Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 07, pp.17734-17736, July, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

REVIEW ARTICLE

ECOLOGICAL CONSEQUENCES OF GM CROPS AND SAFETY OF ENVIRONMENT

*Rakesh Singh Chauhan and Dr. A. R. Singh

Department Of Botany, S.G.S. Govt. P.G. College (A. P. S. University Rewa) Sidhi (M.P.) 486661

ARTICLE INFO

Article History:
Received 28th April, 2015
Received in revised form
05th May, 2015
Accepted 07th June, 2015
Published online 28th July, 2015

Key words:
GMOs, virus, Gene flow,
Toxin flow, Seed escape,
Pollen transfer.

ABSTRACT

Environmental risk assessment is an integral component of biosafety evaluation of GM crops. The purpose of such accessment, is to identify and evaluate the possible adverse effects of GM organisms on the conservation and sustainable use of biological diversity. Known risk assessment techniques in different countries and guidelines developed by relevant organizations recognize comparative risk assessment and indicate the risk associated with GMOs or product thereof. Obtained through the use of modern biotechnology, they should be considered in context of risk posed by non modified recepients or parental organisms in the likely receiving environment.

Citation: Rakesh Singh Chauhan and Dr. A. R. Singh, 2015. "Ecological consequences of GM crops and safety of environment", *International Journal of Current Research*, 7, (7), 17734-17736.

INTRODUCTION

Debates on the ecological consequences of GMOs fall into two extreme categories: Those who feel that GMOs shall be treated as 'guilty until proven innocent' and those who wish to treat transgenic as 'innocent until proven guilty' (Belt, Henk Vanden, 2003). While this polarization, even among the professionals, is clearly due to their philosophical affiliation to the entities they are trying to protect (ecosystem and biodiversity in the first category), or promote (biotech products in the second), unfortunately, in the public and in the media these debates have turned more emotional than rational; more decibel base than data-based; and more prophetic than realistic. As a matter of fact, in a calm and reasonably coordinated atmosphere, neither of the two categories would be able to completely defend their stand as facts available are minimal and where available, they are with neither of two extreme views .Thus the truth of ecological consequences of GMOs lies somewhere in between. That it lies in bettween is also the reason why the two opposite groups have been indulging in an unending tug of the war over the issue.

Ecological impact of GMOs

There are two major ways in which GMOs are suspected to affect the ecosystem and the biological diversity.

***Corresponding author: Rakesh Singh Chauhan**
Department of Botany, S.G.S. Govt. P.G. College (A. P. S. University Rewa) Sidhi (M.P.) 486661

Gene flow

The uncontrolled escape of transgenes into non-target organisms specially into wild relatives is expected to affect the local gene pool and also the ecological balance. Transgenic genes may escape from the source population in three ways: a) through pollen transfer, b) as seed escapes, and c) horizontal gene transfer through transformation and transduction processes. The varied probabilities and diverse consequences of these mechanisms are important in assessing the ecological impact of GMOs.

Pollen Transfer

Introgression between the cultivated plants and their wild relatives is a dominant evolutionary process and hence, it is argued, may not be an exception for a transgenic cultivar as well (Steward Jr. *et al*). In fact most cultivated plants met with one or more wild relative in some portion of their geographic range (Snow, A. A., 2002). Consequently, it is feared that the advantageous genes from the transgenics may be introgressed into the related wild species especially when area under GMOs increases. Obviously the probability and depth of such gene transfer is a function of the extant to which wild relatives of a transgenic plant are distributed in area of cultivation. It is now known that world over there are a number of situations where the cultivated crops exchanges gene pools with their wild relatives Ellstrand, (N C *et al*, 1999) and some of the crops where this is most plausible are sorghum, sunflower, canolla, wheat. sugerbeat and alpha alpha (Steward Jr *et al., 2003*) All these situations are potential grounds for the transgenes to escape as area under cultivation of transgenic increases. The wild relatives thus 'transform may gain additional fitness advantage owing to this gene rendering itself the potentiality to be hazardous weeds in the crop field. While the logic of this cant be denied, we need to look at the facts of such consequences. Unfortunately, while only a few examples of such pollen mediated escape of the transgenic genes into wild relatives have been reported, as for example of transfer of the herbicide resistant gene from *Brassica napus* to *B rapa*, (Warwick *et al*, 2008, Steward Jr *et al. 2003*) there are hardly any study on the fitness related spread of such 'transformed' wild relatives (Snow, A. A., 2002). In fact even in this case of *Brassica*, Warwick *et al*. (2008) showed that the hybrid lineages declined dramatically overtime. For this reason, a proper assessment of the impact of such introgression has not been possible and if anything overestimated. Pollen flow is likely to carry the transgene to land races as well and if this happens the transformed land races may in fact thrive well in the nature and contribute to crops wild gene pool- an entity every breeder would wish to have. In other words such transfer of foreign genes may enhance the intraspecific genetic diversity of the crops (Pilson and Prendeville, 2004).

