Pre-emergence herbicides

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Factsheet about integrated weed management

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Introduction

In an integrated weed management strategy herbicides can be used to support other non-chemical measures. Different herbicides are generally focused on one of the growth stages of the weeds, on specific weed groups and either on establishment or growth of the weeds. Herbicides are basically divided in three groups based on their moment of application: pre-emergence, post-emergence or pre-harvest herbicides. This factsheet focuses on pre-emergence herbicides.

Pre-emergence herbicides

Pre-emergence herbicides prevent weed seedling establishment and reduce weed numbers at the early stages of crop growth. Often non-selective herbicides such as glyphosate are used. Weed seeds need to be germinating first, so that the herbicide can inhibit growth of the root and/or shoot. Pre-emergence herbicides are distinguished from pre-harvest herbicides and post-emergence herbicides by the preventative approach and the moment of application. Pre-emergence herbicides are focused on prevention of establishment of weeds, especially in crops where weeds become dominant more easily, e.g. in onions. Pre-emergence herbicides may be effective against grassy weeds or broadleaf weeds (figure 1).

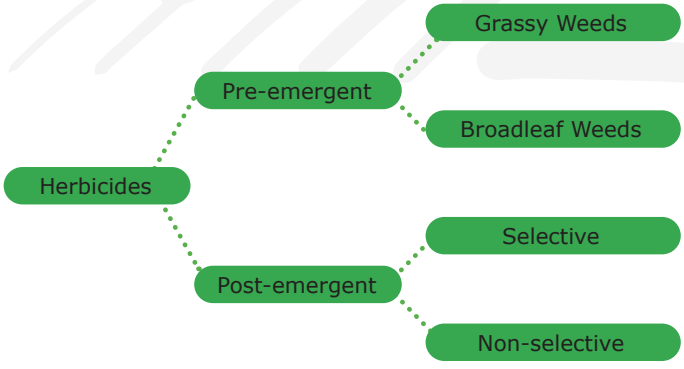

Figure 1|
Classification and application of post-and pre-emergence herbicides.

Applicability and efficacy

Pre-emergence herbicides may be applied to the soil or even the seeds (e.g. by coating). Herbicides are the mainstay of direct control of annual weeds, Broadcast application of either pre- or post-emergence herbicides has been the preferred method of application from the mid-20th century until now. The number of herbicides available to farmers has decreased and herbicides still available have been restricted, in terms of lower doses or a limited application window.

The rapid evolution of resistance to herbicides is the main reason for diversifying weed control tactics. The use of herbicides need to be part of a broader weed control strategy that contains both herbicides and non-herbicide weed management tools. Since adequate rainfall after application is important for the efficacy of most pre-emergence herbicides, the efficacy of common pre-emergence herbicides will likely decline in regions where rainfall becomes more variable in future[1|].

Pre-emergence herbicides allow to control weeds that emerge with the crop or shortly after crop emergence and improves the efficacy of other weed control strategies by reducing the size and number of early emerging weeds before additional tactics are applied[2|].

What to consider?

Scouting is important when selecting a herbicide to be applied. Knowing which weeds are in the field and where the weed seeds are located (shallow or deep) is needed.

In sandy or low organic matter soils the herbicides will bind less to the soil, resulting in a greater availability for crop and weed uptake. However, herbicides will also be more easily lost through leaching.

Generally, higher application rates are required for herbicides that bind tightly to soil and organic matter. The herbicides stay where they are applied (unless the soil moves) and often persist for longer.

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Soil pH may affect how long some herbicides persist and to what extent they become available for plant uptake and soil binding.

Consider rainfall when timing the application of pre-emergence herbicides, as soil moisture content is important for incorporation and availability to the weeds. Availability to the crop must also be taken into account. In addition, the solubility of the herbicide determines the uptake by weeds and crop. Weather conditions also affect degradation.

Extra information

See *https://iwmpraise.eu/publications/* for all crop diversification strategies and their definitions, and for more information on integrated weed management.

Figure 2| Pre-emergence application of herbicides.

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1| *Mehmeti, A., Fetahaj, R., Demaj, A., Nishori, F., & Rraci, V. (2019). Evaluation of pre- and post-emergence herbicides for weed control in maize (Zea mays L.). Journal of Central European Agriculture, 20(1), 208-221. doi:10.5513/JCEA01/20.1.2393*

2| *Jha P, Performance of Preemergence Herbicides on Waterhemp Control in Soybean Integrated Crop Management (2020). Available: https://dr.lib.iastate.edu/server/api/core/bitstreams/1c9e117c-0eff-41ce-ac85-37717bd86e85/content*