



ISSN : 0973-7057

Genetically engineered plants: The scope and hope in controlling pollution

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Received : 25th November, 2017 ; Revised : 19th December, 2017

Abstract : “Stopping pollution is the best solution”; and what can check pollution better than the plants!! Plants absorb the pollutants or simply break the pollutants down into harmless by-products that are incorporated into their roots, stems and leaves or released into the air. But plants too have the tolerance limit. Plants have its own way of cleaning the environment by removing pollutants to maintain a perfect balance but in this era of industrialization the rate of pollutants discharges has crossed the tolerance limit of the plants. The tolerance limit of the plants can be enhanced with the help of Genetic Engineering for the global cause. Genetically engineered grasses and trees could help remove toxin and explosive residues from the environment more quickly and cheaply than ever. In a recent laboratory test it has been experimentally proved that the transgenic plants are able to remove as much as 91 percent of trichloroethylene (one of the common ground water contaminant) than the regular plants. Plant biologists worked in the lab with experimental Poplar tree-cuttings that can break down the pollutant- ‘trichloroethylene’ at rates 100 times that of the normal plants. The transgenic plants have been shown to remove airborne pollutants, providing a new approach someday may reduce the large threat posed by air pollution. Hence, in coming era, the genetically engineered plants are going to be the ultimate scope and hope in controlling pollution effectively.

Keywords: Tolerance limit, transgenic plants, Poplar tree, Trichloroethylene

INTRODUCTION

Fresh air, potable water and healthy food are three basic services for living a quality human life but the core essence of these natural resources has been deteriorated under the influence of fast development and urbanization in cities around the world. The problem of pollution has become complex than any other environmental challenges as one cannot produce fresh air and water for survival.

“Plants are world’s natural pollutant sink. Trees are known to fix and metabolize carbon-dioxide and carbon monoxide both photosynthetically and non-photosynthetically.”¹

“Plant species reduce pollution through their leaf and other aerial surface from air by sedimentation and impaction process.”²

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Plants have its own way of cleaning the environment by removing pollutants to maintain a perfect balance. But plants too have the tolerance limit and in this era of industrialization, the rate of pollutants discharges has crossed the tolerance limit of the plants.

GENETIC ENGINEERING OF PLANTS

The tolerance limit of the plants and efficiency of breaking down of pollutants by the plants can be enhanced by the help of genetic engineering for the global cause. Genetic engineering is a method of cutting DNA from one organism and inserting the DNA fragments into a host organism of the same or different species. Genetic engineering specifically as one type of genetic modification that involves an intended targeted change in a plant or animal’s gene sequences effect a specific result through the use of rDNA technology.

Generally researches isolates a gene from an organism that has the trait they want to impart to a plant

Proceedings of 7th International Conference on -"Global Scenario of Life Science, Agriculture, Nursing & Medical Research for the Welfare of Rural & Urban Folk(GOSLANRUF, 3-5 December, 2017)" held at METAS College of Nursing, Ranchi, Jharkhand & Organised jointly by MSET-ICCB & METAS.

and then many copies of the gene are inserted into plant cells and induced to grow. After that seeds from mature plants are studied for successful transformation.

Genetically Engineered Plants Controlling Pollution

Usage of genetic engineering on plants and trees that already have innate carbon reducing qualities, amplifying their carbon reducing ability. And it can be done via introducing mutated *Rubisco* enzymes that have increased CO₂ conversion ability into plants parts [upto 5-fold improvement]. "Genetic engineered grasses and trees could help remove toxins and explosive residues from the environment more quickly and cheaply than ever." ³

Some plants and trees like poplar/*Populus* is efficient in removing soil pollution and just think by genetically modifying these plants, we can manifold its efficiency. Researchers created genetically engineered poplar trees in the laboratory that can remove as much as 91 percent of trichloroethylene- the most common ground water contaminants. The unaltered plants removed only 3 percent. Both unaltered poplars and the genetically engineered variants produce enzymes that break down trichloroethylene. The modified poplars just generate a lot more of a key enzyme and thus work far more quickly breaking down the dangerous molecules into harmless by products roughly 100 times faster than normal plants. Also such trees and plants even in their natural state absorb environmental contaminants and break them down into harmless components all with the power of the sun. Also with the usage of genetically modified plants we could somehow reduce the usage of fertilizers, herbicides, pesticides, weedicides, etc and helping to reduce the problem of soil pollution and indirectly water pollution too.

CONCLUSION

Rapid technological development is inevitably associated with many environmental problems which primarily include pollution of soil, water and air. The transgenic plants have been shown to remove airborne pollutants, providing a new approach someday it may reduce the large threat posed by air pollution.

"Phytoremediation is often viewed as being too slow to be of practical use." ⁴ so we may enhance the phytoremediation using transgenic technologies. Some people see transgenic trees as risky and think that to

genetically modify a plant is a risk. But, no; it's not a risk, for now it's a need. Like we are using vehicle though knowing that it's adding pollutants to the environment, and resulting into air pollution, but every day we are taking this risk because it is the need of this high tech era. By the way, researchers make sure such concerns are addressed and risks minimized.

Researchers chose poplars might help alleviate concerns that transgenic trees might get into regular forests. Poplars can grow for several years without flowering, at which time they could be harvested to prevent seeds from generating. And unlike some other kinds of trees, branches of the hybrid poplar being studied do not take root in soils when branches fall to the ground. Also Aspen only flowers after seven years and can regrow when cut to the root- such altered trees could be confined to areas where they are needed to consume contaminants over decades. Researcher says, "This ability to prevent flowing is good because researchers don't want to release the transgene into the environment." And by using these trees, we could clean up a site at less cost than any other method. "Transgenic plants represent an ideal system, since they can be grown at the site of pollution or potentially dangerous sites. Plants are ethically more acceptable and esthetically more appealing than animals as sensors of environmental pollution." ⁵

REFERENCES

1. **Siddiqui, B.A., 1998.** Role of Plants in Controlling Air and Noise Pollution. *ECOLOGY ENVIRONMENT AND CONSERVATION*, 4, pp.281-284.
2. **Kaur, N., Singh, S. and Gupta, N.C.,** Study of pollution tolerance index for plant species exposed to vehicular traffic on urban streets.
3. **Macek, T., Kotrba, P., Svatos, A., Novakova, M., Demnerova, K. & Mackova, M.,2008.** Novel roles for genetically modified plants in environmental protection. *Trends in biotechnology*,26(3),pp.146-152
4. **Saier, M. H. and Trevors, J. T., 2010.** Phytoremediation. *Water, Air, and Soil Pollution*, 205(1), pp.61-63.
5. **Kovalchuk, I. and Kovalchuk, O., 2008.** Transgenic plants as sensors of environmental pollution genotoxicity. *Sensors*, 8(3), pp.1539-1558.

