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Mini Review

A Review to increase efficient management, weed science and plant invasion research is being cross-fertilized

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Abstract

Noxious plants are dealt with in both weed research and plant invasions science. Nonetheless, in Europe, they have traditionally emerged as two independent study areas, with different target species, techniques, and management goals, as well as various institutions and researchers participating. We argue that the advantages of these different disciplines can be highly complementary in the implementation of management strategies, and we describe how synergies were formed in an international, multiple disciplines project to create sustainable and efficient monitoring of popular ragweed. We were able to establish a detailed plant demographic method to assess and compare monitoring tools, such as optimal cutting regimes and biological control, for different regions and habitat types, and to assess the benefits and risks of biological control, thanks to our comprehensive approach combining expert knowledge from weed science and plant invasion science. It also resulted in the development and implementation of management methods in collaboration with the different stakeholder groups affected by noxious weeds, the creation of training opportunities for various pioneers in the ecological sustainability of noxious plants, and the active promotion of improved decision-making on the use of exotic biological control at the national and European levels.

Keywords: Biological Weed Control, Plant Invasion, Weed Science

INTRODUCTION

Weed research has traditionally been most successful in delivering effective weed management by keeping up with new agricultural practises and forging solid ties with the commercial sector. Researchers have identified a number of significant weed science failures in modern European civilizations as a result of the tight linkages to agriculture, including soil and water pollution, an increase in herbicide-resistant weeds, and biodiversity loss. Furthermore, weed research has been subjected to criticism that effectiveness, weed biologists, and ecologists investigating plant populations operate mostly in isolation, and that a lack of an interdisciplinary approach has left more fundamental elements of weed biology unresolved (Da Silva, 2015).

With the exception of new advancements in agroecology, there have been only moderate efforts to address new problems such as global warming, invasive alien species, and client diversifying; forestry, landscape strategic planning, urban, amenity, and industrial area maintenance, logistics, or to use agronomic weeds as model study system applications to articulate and test novel assumptions that help advance both weed management and ecological environment. The difficulty to shift emphasis has led to the continuous loss in active weed scientists witnessed in most European countries in recent years (Zachariades et al., 2021).

Herbicide-resistant weeds are becoming more common, highlighting the urgent need to create more diverse weed management strategies that reduce dependency on

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herbicides. This has rekindled interest in weed management, with a focus on effective interventions as well as long-term sustainability. In conclusion, in Europe, weed biology, the more technical discipline that is institutionally "in control" of weed control in reality, has primarily focused on weed killer weed management. While European ecologically based weed scientists have a long history, their impact on weed control has been minimal (Friedman & Barrett, 2008).

The importation and release of specialized natural enemies from the weed's native region to diminish the weed's abundance in the introduced range is referred to as traditional biological control of weeds. Biological weed control has primarily targeted IAP species that invade semi-natural and natural areas until recently. However, recent results in conventional biocontrol of the yearly weeds *Parthenium hysterophorus* (L.) *A. artemisiifolia* show that this strategy can also be used to control annual IAP species that pose issues in crop fields (Muller-Scharer et al., 2018).

Current environmental control and farming techniques aren't primarily geared at minimising ragweed, and they may even help it spread. Ragweed spread can be accelerated by not washing farm machinery after cultivating ragweed-infested areas and mowing linear pathways along road shoulders and watersheds embankments at an unsuitable frequency and timing.

Stakeholders participating in ragweed management come in a variety of sectors (physical and biological, technical, financial), as well as institutional (private, governmental) dimensions, and are linked to interventions at various spatial levels. Thus, measuring effects on ragweed distribution and dissemination, crop yields, airborne pollen, and ragweed-

related medical parameters needs an interdisciplinary approach to ragweed management (Hamill et al., 2004).

CONCLUSION

The growing quantity of weed killer weeds, as well as their resistance to a growing number of active components and banned herbicides, may encourage the formation of interdisciplinary consortia. This is also true of the growing number of IAP species and the absence of effective and long-term management. Major obstacles persist, including a lack of interest from both the private (agro business) and public sectors in developing such networks, as well as a lack of standardisation of additional intervention against IAP species across various nations.

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