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Midweek Review

Will we get debilitated, drug-addicted and suicide-prone plants

by Jagath Gunawardane

The increasing numbers of negative-trait technologies patented by the private sector of the developed countries and their possible applications in agriculture and the implications are not anymore a cause of concern only for those countries. It has now become a looming threat to many developing countries which are mostly dependent on agriculture. Even those countries whose agriculture is not much above the subsistence level are all possible targets of these technologies. This is because the companies have themselves made it clear where they intend to put their technologies into use, a long list that virtually cover every country with an agricultural base. All of them are designated to create plants that are kept under the control of externally-applied chemicals.

A particularly omnious line of negative-trait technologies are those that can be called as "killers", which use the newly inserted genes to bring death to plants, seeds, pollen, ova and parts of flowers such as pistils and anthers. The role of the externally applied chemical is to either induce the killing or to suppress it. The most well-known of the killer line to technologies is the one dubbed Terminator, which is intended to kill the embryos of nature seeds. However, there are some that we even more pernicious but less well-known. A good example is the one registered at the World Intellectual Property Office (WIPO) under WO9735983 which include Sri Lanka among those countries where it is going to be patented.

The patent document of WO9735983 is titled "Cysteine Protease promoters from Oil Seed Rape and a method for the containment of plant gemplasm". It has been applied by Zeneca Limited. The inventors named are Ian Jepson, Andrew James Greenland, Didier Thomas. An international application under the Patent Cooperation Treaty has been filed from Great Britain which has the number PCT/GB97/00729 that has 110 designated states from Albania to Uzbeckistan and includes Sri Lanka. The promoters and the technology, along with all possible constructs are covered under 365 claims. It make use of two new genes made by fusing together parts from other genes (or recombined) and expressing them or repressing them by an external application of a specific chemical.

This technique involves the use of promoters of genes that make enzymes known collectively as cysterine proteases in plants. These are made during various stages of the germination of seeds, seed development, plant development while others are produced when a plant is wounded or exposed to external conditions such as cold or dehydration. The part of a gene that makes it to function and decides where, when and for how long it expresses is called the promoter. The part that produces the proteins is called the code. Protease producing genes active during germination of crops such as bareley, maize, rice, chick-pea, vetch and rape seed (canole) have been identified and described. The patent covers several promoters isolated and identified from cysteine protease producing genes of rape or canole.

The patent deals with using these promoters to make new recombined genes by combining them with codes of other proteins. These have been referred to as Genes of Interest (GOI for short) in the patent. By using promoters from different cystein protease genes, they have made a number of GOI that can be expressed in particular tissues and in the various stages of development of a plant or a seed. The proteins produced by GOI have been called proteins of interest and the recommended one are those that disrupt the functions of cells. Genes that produce disruptor proteins have been referred to as disrupter genes, and described several that can be employed to achieve the required results. One is to use an anti-sense code, or a code that is an exact opposite (mirror-image like) of a gene that plays a vital role in a plant. The expression of the GOI would effectively disrupt the function of the vital gene and could debilitate or even kill a seed or plant. For example, an anti-sense code of a gene critical for flowering could prevent the plants from flowering and producing seed.

Another type of GOI produce cytotoxins or substances poisonous to plants. The patent state that these could be selected from plants, fungi, yeast, bacteria, animals and human beings. The particularly recommend toxins such as barnase ribonuclease, beta-tubuline and adenine nuclestide translocator (ANT). A preferred gene is one that produces barnese, a substance that prevent respiration in cells and causes their death. This gene, isolated from the brown fatty tissue of rats had been used as a disrupter in several negative-trait technologies developed by Zeneca (eg. US 5,808,034 and WO 9403619) they have also stated that new disrupter genes can be produced by recombining parts of different genes to make new codes.

Another preferred GOI are these that produce a class of enzymes known as recombinases. These different enzymes can cut off a DNA molecule at a specific site where a particular sequence of neuclestides can be found. Different recombinases cut off DNA molecules at different sites and are therefore widely employed in genetic engineering to cut desired genes and parts. However, this technology uses such enzymes to achieve a completely different purpose. That is to excise or cut-off a vital gene that may correspond to the seed germination, seedling development, or the expression of an essential feature such as shoot, root or flower development. Once the vital gene is cut off, the plant could either die or be debilitated by being unable to express a vital characteristic.

The usefulness of this technology is dependent upon the ability of the inventors to keep the GOI under control and being able to express or repress it as desired. This is achieved by the use of another recombined gene that makes a protein that acts on the GOI and repress its functioning. This repressor gene is fused with a promoter that is functional at all times but has to be induced or prodded into action by the stimulus produced by the presence of a chemical. This chemical is a substance that is not produced in plants and has to be always externally applied on plants or seeds. The timing of the application of chemicals is decided by the type of promoter in the GOI. It is possible to have one or more GOI in a plant making it necessary to apply the chemical periodically or at specific period during the growing season of a crop. The chemicals should preferably a substance covered by a patent thereby the company could have a monopoly control over it.

The destructive and disruptive intents of this technology is evident even from the claims. According to claim 33, it covers a "plant or seed which is incapable of growing to maturity" containing a recombinant DNA construct. Chemically dependent plants made through this technology could be of several types. One type is the "suicide-prone" plants that needs a chemical at specific periods of the growth cycle to keep it alive. Any failure to apply the necessary chemical at a given time period would make the plants to commit suicide by the activation of a disrupter gene. The second type is those "debility-prone" plants which would be debilitated critically (eg. root formation or growth) unless supplied with the chemical as needed. The third is the "drug-addict" or "junkie" type that needs the chemical application to function with a sense of normalcy (eg. - to flower and bear seed). All these types are detrimental to the interests of farmers and a country.

The purported use of producing plants through this technology is, according to the patent, is the containment of crop plants within the area of cultivation and prevent them becoming weeds. Another related problem cited in the patent is the intraspecific crossing of between crops and non-cultivated wild relatives of crop plants by pollen that can travel a long distance. It specifically state that "ways to reduce viability of such hybrids would limit the risk of transgenics escaping to non-crop species thus avoiding the spreading of plants with enhanced invasiveness and weediness." These preceding arguments are often made by the opponents of genetic-engineering and the biotech companies and their scientist allies take great effort to counter these as baseless. It is ironic that the arguments of their opponents have been made use of to justify this technology. The patent state that this technology can be used in all plants and given examples including rice, maize, soghum, sugar-beet, sunflower, tomatoes, mangoes, peaches, bananas, carrot, lettuce and onion.

This is only an example of the types of negative trait technologies that could be patented and made use of in Sri Lanka. A company may make seed in Sri Lanka itself or may import their genetically-modified seed. It is up to the relevant government bodies to be alive to these possible threats to the agriculture and economy, and to the independence and the well-being of farmers, and to take appropriate preventive action. There are two parallel courses of action available to use to deal with negative-trait technologies that have to be taken concurrently. One is to refuse the patenting of any new genetic-engineering technology that is against public interest. This is possible under section 76(1) of the Code of Intellectual Property Rights Act No. 52 of 1979, which has provisions to refuse patents on grounds of public order. The other is to prevent the import of planting material under provisions of the Plant Protection Act, No 35 of 1999. The public interest organizations, such as eco-action groups have a vital role to play in keeping abreast of these, analysing the new technologies and inform the public and to make representations to decision makers and to see that preventive action is taken.

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