frontiers | Frontiers in Agronomy

TYPE Editorial
PUBLISHED 08 November 2023
DOI 10.3389/fagro.2023.1328082

OPEN ACCESS

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RECEIVED 26 October 2023
ACCEPTED 30 October 2023
PUBLISHED 08 November 2023

CITATION
Chauhan BS (2023) Editorial: Insights in weed management.
Front. Agron. 5:1328082.
doi: 10.3389/fagro.2023.1328082

Editorial: Insights in weed management

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KEYWORDS

Palmer amaranth, annual ryegrass, allelopathy, Australia, Sri Lanka, USA

Editorial on the Research Topic
Insights in weed management

Weeds pose significant problems and challenges in various ecosystems and agricultural systems worldwide. These unwanted plants are aggressive competitors, competing for resources, such as sunlight, water, and nutrients, with desirable crops. Weeds not only reduce agricultural yields, affecting food production and economic livelihoods, but they can also disrupt natural ecosystems, leading to declines in biodiversity. Furthermore, the control of weeds presents a multifaceted challenge, with herbicide resistance, changing climate conditions, and the need for sustainable and environmentally friendly management practices adding to the complexity. As our understanding of weeds and their interactions with their surroundings deepens, so too does the need for innovative solutions and holistic approaches to manage and mitigate the impacts of these persistent adversaries. In this Research Topic of "*Insights in Weed Management*," we published four articles and delved into recent research, seeking to provide a deeper understanding of the complexities and innovative solutions in this ongoing battle.

Paper 1: Palmer amaranth (Amaranthus palmeri) adaptation to US midwest agroecosystems: Unveiling Palmer amaranth's northern invasion strategy

Palmer amaranth has earned a bad reputation as one of the United States' most troublesome agronomic weeds (Oliveira et al.). Originally concentrated in the Southern Great Plains and Southeastern United States, this aggressive weed is expanding northward. A 2018-2019 Midwest study sheds light on Palmer amaranth's adaptation strategy as it encroaches into new regions. The research reveals Palmer amaranth's remarkable plasticity in response to various crops and cohort timings. Plants established in June produce significantly more biomass than those in July, with growth variations under corn, soybean, and bare ground conditions. This adaptability, coupled with shifts in flowering patterns, highlights the challenges of managing this weed. Effective management strategies that account for its dynamic behavior are essential to curb its spread into new habitats.

Paper 2: Changing seasonality of Lolium rigidum (annual ryegrass) in southeastern Australia: The puzzling summer adaptation of annual ryegrass

Annual ryegrass, a persistent winter weed in Australia, has recently raised concerns by thriving in summer conditions, a previously undocumented phenomenon (Thompson and Chauhan). While dormancy affects germination patterns, its expansion into summer crops poses questions about underlying factors contributing to its success. This perspective article emphasizes that dormancy alone cannot explain this shift, as typical summer temperatures are unfavorable for this weed. Factors like temperature and photoperiod must be considered to understand weed growth and reproduction patterns. Unraveling the mechanisms behind this seasonal expansion is crucial for effective management, especially in regions where annual ryegrass threatens summer crops.

Paper 3: Allelopathy: an eco-friendly approach to control Palmer amaranth using allelopathic sweet potato: Allelopathic sweet potatoes are a sustainable approach to Palmer amaranth control

Palmer amaranth poses a significant threat to sweet potato crops, impacting both quantity and quality. Traditional chemical herbicides, while effective, face challenges with herbicide-resistant populations and incompatibility with organic production (Singh et al.). This study explores the allelopathic (weed-suppressing) potential of 17 sweet potato varieties. Results demonstrate that several sweet potato varieties significantly reduce Palmer amaranth's height, chlorophyll content, and shoot biomass. The allelopathic effect is particularly pronounced in selected varieties, offering a promising avenue for sustainable weed management in organic farming. Combining these allelopathic sweet potato cultivars with practices like cover cropping and hand-weeding holds potential for enhanced weed control, boosting crop productivity while reducing reliance on chemical herbicides.

Paper 4: Weed dynamics under diverse nutrient management and crop rotation practices in the dry zone of Sri Lanka: Understanding weed dynamics in sustainable nutrient management

In the pursuit of sustainable weed management, comprehending weed dynamics is paramount, especially in systems minimizing synthetic chemicals (Wickramasinghe et al.). This study examines weed abundance, growth, and composition under conventional, integrated, and organic nutrient management in Sri Lanka's dry zone. Crop diversification intensities, encompassing monocrop rice and rice-maize rotations, are also considered. Findings highlight that integrated nutrient management, characterized by crop rotation, effectively suppresses weed growth irrespective of rotation intensities. Surprisingly, monoculture rice within this system outperforms rice-maize rotations. Organic nutrient management systems exhibit higher weed density in the early growth stages of specific rotations, underscoring the complexity of weed interactions in diverse nutrient management contexts.

In this Research Topic of "*Insights in Weed Management*," these studies provide valuable glimpses into the multifaceted realm of weed control. From Palmer amaranth's adaptability to the unexpected behavior of annual ryegrass, the quest for sustainable alternatives in sweet potato farming, and the dynamics of weed populations under diverse nutrient management practices, these studies collectively underscore the necessity for holistic and adaptable approaches to weed management.

We hope these insights will ignite further research, innovation, and collaboration in the field of weed management. As we continue the ongoing battle against these formidable adversaries, we strive for sustainable coexistence in agricultural and natural ecosystems.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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