Seed Escapes

This is an immediate possible consequence of growing transgenic crop; The transgenic seeds after the harvesting of the main crop may be left behind, Escape and survive as admixtures and hence may enter into the chain of gene flow into wild relatives (Dlugosch and Whitton, 2008). There are a few examples of such escapes of seeds and not surprisingly they survive well in the wild.

Horizontal Gene Transfer

It is suggested to occur from transgenic sources to other related plant species through viral transduction or, to other microorganism through transformation (Pilson and Prendeville, 2004). The viruses that infect the transgenics may encapsulate the specific gene and re-infect other plant and release the gene in question or DNA of the transgenic plant entering the soil system may be taken up by microorganism transforming them. However horizontal gene transfer is among the least likely event because this requires high concentration of viable DNA of transgene to be accumulated in soils. While there are reports of such DNA getting released into soil, It is very unlikely that such DNA fragments would be in viable and sufficient quantities for their effective transformation. Studied have shown the possibility that transgene can be transferred to native soil microorganisms, although there is no evidence of this occurring in soil.

Toxin flow

Addition of chemical products from trans gene into soil and environment is argued to affect the biological systems. Perhaps by far the most well documented and highly celebrated case is that of reduced fitness of the monarch butterflies feeding on the pollen from the Bt transgenics (Losey *et al*., 1999). Similarly flow of toxins into soil has affected the soil micro flora towards the predominance of specific species or types in some cases and towards altered microbial diversity in other cases (Dunfield and Germida, 2004). It is also important however to realize that similar effects are seen even with any two non transgenic crops suggesting that the minor change in soil flora is an ongoing process of farming per se and need not be linked exclusively to the trans genes.

Problems of Negative Reports

The debate on GMOs suffers from a peculiar habbit of biased reporting that is charecteristics to science. It is important to realize that scientist in general exhibit a peculiar bias in there habbit of reporting results. For instance while some of instances cited above do reflect the negative impacts of GMOs on the ecosystem, positive results, in this case demonstrating that GMOs have an impact, are almost always reported and appreciated than those where impact is not detected. The authors don't find negative results of such work as interesting and worthy of publishing as those of the positive results and hence a lot of work goes unreported making it difficult to weigh the relative disadvantages of GMOs over their advantages. Debates over GMOs always suffer from this bias in science.

Future Challenges

Increased urbanization, population and income growth, will drive sustained growth in food demand, with a doubling of food needs in developing countries possible over the next four decades. With increasing urbanization, industrialization and population growth, land is limiting. GMOs, by increasing production of crop in same land area, enriching more nutrient value and more stress resistance crop plant, can contribute to future food security. Presently, agro-biotechnology research cites environmental safety, ethical and intellectual property rights issues and addressing them will be crucial for the well-being of today's hungry people and future generations.

Conclusion

There are very minimal data to evaluate impact of GMOs. What exists is only indicative and inconclusive and there is a massage here for r & d funding agencies. There is no point blaming those who use their decibels than datasets to push their views in public. We need to generate reliable information such that policy maker take an informed decision. Thus we need to facilitate certain areas of research that demand immediate attention such that professionals find them on a solid ground in drawing conclusions and public are fed with more substantiated policy statements.

Acknowledgement

We are thankful to Dr. A. P. Singh, deptt. Of Botany, Govt Science College Rewa, for his valuable inputs in preparing this paper. We are also thankful to other departmental staff for their coordination.

REFERENCES

Belt, Henk Vanden, 2003, Debating the precautionary principle: "Guilty until proven innocent" or "Innocent until proven guilty". *Plant Physiology*, 1122-1126.

Dlugosch, K M and J Whitton, 2008, Can we stop transgenes from taking a walk on the wild side, *Journal Compilation.* 2008, Blackwell publishing ltd.

Dunfield, K E, and J J Germida, 2004, Impact of GM crops on soil and plant mediated microbial communities. *J Environ. Qual*., 33: 806-815.

Ellstrand, N C *et al*, 1999, Geneflow and introgression from domesticated plants into their wild relatives. *Ann Rev. Eco. Syst*., 30:539-563.

Losey, *et al*. 1999, Transgenic Pollen harms monarch larvae. *Nature,* 399:214.

Pilson and Prendeville, 2004, Ecological effects of transgenic crops and escapes of transgenes into wild populations. *Ann Rev. Ecol. Syst*., 35: 149-174.

Snow, A. A., 2002, Transgenic crops-Why gene flow matters. Nature Biotechnology, 20:542.

Steward, Jr *et al*. 2003, Transgene introgression from genetically modified crops to their wild relatives, *Nature Reviews/Genetics*, 4: 806-817.

Warwick, *et al*. 2008, Do escaped transgene persist in nature. The case of a herbicide resistance transgene in awed population of Brassica Rapa. *Molecular Ecology*, 17:1387-1395.

****