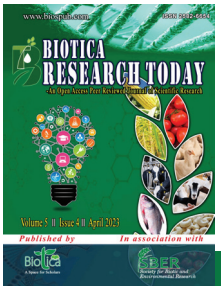
Bio. Res. Today 2023, 5(4):323-325



Biotica Research Today

e-ISSN: 2582-6654

April, 2023

Article ID: RT1296 **Popular Article**

Super Weeds - A Threat to Herbicide Tolerant Crops

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Conflict of interests: The author has declared that no conflict of interest exists.

How to cite this article?

Gobikashri *et al*., 2023. Super Weeds - A Threat to Herbicide Tolerant Crops. *Biotica Research Today* 5(4), 323-325.

Abstract

As a result of public concerns, GM plants may be able to satisfy the needs of an expanding population. GM plants are created to acquire advantageous characteristics like insect and disease resistance, herbicide tolerance, and others. In India, weeds are responsible for around one-third of crop output losses. Weed management became easier and more energy-efficient with the advent of herbicides. The chemical weed management approach has quickly spread around the world and emerged as one of the most efficient instruments to manage weeds due to its low cost and quick performance. Unfortunately, the current situation's emergence of herbicide resistance poses a threat to this essential technique. Herbicide-resistant weeds are weed species that have evolved the capacity to withstand the application of an herbicide that previously controlled them. This leads to the evolution of super weeds.

Keywords: Genetically modified plants, Herbicide tolerant crop, Super weeds, Wild mustard

Introduction

Southwest Asia is where a human's first produced plants through artificial selection and selective breeding, and this is where the first evidence of genetic change in plants was discovered 10,000 years ago. Since then, the GM crop revolution has been fueled by developments in the agriculture, science and technology sector. Currently, the ability of genetically engineered plants to meet the needs of an expanding population is not understood. This is a result of anxieties expressed regarding their use and discharge into the environment by the general public and critics. "Agrobacterium method" and "Gene gun method" are the two methods in which genetically modified crops in agriculture are produced. In agrobacterium method, it is nature's genetic engineer which carries the desire's plasmid genes. The desired gene is a part of DNA that transfers in to the genome of plant cells. In gene gun method, the particles are coated with the desired gene and through gene gun; DNA is bombarded in to genome of the plant cell. Both methods include cell division, which leads to the initial shoot regeneration, followed by root regeneration, which is then transferred to field trials for the development of new traits. The benefits of genetically modified crops are decreased pesticide use and increased farm income. These beneficial GM crops are under threat due to evolution of "Super weeds".

Super Weeds

Super weeds have the ability to resist herbicide which has been accidentally pollinated by a GM plant.

Till now the super weed is only reported in wild mustard in GM oilseed rape. The super weed does not show any effects even under the high dosage of herbicide (Nalia *et al*., 2019).

From the figure 1, shows about the Herbicide resistant weed vs. Super weed. Herbicide resistant weed is the continuous application of herbicides which leads to develop weeds are resistant to herbicides. In case of super weeds, pollens are cross pollinated from GM oilseed rape to wild mustard. It leads to the development of super weeds.

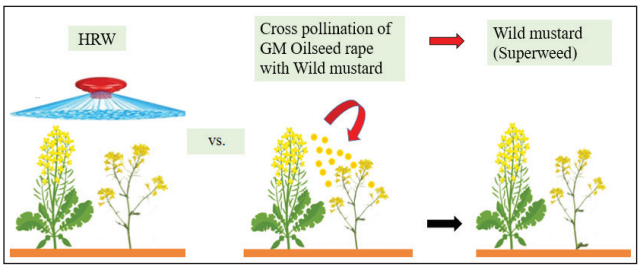

Figure 1: Herbicide resistant weed vs. Super weed

Article History

RECEIVED on 15th April 2023 RECEIVED in revised form 19th April 2023 ACCEPTED in final form 20th April 2023

Evolution of Super Weeds

• Super weed was discovered by the British centre for Ecology and Hydrology in July 2005.

• Due to its resistance to a potent weed killer, one wild mustard plant acquired the name "Super Weed."

• Rape plants that have been genetically modified to produce oilseeds possess a bacterial gene that renders them resistant to a potent herbicide. The protein that this bacterial gene produces chemically modifies and detoxifies the herbicide. Since wild mustard accidentally received pollen from GM oilseed rape. The super weed originated as a result of the transmission of the gene.

How to Identify Super Weeds

There are seven steps processes for the identification of super weeds (Daniels *et al.*, 2005), namely:

• Field observation.

• Seed collection.

• Pot culture/ Glasshouse trials.

• Dose response experiments.

• Confirmation of HRW.

• PCR.

• Flow cytometry.

• Conclude - Super weed.

Factors Influencing Super Weed

Monoculture

• Monoculture of genetically modified - herbicide resistant crops is the only one factor, which induces super weeds.

• Monoculture is defined as the practice of the growing large swaths of the same crop in the same place year after year.

• From the figure 2, shows about the monoculture of GM - herbicide tolerant crops in the place of wild relatives. This leads to the transformation of wild relative weeds into super weeds by accidental pollen transfer.

