



**Biotica  
Research  
Today**  
Vol 3:12 **1146**  
2021 **1147**

## Adoption of Herbicide Resistant Crops: Opportunities and Challenges

Anamika Barman<sup>1</sup>, Priyanka Saha<sup>1</sup> and Anurag Bera<sup>2</sup>

<sup>1</sup>Division of Agronomy, ICAR- Indian Agricultural Research Institute, New Delhi, Delhi (110 012), India

<sup>2</sup>Dept. of Agronomy, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar (848 125), India

 Open Access

### Corresponding Author

Anamika Barman

e-mail: [anamikaiari123@gmail.com](mailto:anamikaiari123@gmail.com)

### Keywords

*Bt* cotton, Herbicide resistance crop, Weeds control efficiency, Yield

### Article History

Received in 20<sup>th</sup> December 2021

Received in revised form 23<sup>rd</sup> December 2021

Accepted in final form 24<sup>th</sup> December 2021

E-mail: [bioticapublications@gmail.com](mailto:bioticapublications@gmail.com)

### How to cite this article?

Barman *et al.*, 2021. Adoption of Herbicide Resistant Crops: Opportunities and Challenges. *Biotica Research Today* 3(12): 1146-1147.

### Abstract

Resistance of crops to herbicides through biotechnological techniques has got immense application towards convenient, flexible, and efficient weed management. Herbicide-resistant crops (HRCs) are designed to tolerate specific broad-spectrum herbicides which kill all the associated weeds without injuring the cultivated crops. HRCs allow farmers to more effectively use reduced or zero tillage cultural practices, eliminate the use of toxic herbicides and allow the use of fewer herbicides to manage the entire spectrum of weeds. But in India, *Bt* cotton is the only permitted transgenic crop for commercial cultivation. The major benefits associated with HRCs include: broad-spectrum weed control, reduced crop injury, cost-saving, yield advantage. However, the long-term impact of HRCs on biodiversity, the environment, and human health has yet to be fully understood. This article attempts to provide an insight into the challenges and opportunities of the adoption of HRCs.

### Introduction

Agronomic practices have changed dramatically as herbicide-resistant crops have been adopted. HRCs encourage the use of efficient, simple, and adaptable crop production techniques that require less herbicide, tillage, and energy. Overall, the adjustments benefit the environment by reducing the number of times machinery travels through the field, the amount of fuel used for ploughing, the number of herbicides used, and the amount of soil erosion. It also contributes to a decrease in groundwater advisories and a minor reduction in herbicide use's overall environmental impact quotient. Herbicides, on the other hand, place substantial selection pressure on weed populations, and the density and variety of weed communities alter over time as a result of herbicides and other control measures. In this case, concurrent use of herbicides with various modes of action, mechanical and cultural methods, or a combination of both may provide benefits.

### History and Global Area of Biotech Crop

In total, 190.4 million hectares of biotech crops were grown in 29 countries in 2019, contributing significantly to food security, sustainability, climate change mitigation, and upliftment in the lives of up to 17 million biotech farmers and their families worldwide (ISAAA, 2019). 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, according to the Directorate of Economics and Statistics.

## HRCs/ HTC

**H**erbicide resistance refers to the inherited ability of weeds or a modified ability in the case of crops to survive herbicide application to which the original populations were susceptible. The HRCs/HTCs are genetically modified crops in which resistance to certain non-selective herbicides such as glyphosate, glufosinate-AM, bromoxynil, etc., has been conferred through traditional breeding or genetic engineering methods.

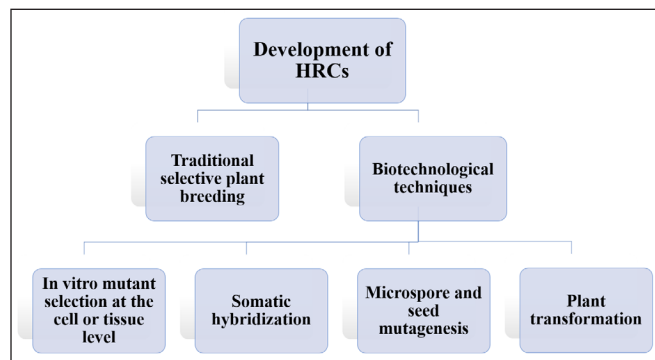


Figure 1: Techniques in developing HRCs (Source: Dekker and Duke, 1995)

## Reasons for Research on HTCs/HRCs

- There is no novel herbicide in the world in the true sense.
- The cost of developing a new herbicide is very higher.
- It is fewer times consuming process than conventional breeding.
- Developing a new herbicide is a risky business and very expensive.
- The pesticide business is highly competitive across the MNCs.
- The marketing of HRCs is more profit-driven.

## Precautions towards Better Adoption of HRCs

- It is critical to have a thorough understanding of the ecology and biology of crops and their associated weeds.

- HTCs' performance qualities should be thoroughly examined.
- HTCs can be used as part of an integrated weed control plan to manage weeds more efficiently and effectively.
- If the weeds get resistant to the herbicide, switch to a different one. To solve the problem, switch to a different herbicide, rotate the herbicide, or use an herbicides blend.
- Assess the influence on the environment and the agronomic benefits.

## The Need of the Hour

- It is too late to debate whether transgenic crops should be used since they are already used in many countries like the USA, Brazil, Canada, Australia, etc.
- Now the real question is no longer preventing the use of transgenics but rather minimizing their damage.

## Conclusion

**H**owever, HRCs cannot be used as a sole weed-control technique. Other control measures, such as herbicide rotations/ mixtures, should be combined appropriately under an IWM schedule based on the soil and climate, crop, or cropping system.

## References

- Dekker, J.H., Duke, S.O., 1995. Herbicide-resistant field crops. *Advances in Agronomy* 54, 69-116.
- ISAAA, 2019. *Global Status of Commercialized Biotech/ GM Crops in 2019*; ISAAA (International Service for the Acquisition of Agri-biotech Applications) Brief No. 55. Available at: <https://www.isaaa.org/gmapprovaldatabase/cropslist/default.asp>. Accessed on: 20.12.2021.