Possible Health Hazards from Genetically Engineered Crops

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Abstract

T***he paradox of Genetic Engineering of crops is evident from the unending revolution in the seeding and growth of new multibillion naira industries while it also poses the greatest hazards to life on the planet Earth. Recombination DNA technology is used to insert, delete, transpose and substitute new genes in plants that can lead to introduction of improved varieties, such as size, quantity, quality, taste, herbicide and pesticide resistance and many other traits. New proteins are produced or eliminated to give rise to these new resistant phenotypes. The new gene products may serve as allergens capable of inducing illness that can result n death of its consumers. Also new genes are often introduced in the engineering process to enhance the selection of cells containing the desired product. Antibiotic resistance genes are often used to enable the selection of bacteria harbouring the desired gene, a technique which is thought to contribute o increasing resistance of bacteria to most well established antibiotics such as penicillin, ampicillin, tetracycline and numerous others. Also, the effect if the viral vector used in gene transfers on the environment, crops and individual consumers are not known. The assessments of the genetic engineering of crops indicate the need to substitute alternative steps in the gene selection process. It also exposes the hazards in the consumption of genetically engineered crops to humans, animals and insects as well as the environment, while genetic engineering of crops remain a useful tool in mass industrial production of various gene products which has led to increased job creation in society, the need for an active regulatory guide by the United Nation Organization and within NAFDAC has become necessary to safeguard the human population, the environment and life in general.***

Keywords: Health hazards, Genetically engineered crops

Introduction

Genetically Engineering – the manipulation of DNA the hereditary macro molecule and universal code that determines the characteristics of all organisms has given rise to altered traits that produce improved varieties in crops such as size, quantity, quality, taste, herbicide and pesticide resistance among others. New powerful multinational industries have harnessed Genetic Engineering to create and patent new seeds, new gene products for profit with the promise to transform agriculture and eliminate world hunger and disease.

However the technology is compounded by difficulties inherent in its methodology which threatens the existence of life on earth. Recombinant DNA technology often requires the utilization of antibiotic resistance genes as markers viruses as vectors as well as sequence promoters, all required to convey the desired gene or trait of interest into the DNA of the particular crop to be transformed, (Styer, 1988).

The antibiotic resistant genes are used to select those host plants that have internalized the new trait in their DNA. What consequences result in humans who consume such crops? A number of researcher have found that not only do bacteria develop resistance to these antibiotics but that animals consuming such genetically engineered crops also acquire resistance to such antibiotics and are a result susceptible to such bacteria infection. Furthermore viruses are often used as vectors to transfer the desirable gene to its host or consumers of such crops but can mutate into more virulent viral strains released to the environment where it threatens other life forms (Kliner, 1997).

Another serious aberration in genetic engineering has been shown from experiments of crops genetically engineered to

be resistant to herbicides and pesticides. Questions have arisen on the toxic effects of the crops when consumed by animals (Levine, 1992, Murray *et al*., 2000, Gupta, 2004). Among such changes include smaller offsprings, effects on the liver, kidney, pancreas, lungs and brain.

Above all as genetic engineers introduce new genes by insertion rearrangement or deletion of old bases from the DNA of a crop, not as much is known about the effect of old bases from the DNA of a crop, not as much is known about the effect of the new gene on the expression timing and regulation of existing host genes that may be vital to the organism. Over 97% of DNA is structures whose functions are not known referred to as intronic sequences. Clearly evident dangers exist in ploughing through the intronic and exonic sequences of DNA and inserting a gene as the consequences of such an insertion are not at all evident.

Indeed the technique of genetic engineering has the potential to eliminate world hunger by creating new transgenic crops, with great yields taste and other qualities. It has led to the emergence of multibillion dollar transnational corporations with the capacity to boost employment and maximize profit. Yet the continuous danger posed by the genetic engineering of new traits in crops such as herbicides, for herbicides the possible emergence of new viruses the generation requires a new reawakening and re-evaluation. Such attention and vigilance is an imperative to African nations which has not only become the dumping ground for genetically engineered crops but serve as a major potential market for translational firms.

Materials and Methods

A comprehensive search was made from the internet, various journal articles and textbooks reports on health hazards from genetically engineered crops in various parts of the world. Such articles were assembled and studied and synthesized into this opinion paper.

