

APPENDIX E

The Importance of Herbicides in Food Production and Food Security

1. Introduction

In modern agriculture, herbicides play a crucial role in improving the efficiency, productivity, and sustainability of food production. Their use has become indispensable in addressing the challenges of feeding a growing global population while managing limited resources and combating the effects of climate change. (Gianessi, 2013). This report explores the importance of herbicides in enhancing food production and ensuring food security.

2. Importance of Herbicides in Food Production

2.1 Effective Weed Control

Weeds are among the most significant biological threats to agricultural productivity, as they reduce crop yield and quality, resulting in huge financial losses annually (Parven, Meftaul, Venkateswarlu, & Megharaj, 2024). They compete with crops for sunlight, water, and nutrients, leading to reduced growth and lower yields. Herbicides are designed to target and eliminate weeds efficiently, thereby minimizing competition and enabling crops to thrive. Weeds if not controlled effectively tend to reduce yield or affect the quality of crops. Weeds sometimes act as hosts of other pests affecting crops in the absence of the main crop, maintaining pest populations which will be available to attack the crops once planted (Ntidi, 2018).

2.2 Improved Labor Efficiency

Manual weeding is a labor-intensive and time-consuming process, particularly in large-scale farming operations. The use of herbicides significantly reduces the need for manual labor, allowing farmers to manage larger areas more effectively and allocate labor resources to other essential activities.

2.3 Increased Crop Yields

Studies show that weed competition can reduce crop yields by 20–80%, depending on the crop and weed species. By controlling weed growth, herbicides help preserve the full yield potential

of crops, making them a vital tool for maximizing food production. Weed management in some crops is more critical, as weeds can sometimes emerge at the same time as crops or even before the crops, resulting in serious problems of competition. Non-selective herbicides play a major role in making sure that fields are clean before the main crop is planted.

3. Role of Non-selective Herbicides in Agriculture

3.1 What are Non-Selective Herbicides

Non-selective herbicides are chemical agents that kill or suppress all vegetation they encounter, regardless of species. The most used non-selective herbicides are groups 9, 10 and 22 on herbicide mode of action class grouping. These are broad-spectrum and kill some of the species that are not controlled by the selective herbicides. Non-selective herbicides are helpful in pre- and post planting burndown to control a variety of weed species. These types of herbicides work either by contact or systemic mode of action.

3.2 Key Roles of Non-Selective Herbicides in Agriculture

Non-Selective herbicides are used to clear or clean the field before planting, ensuring that the crops are not competing with weeds for water, sunlight and nutrients. In recent times, non-selective herbicides like Glufosinate Ammonium are used in no-till or reduced-till farming practices, which helps preserve soil structures and reduce soil erosion.

These herbicides are often used to control perennial weeds which are difficult to control with selective options, like with the case of *Amaranthus palmeri*. Glufosinate ammonium is known to have less weeds that are resistant to it as compared to either Glyphosate or Paraquat.

4. Conclusion

Herbicides are a foundational component of modern agriculture, significantly contributing to increased food production and enhanced food security. By enabling effective weed control, improving efficiency, and supporting conservation practices. Herbicides help farmers meet the challenges of feeding a growing population. However, responsible use and continuous innovation are essential to mitigate risks and ensure long-term sustainability.

References

Gianessi, L. P. (2013). The increasing importance of herbicides in worldwide crop production. *wileyonlinelibrary.com*, 4.

Ntidi, N. (2018). *Impact of weeds and nematodes on crop production*. Potchefstroom: Grain SA.

Parven, A., Meftaul, I., Venkateswarlu, K., & Megharaj, M. (2024). Herbicides in modern sustainable agriculture: environmental fate, ecological implications, and human health concerns. *International Journal of Enviromental Science and Technology*, 3.