

## Ethical Apprehensions Correlated to Genetically Modified Plants: A Philosophical Brief

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### Abstract:

*The current article corresponds to a succinct rational review about advancements of plant biotechnology that have initiated moral concerns due to large scale production of genetically modified/transgenic (GM) plants and the consumption of GM food*

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*products. As many controversies have been raised due to development and deployment of GM crops, fundamental issues of mankind's relationship with environment and nature along with theological premises are highlighted. Additionally to consequences on biodiversity, benefits and perils of applied GM crops have been argued with related particular examples. Conversation about transgenic crops utilization to lower human hunger, health risks and poverty has been addressed. The socio-economic influences and communal worries have also been assessed with the dividend opinions of both the scientific groups and the public communities on the merits and demerits related to GM plants/ foods. Variable arguments, for and against advanced GM technology, can be based on ideas viewed from largely dissimilar ethical perceptions. In coming years, expensive and more advanced transgenic technologies would become mandatory requirement in order to develop successful GM plants on large scale to meet food demands but only when they offer less ethical problems. In future, large scale transgenic plant production will be applicable with less environmental concerns, hazards and more desirable products for human consumption. In short, the future of GM crops may remain a vital debate, as its applications have reasonably a lot of advantages along with moral apprehensions.*

**Key words:** Plant genetic engineering, Ethics, Herbicide resistance, Biopiracy, Socio-Economic, Terminator Technology, Biosafety

## **INTRODUCTION**

The field of biotechnology has been referred to the exploitation of subsist organisms or their systems and parts for the intention of production or developing valuable commodities for mankind. Since the ancient times, biotechnological practices have been present in one form or another and human kind has been using it in agriculture, food production and medicine (Robinson, 1999). Among the branches of biotechnology “Plant Biotechnology” has the major importance and huge impact. The

greatest achievement of plant biotechnology is developing genetically modified plants (GM Plants/Crops) or “Transgenic Crops” which entails moving genes, the explicit parts of deoxyribonucleic acid (DNA), from either plants, bacteria or even from animals, into various species of crops and other essential plants. This process is called genetic engineering (GE) or plant transformation with an intention of introducing novel traits to the plants which does not occur naturally (Rani and Usha, 2013).

Introduction of superior traits into key plants is an aged farming modus operandi carried on by farmers since ancient epoch, although in recent era, it has been enhanced and accelerated by recent bio-technology methods (Uzogara, 2010). As it has been made uncomplicated via biotechnological tools to pinpoint which genes or a single gene is accountable for particular trait and attributes, favorable genes can be added specifically inside genome of those plants which we aspire to transform. Regardless of the latest and intricate measures needed to develop GM crops, genetic modification in the best reverence, an intriguing accomplishment for benefit of humans because GM crops can be resistant to insects, herbicides, abiotic stresses, produce higher quantity and quality yields and can generate special compounds like biodiesel, vaccines, essential vitamins or nutraceuticals (Davies, 2007). Essential GM crops include rice, maize, wheat, tobacco, barley, tomato, cotton etc. (Qaim, 2009). Such plants are believed to enhance human health, reduce hunger, meet the world’s increasing population food burden and ensure food safekeeping (Brana *et al.*, 2012).

The indispensable endeavor of developing transgenic plants is to get advantage from these but the development and deployment of these transgenic plants have raised many moral apprehensions (Bhat and Chopra, 2005). Controversies surrounding transgenic crops have divided minds into proponents and opponents. The case of altered plants includes

most of the dominant disagreements in philosophy, free will, concepts of good and bad, justice or injustice, the meaning of words and at last the meaning of life itself. It has evolved into a fight hub including GM developers or scientists, business and commerce persons, industrialists, people of politics, media workers and journalists, lobby chat parties and people of the public. The questions raised being of ethical principles which are neither absolute nor universal; these concerns may seem reliable and good for some like scientists and researchers but at the same time may be deemed apprehensive by many others (Robinson, 1999). Emergent transgenic crops became regular within the last decade and have diversified the standards of plant breeding appreciably; evolving a complete new area of ethical worries as a consequence This focuses on the associated non safety and advantages to man and the environment, the stability of assigning of benefits and on the technology being acceptable or non acceptable itself (Weale, 2010). The ethical and moral issues are important aspects in persuasion of the public and are necessary attributes of the discussion on GM crops and the products obtained from them (Bhat and Chopra, 2005).

Genetically modified plants goaded a retort which is inflexible to put within debates about well-being, privileges, rights and impartiality. Few observe them as non natural and those who don't acknowledge its advancement and usage are among the vigorous analyzers of GM plants, they simply analog it by saying "Playing God" a sardonic way to say interfering with works of god. Some critics have pointed that it is immoral to control nature in an 'industrial' fashion, not just because of the inauspicious consequences of doing it but because they think it is fundamentally erroneous (Prakash, 2001). Biotechnology research findings related to plants and its role in production of food has been distinguished a fundamentally fine approach, however, this vision has been misrepresented by

introduction of genetic transformation. Prominent concerns vis-à-vis transgenic crops have been largely reviewed and discussed in recent times (Fischer *et al.*, 2015), focusing on the main concerns, that are, Does GM plants are accountable for unwanted worries to the environment and to the health of humans? Do these correspond to the solution of world hunger partially or absolutely? Do these offer ways for increasing equal distribution of the rewards of technological advancements? In our current review, concise ethical and moral principles related to genetic manipulations of plants/crops are accentuated. Essential concerns are focused in the subsequent text.