Results and Discussion

Inherent threat to life in the technique of centre engineering: Two alternative pathways in which a gene or trait of interest can be brought into a host cell and expressed readily are known. One method utilizes a promoter sequence joined to the gene of interest usually followed by an antibiotic gene all in a circular DNA known as plasmid (Stryer, 1988). A vector, usually a virus carrying the recombinant gene can also be used to infect bacteria which serve as a factory for manufacturing the new insert into the derived protein. An important step in the process is the selection of bacteria which has internalized the new trait from those lacking such trait. This point is where the antibiotic resistant gene ligated with the antibiotic resistant gene. Since the bacteria is grown in a media containing the antibiotics, only those microorganisms with the antibiotic resistant gene will survive to manufacture the desired protein (Stryer, 1988).

However, the same antibiotic resistant gene that enables for screening has two possible adverse effects, first, it had conferred resistance to the bacteria against known antibiotics and their escape into the environment would lead to the propagation of antibiotic resistant bacteria. Secondly, crops consumed by animals containing the antibiotic resistant gene could confer antibiotic resistance and in both cases make it difficult for most of the general antibiotics to become effective in combating bacteria infections (Cummins, 1999). In other words the present ineffectiveness of antibiotics world-wide to contain bacteria infections among humans may in part be attributed to genetically engineered crops and the mechanism of using antibiotic resistance genes for screening bacteria.

A second mechanism in genetic engineering used to deliver the desired gene into its eukaryotic host is through the application by retroviruses as vectors, retroviruses are capable of carrying foreign genes into their mammalian hoist cells where their genes integrate with that of the host as a provirus (Stryer, 1988; Kleiner, 1997).

Vectors that have been used to introduce foreign genes to eukaryotic cells include Maloney Murine Leukemia virus (Stryer, 1988). The assumption here is that retroviruses are generally harmless. Yet the Human Immuno Deficiency Virus (HIV) is a retrovirus. The fact that their gene remains dominant in the provirus stage in the best is no indication that they are harmless when as vectors to ferry foreign genes for genetic engineering.

Another aspect of crop genetic engineering is the tailoring of promoter sequences on the foreign gene which enables its activation within the host factory, recent work by British Scientist at the Rowet Institute has shown that Genetically Engineered potatoes obtained with a commonly used viral promoter, the Cauliflower, Mosaic Virus (CaMv) are poisonous to mammals (Cummins, 1999). In further findings indicate the damage of organs and immune systems of laboratory rats fed the Genetically Engineering and choosing the types of the antibiotic resistance screening genes as well as DNA sequence promoters greater care is required as they are potential problematic areas which can cause various ailments and disease in mammals consuming products emanating from these crops.,

Genetically engineered resistance of crops to viruses, pesticides and herbicides: One major contribution of genetic engineering to aid world farmers is the significant improvement of crop yield through the production of genetic engineered seeds of superior varieties. The view Genetically Engineered seeds were imbued with genes to protect them from viruses, weeds and insects which otherwise attacked the crops and limited their yield. However while crops are given viral genes to make them resistant to such viruses recent evidence indicate the existing viruses may acquire traits from Genetically modified crops making them more virulent (Kanieusky *et al*., 1997). Thus, viruses which may be naturally harmless to man may acquire virulent traits from transgenic crops and become dangerous. Furthermore, researchers from Michigan State University have found that genetically altering of plants to resist viruses can induce mutations in the virus to take on more virulent features. Researchers have continued to observe the increased virulent of viruses such as the Germiniviruses that were once harmless, but have now spread world-wide and become a menace to crops. Germiniviruses now destroy tomato, cotton and cassava causing serious plant disease in at least 39 nations (Mofat, 1999).

Also crops yield has improved significantly through the production of Genetically Engineered seeds that resist pesticides, insecticides and herbicides (Murray *et al.*, 2000). These crops have been genetically engineered to contain the Bacillus thuringiensis toxic gene (Bt). The Bt toxin produced by the crop protects the crop against pests to the “Bt” crops may lead to the eventual development of a rare resistance gene and selection of a new ravaging set of pest capable of destroying the “Bt” crops (Cummins, 1999). The same way crops containing genes engineered to protect them against certain pesticides and herbicides not only ultimately lose their capability to resist the diverse encounters of pests and weeds but also ultimately encourage the emergence of new forms of pests and weeds that will ultimately overcome their genetically engineered resistance (Gerayatuam 1990; Murrat *et al*., 2000; Gupta, 2004).

