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Terminator Seed Technology

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Abstract: ***Terminator technology or Genetic Use Restriction Technologies (GURTs) are new bio-technological inventions. GURT is a technique that produces sterile seeds by altering the plants genetically for the next generation. Terminator seeds have been classified as V-GURT and T-GURT. The Terminator Technology claims for the protection of intellectual property rights, use of newer and more productive varieties, checking of transgene contamination. But if we consider its broad aspect, it surely promotes the growth of MNCs but for the farmers especially in developing countries like India where about 75% of the population depends on agriculture and practices traditional farming depending on their own saved seeds, this technology can cause a threat. GURT technology is clearly an interference of the corporate sector in the agricultural sector. Hence, more investigation, discussion and evaluation should be conducted to make it beneficial both for the companies and the farmers especially in developing countries.***

Keywords: GURT, Terminator technology, IPR, Genetically modified crops

1. Introduction

Transgenic crops are the best example of modern agriculture. Genetically modified crops possess one or more useful traits, such as, herbicide tolerance, insect resistance, abiotic stress tolerance, disease resistance, and nutritional improvement. At present, nearly 525 different transgenic events in 32 crops have been approved for cultivation in different parts of the world. Globally, area under GM crops has increased manifold from 17 lakh hectares in 1996 to 1917 lakh hectares in 2018. Meanwhile, in India, the area under Bt. Cotton has increased from 0.29 lakh hectares in 2002-03 to 117.47 lakh hectares in 2019-20, (Directorate of Economics and Statistics). The figure for 2019-20 is almost 94% total area under cotton cultivation in India. In other words, the area under Bt. Cotton cultivation has increased from less than 1% in 2002-03 to almost 94% in 2019-20. This shows the flexibility of farmers towards generic seeds in agricultural sector. Somehow, transgeneric seeds and crops has increased the yield and quality and production which has been sound profitable to the farmers globally. But still there are certain technologies that have been not accepted by the farmers one of them is TERMINATOR TECHNOLOGY. Terminator technology also known as GURT, is one of the controversial subjects in the seed industry. There is a lot this and that about this concept which never came under existence and has just remained as concept.

What is Terminator Technology?

Terminator technology is also called as Genetically Use Restriction Technology (GURT) is a technique that produces sterile seeds by altering the plants genetically i.e., seeds are made 100% sterile for next generation. Terminator technology is a joint venture between the United States Department of Agriculture (USDA) and Mississippi based Delta and Pine Land Company, one of the largest cottonseed companies in the world.

Terminator seed technology is a combination of genetic interaction that allows the controlled gene expression of value-added traits of seed viability in a crop plant. Terminator seeds can only be used for food production and not for seed production.

Terminator seeds have been classified as V-GURT and T-GURT.

Through V-GURT, plant fertility and seed development is controlled at varietal level through genetic process triggered by chemical inducer. It will allow plant to grow and will also form seeds but embryo induce a toxin that inhibits the germination if replanted. Hence, a seed in its second generation becomes sterile.

T-GURT, is also known as traitor technology and is restricted to registered at the trait level. It is a switch on and off type technology that modifies the crop trait in such a way that genetic enhancement engineered into a crop remains non-functional until crop plant is not treated with a chemical.

What are the benefits of terminator technology?

Protection of Intellectual property right of the firms and MNCs is one of the reasons for the introduction of GURT technology. GURT ensures farmers cannot use reused seeds or exploit a valuable trait without using a chemical and even prevents a competition against biotech industries from using seeds in their own breeding programme.

GURTs could be applied to all the seed propagated crops (lehmann, 1998).

GURTs can prevent the unnecessary gene flow from transgeneric to non- transgeneric varieties or a wild relative as pollen carries a dominant allele of the lethal inhibiting protein (V-GURT). Monsanto has described it as a "**gene protection technology**".

GURTs could prevent either germination of volunteer weeds (V-GURT) or weeds would not be able to express the GM trait (T-GURT).

GURTs favors Induced male sterility which is an accepted tool in plant breeding to produce hybrids.

V-GURT would be useful to effectively reduce the risk of creating "**superweeds"** by reducing the presence of GM crops in subsequent year.

Disadvantages of GURT Technology

"The minute seeds stop being the seeds of renewal and starts being the seeds of death- like the terminator technology,

creating sterile seeds, patented technology that makes it illegal for farmers to save and exchange seed, we get scarcity that is why a quarter million Indian farmers have committed suicide".

"The gradual spread of sterility in seeding plants would result in a global catastrophe that would eventually wipe out higher life forms, including humans, from the planet".

– Vandana Shiva

In spite of its benefits than why GURT has just become a concept? Why the farmers and activists and environmentalist are not able to accept this for benefit of agriculture?

Every coin has two sides, similarly GURT has been proved beneficial for the MNCs and government and farmers in the developed countries who completely depends on hybrid seeds and economically is more stable. But we see, the sizeable portion of agricultural activity is carried out by small and marginal farmers in developing countries like as India. This sector of agriculture will be greatly affected by this technology as this it will inhibit the farmers from saving their own seeds from their own seed stock which will cause the unavailability and lack of seed inputs to the farmers.

It will affect the sustainable culture of the local farmers in developing countries who mostly practice subsistence agricultural production. The traditional landraces possessing desirable characteristics and adaptability to the local environment such as disease and pest resistance, drought tolerance, etc. acquired over time compared to modern varieties are exchanged among farmers and this cycle of seed exchange will be impaired by the GURTs.

Various ethical and bioethical concerns have been put forth by the activists. There are several risks of genetic engineering some of which are:

1) The risk of unintentionally changing the genes of an organism
2) The risks of harming that organism
3) The risk of changing the ecosystem
4) The risk of change or harm to any other organism of that species or others including human beings who may even be the target of change.

Epstein (1998) has reported that "At a time when an estimated 50,000 species are already expected to become extinct every year, any further interference with the natural balance of ecosystems could cause havoc. Genetically, engineered organisms, with their completely new and unnatural combinations of genes, have a unique power to disrupt our environment. Since they are living, they are capable of producing, mutating and moving within the environment. As these new life forms move into existing habitats, they could destroy nature as we know it, causing long term and irreversible changes to our natural world." This is a violation of the balance of natural ecosystem.

2. Conclusion

Terminator technology can be taken as an interesting concept, how this technology terminates or we can say control the multiplication of seed for the next generation. No doubt how it this can proof one the best example of modern agriculture but only in the favor of MNCs and seed companies that too in developed countries and somehow farmers from developed countries can make a profitable use from this technology. But practically, this concept cannot be beneficial for the farmers in developing countries who mostly depends on their on their own saved seeds as in India. Farmers are the backbone of world; technology should be used to support them so that food requirement can be completed for the whole world but if in certain cases if the large mass of farmers is not getting profit or if they have to compromise with their rights so either certain changes is required.