## **Environmental Alarms and GM Plants**

Environment is the precious source for mankind; it should be respected as well as protected. There is an apparent dissimilarity amid human needs and respect for nature which looks an essential concern in placement of GM crops (Halford, 2006). Issues regarding the natural and GM farming environments vary according to places around the world (Demont *et al.*, 2009). Those crop plants developed to cope with the environment efficiently (via insertion of genes for showing resistance to biotic and abiotic stresses) have been suggested to demonstrate an increase in production of crops but adversaries suggest these engineered plants are just as environmentally unreceptive as the technologies because by using the new technologies, the farming areas and non farming surroundings may be debilitated by growing more and more transgenic plants (Qaim, 2009).

Queries about the making and field deployment of GM crops rely upon many perils pertaining to the balance of related reservations and enhancements. Most crops have been made to cope herbicide usage and thus ethical concerns up rises on whether it will head to high or low herbicide content being

applied to crops, which kind of herbicide (in relation to environmental affability) will be used, the perseverance and effects of herbicide remnants, the likelihood of herbicide resistance developing in wanted species and their genes being in turn shifted on to non-target related species to make uncontrolled herbicide tolerant weeds (so called super weeds) (Jamal, 2013). There is as much as necessary proof that GM crops and their genes via pollen spreading activity can scatter even among those species that are predominantly self breeders (Lu *et al.*, 2009). The acceptance of herbicide tolerant plants could encourage farmers to apply higher amounts of broad-spectrum herbicides with resulting harmful effects on natural life and such damaging effects can't be reverted back in any circumstances which would be a strong drawback for transgenic crops (Neve, 2007).

Not only herbicide resistant plants but pest and disease resistant plants also present notable and tentative moral worries. Genetic engineering has attracted much denigration and deprecation e.g. a virus resistant plant could effect in evolution of even new virulent virus strains, which could prove more unsafe than the former virus. Similarly, insecticide tolerant plants can kill the non pathogenic or friendly insects also (like the monarch butterfly or lady bug), while for sure their prime function of development is to harm the pathogenic insects only (like corn borer), these results in divisive debates for such GM plants' role in environment (Waterfield and Zilberman, 2012). There are already evidences that weeds have acquired resistance towards the genes designed against them and speculations are that the transgenic crops are even speeding up the resistance ability of pathogens, these facts are strong enough to raise questions against insecticide resistant plants (Powles, 2008). Apart from that, recent advances involving developing GM plants with strategies to acquire

genes from beneficial microbes are also under condemnation (Shinwari *et al.*, 2015).

Biopiracy is a term that has been used to refer the transfer of genes of non farming surroundings to those plants which are on farming environment (lands) in order to surmount markets by private benefits (Qaim, 2009). The practices concerning development of transgenic plants are judged to be unethical to amend long-established forms of agriculture because conventional agriculture is general resource and it is substantially accessible to everyone but on the other hand, GM crops are proscribed by or are property of specific developers or companies (e.g. Monsanto, USA) and every farmer is unable to purchase them (Klümper and Qaim, 2014). Biodiversity or genetic diversity is another factor correlated to transgenic crops, while few comment that the production of GM plants will augment biodiversity by producing a superior necessity for new genes, some critics compel that genetic diversity will be lowered via application of a limited variety of germplasm. Biodiversity is already decreasing due to ongoing farming techniques in both of the developed and developing countries but either GM crops will enhance or lower it, still presents a contentious fret and apprehension (Qaim, 2009).

## **Human Wellbeing & GM plants**

People's diet depends chiefly on plants which have become source of survival for them. A large panic of the people, apart from critical worries, is that GM crops include genes which are sensitive ethically e.g. antibiotic reporter or marker genes and the virus derived sequences of promoter regions of genes. Numerous concerns have been provoked by journalists and even divergent scientists on the subject of plant transformations that people's health and well being will be sternly dented by consumption of transgenic crops and derivatives produced from

such plants (Romeis *et al.* 2008). These distresses have multiplied to the points that scores of restaurant and eatery groups have purged GM foods from their list of foodstuff, schools have withdrawn GM foods and there has been elevated request in markets for supplement of organic items of food. Movements have also been started by various social groups to disallow these modified plants with or without expressive of the prospective or functions of GM plants (Weaver, 2005).

