Values of IPRs-Intellectual Property rights in Genetic Engineering.

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Abstract: Humans are manipulating the genetic material of plants since long. DNA, gene or genetic composition of any organism including microorganism, plant or animals can be altered using a technique known as genetic engineering or recombinant DNA technology-known as genetically modified organisms (GMOs). Preparing a recombinant DNA, constructing a plasmid and transfection are key steps in GMO experiments. IPR (intellectual property rights) reserves the right to use the GMO exclusively for the original researcher or company, only. Trade secrets, patent, copyrights, Geological indications and breeder’s rights are various forms of IPRs using which one can exclude their product’s unauthorized use. IPR secures returns of investment in the form of royalty or partnership for a researcher to continue R & D in future. Utilizing any form of one’s research is unethical and subjected to crime, legal action can be taken against it.

Keywords: IPR, Intellectual Property Rights, Genetic Engineering and Recombinant DNA.

Introduction:

DNA, gene or genetic composition of any organism including microorganism, plant or animals can be altered using genetic engineering techniques are called GMOs, defined by National Research Council Committee On Identifying and Assessing Unintended Effects of Genetically Engineered Foods on Human Health. Humans have been manipulating the genetic material of plants since long through various breeding techniques. Although We are unaware of its potential application until the first genetically engineered plant was developed. In 1980, Chakrabarty DV had filed the world's first patent application for the living organism to the United States Patent and Trademark Office, USA (Kevels DJ, 1994). Soon after, for various commercial applications, genetically modified plant species known as GMO or GM-plants are being created every year. Using intellectual property rights, the patents or the copyright for using, transporting and selling rights of those plants can be protected to its original developers (Saha CN and Bhattacharya S, 2011). The present article is a kind of review on how genetic engineering and intellectual property rights changed plant breeding and crop improvement sector.

The word “genetic engineering” is mysterious, not first used in any genetic experiments. In 1951, novelist Jack Williamson used the term “genetic engineering” in his novel “Dragon’s island”, instead (Stableford BM, 2014). The genetic engineering technique is not only limited to crop improvement or plant breeding but the method is used in medicines, animal research, development of vaccines, construction of transgenic organisms and gene therapy experiments for various medical applications. Although, genetic engineering and recombinant DNA technology are widely used in agriculture, plant research and crop improvement, indeed (Fang J, 2016). During the genetic engineering experiments recombinant DNA molecule- a hybrid DNA of two different species is constructed, aimed to improve crop quality or quantity. Paul Berg was the pioneer in the field of genetic engineering who constructed the recombinant DNA very first time in 1972 (Berg P, 1972).

Methods and Applications:

Constructing recombinant DNA is the prime step in genetic engineering experiments. A gene of interest is isolated and cleaved in various fragments using either restriction digestion or polymerase chain reaction mediated amplification (Berg P & Mertz JE, 2010). The gene of interest is ligated into the plasmid. Soon after, the recombinant plasmid DNA is injected into the bacteria. Agrobacterium tumefaciens is the first choice for gene transformation in plants. Furthermore, various other methods like particle bombardment, liposome, electroporation and microinjection are used to insert a gene, Agrobacterium T-plasmid widely used for gene transfer, however. The host plant is then infected with the A. tumefaciens with the gene of interest (Geivin SB, 2003). Various methods like Polymerase chain reaction [9], DNA sequencing (MacCormick, 1998) and DNA microarrays (Leimamis S, 2006) are used to validate the gene transformation results.

The brief overview of the entire process of genetic engineering and recombinant DNA technique is shown in figure 1.1.

Insecticidal resistant, abiotic stress resistance, disease resistance, herbicidal resistance, high nutrient value, high yield, male sterility, production of edible vaccines, delayed ripening and good ornamental value in plants can be achieved by developing various transgenic plants (Rastogi S & Pathak N, 2009). One of the classic examples of genetically modified plant species is BT- cotton. A pest-resistant cotton species was developed using the Cry gene of bacillus thurigiensis organism (Umbeck PF, 1991).

Genetic engineering technology is widely applicable in controlling plant disease by developing various abiotic and biotic resistant plant species. Herbicide-resistant plant species of cotton, soybeans and maize are now successfully created (Green JM & Owen MD, 2010). Besides, insect-resistant transgenic cotton, maize, potato and tobacco plants were also successfully constructed in past (Bates...
and various genetically modified crop species to improve the nutrient values of food product (Khare N et al., 2010).

Image 1.1: The brief overview of the process of constructing genetically modified plant species through Agrobacterium tumefaciens.

IPR (Intellectual property rights in genetic engineering):

Scientists research for years to develop new varieties which are economically important to us. Thus it is very important to reserve their rights for using those transgenic plant species, especially for developing new GMOs (Ashok KC, 2009). IPR- intellectual property rights for biotechnology or genetic engineering reserves their rights in forms of trademark, trade secret or patent. In addition to this, ideas, protocols, SOPs, software and other publications related to the product can also be considered in IPR as well (Ramakrishna T, 2008). This literally means that no one can use any form of one’s idea or product, either partially or fully without its original developer’s permission (Jayprakash K, 2016).

Patents- a form of IPR, exclusively granted to the original developer, scientists or inventor for a minimum period of 20 years. The right of producing, selling or importing inventions are monopolized through patents. Once the period of patent expired, the product can be used in the form of “no profit share” publicly (Cohen, JI & Paarlberg R, 2002). The trade secret is another form of IPR in which the product information, SOPs, protocol, business ideas and clientele remains disclosed or protected (Hing CB, 2009). Copyrights are exclusively given to protect the unauthorised use of software and database of organisation, researcher or company (Malik AK, 2005). Besides these major forms of Biotechnology IPRs, Plant breeder’s rights are also granted to a researcher to restrict unauthorized use of novel genetically modified plant species, given for approximately 20 years. Notably, genetically stable, novel, uniform, economically important and distinct varieties only included in this form of IPR, however (Binenbaum E et al., 2000). The specific geological indication, quality, reputation or other related information of products are considered in geological indications, GI. Yet another form of the IPR, the GIs prevents misleading the public for fake product origin information (Marie VD, 2014). These are the common IPR forms scientists, company or research organisation can use to protect or restrict the use of their product.

Conclusion:

In crop agriculture, the genetic engineering technique gives tremendous advantages. It helps in increasing crop yield, reducing cost and developing pest and insect resistance plant species. Furthermore, economically & medicinal important plant species and various stress-resistant GMO can be developed using genetic engineering. Huge investments and funding required to conduct research on plant genetics and biotechnologies. Genetic engineering technologies like PCR, DNA sequencing and DNA microarray are costlier. Companies are doing huge investments in developing new products and plant species through gene transfer, transgenic technique or recombinant DNA technologies. IPR secures returns of investment in the form of royalty or partnership for a researcher to continue R & D in future. Furthermore, it restricts the unauthorized use of GMOs. IPRs are of great value for original developers, therefore. Utilizing any form of one’s research is unethical and subjected to crime, legal action can be taken against it.
References:


4. Stableford BM. Historical dictionary of science fiction literature, 2014; p 133.