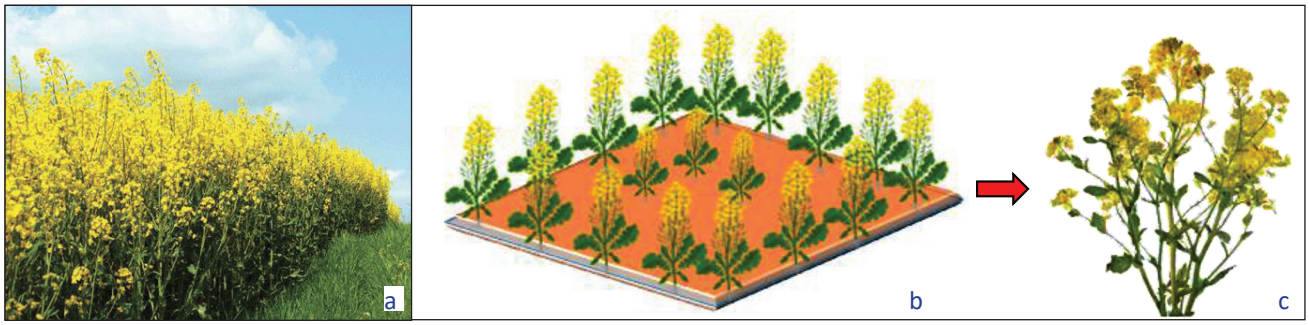

Figure 2: Factors influencing super weed; (a) GM oilseed rape cultivated as a monoculture; (b) Monoculture of GM - HTC; (c) Conversion of wild relatives into Super weeds

Management of Super Weed

There are no special management strategies for super weed. Hence, the management of herbicide resistant weeds are only followed for super weeds. It includes:

• Strategic tillage practices.

• Crop rotation.

• Stale seed bed techniques.

• Herbicide rotation, recommended dose and timely application.

• Growing of GM crops carefully.

• Training among farming community.

Strategic Tillage Practices

As it immediately attacks the weed seed bank in the soil, summer ploughing is a long-standing practise among the farmers. By removing the roots and soil-based propagation resources, one or two deep ploughings each year aid in the management of weeds.

Crop Rotation

Crop rotation implies growing many crops one after the other. It requires various farming techniques, such as tillage, seed rate and time of sowing, which create a distinct microclimate for weed species and hence affect their ability to germinate.

The soil is better covered when pulses like green gram, black gram, cowpea, lentil, and chickpea are included. As a result, it prevents weed germination.

Stale Seed Bed Technique

Weeds are allowed to grow for at least two weeks in the bed using the stale seed approach. After that, non-selective herbicides like glyphosate are used to destroy the emerging weeds. It is one method for reducing the weed seed bank in the soil (Habimana *et al.*, 2019).

Herbicide Rotation, Recommended Dose and Timely Application

The formation of a resistant weed biotype can result from repeated applications of a single herbicide. Therefore, managing weeds is made possible by the diverse modes of action of herbicides. The herbicide dosage varies depending on the active components, crop type, soil, weather, effectiveness, and toxicity level, among other factors. Therefore, using the recommended amount of herbicide treatment will efficiently reduce weed growth without endangering crops. Only when it is necessary an herbicide is used.

Growing of GM Crop Carefully

There is a chance for unintentional transfer of pollen from the wild relative weeds. Hence the growing of biotech crops

in the place of wild relative weeds must be carried out very carefully.

Training among Farming Community

Conduct training programmes on resistance modelling, appropriate management strategies and field demonstration among farming communities. It creates awareness about herbicide resistance weeds and super weed to farmers.

Conclusion

The usage of additional herbicides is a result of the global trend towards herbicide-resistant weeds. In such cases, the excess amount of herbicide should be reduced and integrated management should be done to achieve sustainable agriculture. There is no appropriate management of super weed and therefore the only way to reduce the incidence of super weeds is to avoid the cultivation of GM (HTC) plants in the place of wild relatives.

References

Daniels, R., Boffey, C., Mogg, R., Bond, J., Clarke, R., 2005. The potential for dispersal of herbicide tolerance genes from genetically-modified, herbicide-tolerant oilseed rape crops to wild relatives. Final report to DEFRA. Dorchester: Winfrith Technology Centre. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20080307193835mp_/http://www.defra.gov.uk/environment/gm/research/pdf/epg_1-5-151.pdfhttps://webarchive.nationalarchives.gov.uk/ukgwa/20080307193835mp_/http://www.defra.gov.uk/environment/gm/research/pdf/epg_1-5-151.pdf. Retrieved on: 25th January, 2023. pp. 1-23.

Habimana, S., Kalyana Murthy, K.N., Hanumanthappa, D.C., Somashekar, K.S., Anand, M.R., 2019. Standardization of agrotechniques for weed management in aerobic rice (*Oryza sativa* L.). *Journal of Plant Protection Research* 59(2), 273-280. DOI: https://doi.org/10.24425/jppr.2019.129292.

Nalia, A., Ghosh, A., Reja, M.H., Venugopalan, V.K., Nath, R., 2019. Superweed - An Alarming Threat. *Indian Farmer* 6(12), 878-882.