The toxicity and allergenicity of transgenic foods are other indispensable fretfulness, even though modest has been in knowledge about the toxicity of transgenic plants' derivatives and compounds but the fact remains GM plants may not be regarded as safe as naturally present without genetic amendments. Premature testing of known toxins and allergens can be completed in order to curtail the possibilities of introducing potentially perilous foods. For those consumers having allergies, exact naming of the products would be valuable and also enlightening enough for non buyers of GM foodstuffs (Weaver, 2005). Unadulterated vegetarian diets made of GM plants might be viewed fine and sound from consumers' and public's point of view but vegetarians might object to GM foods because they consider it unnatural to consume such foods. Even if a specific GM food is proven safe still the conservative minds won't accept them (Domingo, 2007).

## **GM Foods, Hunger and Poverty**

The broad outlook about the transformation in agriculture is that it holds an ethical control for alleviating poverty, hunger, food shortage and sharing justice among the world's inferior countries. As stated by Borloug (2000), making use of plant transformations symbolize the moral validation to feed a human population of ten billion or more. The scale of judgments on the promising impact of GM crops is boundless; it is still



indecisive how transgenic crops might offer aspects to extend practices of farming although some opponents suppose that the agricultural transformations are misdirected and lead to failures, while others suppose that the lucky chances for developing GM varieties are inestimable (Lemaux, 2008). It can be recommended that GE would lift up food production in under developed nations and malnutrition could be eradicated, but on the other hand, many critics squabble that genetic transformations will deracinate industries in poorer countries and will reveal threats to smallholder farming (Verma *et al.*, 2011). Communal and social challenging circumstances like poverty, swelling population expansions and political discrepancy leads to food shortages and hunger, apart from them if favorable and farmable land is not at hands along with environmental confines, it also leads to food shortages. It might consequently be probable that GM crops play an optimistic contribution to lessen hunger and as a straight forward and single solution to reduce hunger of human beings, it looks unlikely that GM crops will contribute to the desirable effects (Wilson *et al.*, 2006).

### **Socio-Economic Impacts and GM plants**

There is fervent incongruity in the general public and research community at large on employing GM plants in agriculture and on questioning whether it can contribute towards a sustainable growth but advocates of GM expertise assert that they are competent to renovate farming, fortification of environment and derive profits and in that way argue the overall humanitarian, environmental and business values (Ervine *et al.*, 2011). However, Brookes and Barfoot, (2014) had pointed out that transgenic developments will assist only those farmers which have wide-ranging farming practices and there might be a failure chance for those farmers who don't have the access to

utilize such technologies for the reason that their farming products won't be able to cope with transgenics and in due course conventional agricultural methods could be substituted and enormous loss to third world markets might occur. Current economic impact studies state that GM crops provide economic profits for farmers but at present; it appears that the poorer portions of public will suffer the losses, nevertheless, it can possibly be comprehended that production of transgenics has to initiate in one place or another (Fischer *et al.*, 2015).

A noteworthy but dubious GM technology had been offered i.e. "Terminator Technology" with the purpose of utilizing the bioprocess that produces sterile or suicidal seeds and such seeds are incompetent to develop into new plants in the subsequent generation (Chimakonam, 2013). This technology presents risks to biodiversity of agriculture and the economic wellbeing of people around the world outstandingly in developing countries which commonly rely on farm collected seeds and general plant breeding methods. Farmers can easily become adhered to them and so they may stop using their old plant cultivars or varieties (Yusuf, 2010). It has elevated major ethical issues that farmers would not be capable of maintaining a variety of commercial value from their own stocks of seeds and therefore would turn back to the seed providing companies to take more seeds for growing in next crop season. This would definitely place the farmers massively under the domination of the firms providing the seeds and this brings an obvious clash between humanitarian and business moral values (Ekici and Sanack, 2011). In the theatre of society, the perils of transgenic crops looks to be hyped while the advantages devalued, while the public belief allied to GM crops remains at odds despite of their potentials. Moral thoughts about contemporary threats and the debates of anti biotech groups have led to expensive biosafety, intricate labeling and food protection rules, which hinders advancement and growth of GM crops therefore

affecting countries, small companies and firms, organizations and associations of public research. Overregulation has become an absolute worry for further enhancement and utilization of crops modified by transformation process. The expense of regulation in appreciation of unsurprising benefits might be high principally for under developed countries (Qaim, 2009).

## **Conclusion**

GM plants or foods have been under strong debate since their initiation and development. Many ethical, moral worries and issues have been raised against them. The main purpose of developing GM crops is surely to maximize crop yields and increase food production in hostile environmental conditions, which may seem appreciating regarding the current world's population food demands and overcoming hunger. GM technology is not regarded a very well practice in conserved communes except that it provides tools where unrestricted and clandestine science can stabilize each other. GM crop farming albeit of positive and negative effects, might be a must do practice in future, but the current risks related to environmental imbalance, human health, disturbance in nature and the socio-economic concerns mask the good face of transgenics. Costly and more advanced GM technologies, in future prospects, would become indispensable requirement in order to develop effective GM foods on large scale to meet food demands but only when they offer fewer perils. Indubitably, the current explanation is a succinct compilation of discerning literature arguing both on negative and positive impressions of GM plants/crops or foods.

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