and Charles M. Benbrook (2016).

Concerns over use of glyphosate-based herbicides and risks associated with exposures: a consensus statement. *Environmental Health*, 2016. 15:19 DOI: 10.1186/s12940-016-0117-0

WHY HAS DMH-11 GM MUSTARD BEEN ALLOWED TO REACH THIS STAGE, DESPITE BEING A HERBICIDE TOLERANT CROP? SIMILARLY, THE PARENTAL LINES?

WHY WAS THE APPLICATION FOR R&D ACCEPTED AND PUBLIC FUNDS SPENT ON THE SAME?

WHY DID THE APPLICATION NOT DISCLOSE THAT IT IS A HT CROP AND WHY WAS THE REGULATORY RISK ASSESSMENT NOT THAT OF A HT CROP RISK ASSESSMENT?

WHERE ARE HT CROP RISK ASSESSMENT PROTOCOLS IN INDIA?

THIS GM MUSTARD NEEDS TO BE REJECTED FOR THE SAME REASONS THAT THE INDIAN REGULATORS THREW OUT BAYER'S GM MUSTARD IN 2002 – THE SAME REASONS APPLY, AND APPLY WITH GREATER REASON GIVEN A LARGER BODY OF EVIDENCE IN FRONT OF US ABOUT HT CROPS.