Other efforts made to protect crops against pest by Genetic Engineering are the transfer of the chicken gene, responsible for producing avidin into maize. The end result was a the development of a transgenic maize that contains the hens egg white protein avidin which makes the grain resistant to insect pests (Morgan *et al*., 1993). The avidin transgenic maize appears more appear more useful than “Bt” crops toxicity has no such antidote. Another study in Britain indicated adverse results when genetically engineered potatoes engineered to express toxicity towards insects as “Bt Crops” proved to be lethal to rats fed the same potatoes. Such rats had impaired kidneys, pancreas, liver, brain as well as enlarged thymus associated with a depressed immune response (Kleiner, 1997; Cummins, 1999). Certainly crops genetically engineered to resist insects and weeds through their newly engineered gene products would be expected

to have some adverse effect on humans who consume such altered crops when compared to their natural wild type form (Levine, 1994). The damage done to its consumers can only be quantified in terms of the dosage of the gene product or toxin consumed.

Gene products, ecological consequences an d genomic complexity: While most crops genetically engineered to be toxic and to serve as insecticide and pesticide has various effects on organisms who consume them, there is evidence that genetically engineered proteins that are direct gene products transferred to crops could also be allergenic to mammals who consume them. A study by scientist at the University of Nebraska shows that a soya bean that has been genetically engineered to express Brazil-nut proteins caused adverse reactions in individuals allergic to Brazil nuts (Cummins, 1999).

Since allergenicity is a product of individual experience there is no way of preventing it in individuals who unknowingly consumed a genetically engineered crop containing such allergen. In 1989, a genetically engineered brand of L-tryptophan killed 37 Americans and disabled of afflicted more than 5000 others with potentially fatal and painful blood disorder, eosinophitia myalgia syndrome (EMS) before it was recalled by the Food and Drug Administration with the manufacturers, paying over 2 billion dollars damages to the victims (Cummins, 1999). Also, studies published in Journal of Medicinal Food showed that concentrations of beneficial phytoestrogen compounds thought to protect against heart disease and cancer were lower in genetically modified soya bean than in traditional strains (Cummins, 1999).

Despite the health hazards posed by gene products in genetically engineered crops there are grave ecological consequences caused by these crops. That using viruses from the pollen of such plants to other distant crops in the environment has already been demonstrated (Cummin, 1999). Furthermore, there is the real possibility if genetic engineering crops spreading several kilometres through their pollen and eventually dominating wild type crops thereby displacing these crops which most mammals have for thousands of years depended and adapted to leading to an ecological catastrophe

Finally, genetically modified crops with their commercialized seeds will make not only farmer dependent on large profit driven genetic engineering transnational companies but will impoverish much of the world population especially Africa where peasants sustain much of food production from crops. Only the multinational Genetic Engineering companies ultimately stand to maximize their profits. It should be noted that even the cost of herbicides and pesticides for maintaining these crops will be a great liability to most farmers in Africa who are largely peasants, as their wild crops adapted to the insects and weeds in the environment would have been replaced by herbicide and pesticide dependent genetically modified seeds.

Conclusion: Genetically engineered crops now loom among the most ominous dangers to Africa's survival. Traditionally, Africa had supplied the market and dumping ground for most translational corporations due to non-existent laws and policies to protect its citizens from products of these transnationals whose sole aim is to maximize their profit. With the rising protest by their dangers to human life and the environment, most of these companies turn to Africa where hunger and starvation- products of underdevelopment-still pose a serious threat to its population. Thus, imported cereals – maize, rice and other foods are on the rise. Also genetically modified and processed foods and drinks have no laws, acts to counter their presence.

When disease such as cancer are on the upswing, other disease alien to Africa is on the increase and possibly these ailment may be traced to imported genetically engineered crop products processed foods and drinks with their genetically modified ingredients.

While an attempt has been made to highlight and assess the dangers of recommended that the Federal Government immediately place a ban on the importation of all such crops and their accessories. Second the Government should enact laws to ensure that all processed foods cereals and beverages including beers must carry not only the contents on its label but indicate whether

they possess Genetically Engineered products thereby giving the consumer a choice to determine whether to buy them. Third the Federal Government must work to enact a law at the level of the African Union as well as the United Nations to protect Africans as well as the Global population from Genetically Engineered Crops and processed foods and products. It should mobilize other African countries to push for a five year moratorium to stop all such meddling and interchanging of genes in crops until a thorough and reasonable and understanding of the universal genetic code (DNA) is attained.

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