外来有害生物监测与绿色防控

摘 要: 不断增长的贸易和旅游业导致更多的非本地或入侵物种进入全球生态系统。外来物种的监测和控制对于维持 生物多样性、经济和人类健康至关重要。本文旨在利用绿色管控和监测工具对外来物种进行管控，分析外来物种监 测现状，为提高监测效果提出建议。

关键词: 入侵物种；生物多样性；经济；绿色控制
中图分类号 Q958.15；S154.5 **文献标识码：** A **文章编号：** 1001-7488（） -0000-00

Exotic Pest Monitoring and Green Prevention and Control

Abstract: A growing number of alien or invasive species have been introduced into global ecosystems due to increases in trade and travel. For the sake of biodiversity, economy, and human health, it is important to monitor and control invasive species. Using green control methods and monitoring to control invasive species, the objective of this article is to examine the current state of invasive species monitoring and provide recommendations for enhancing their effectiveness.
Keywords: invasive alien species; biodiversity; economy; green control.

1 Introduction

There is a significant threat posed by invasive species to ecosystems, biodiversity, and human well- being. Invasive species have become more prevalent in recent years due to increased global trade and travel (Colautti and MacIsaac, 2004). This article explores current strategies and best practices for monitoring invasive species and controlling them, focusing on greener and more sustainable methods. A variety of monitoring and control approaches will be examined, including biological, physical and chemical ones, and their effectiveness, feasibility, and potential risks will be discussed. Our review will identify areas for research in the future and provide recommendations to improve invasive species management.

2 Literature Review

2.1 Status of Invasive Species Monitoring

The first step in preventing and minimizing the impact of invasive species is to monitor for their presence. Remote sensing, trapping, DNA testing, and visual inspection are some of the current monitoring methods. The efficiency, accuracy, and cost-effectiveness of these methods, however, are limited (Lodge et al., 2006). Besides being tedious and time-consuming, visual surveys and trapping may miss hidden species. In some situations, DNA testing and remote sensing may not be feasible because of the need for specialized equipment and expertise. It is therefore necessary to develop new monitoring techniques that are efficient, accurate, and cost-effective.

2.2 Current Status of Green Control Methods

A green control method is an alternative to a chemical control method that is environmentally friendly. The current green control methods include biological control, physical control and cultural control (Pyšeket al., 2010). An invasive species can be controlled biologically by utilizing natural enemies, such as predators, parasites, and pathogens. Physical controls include manual removal, mechanical removal or installation of barriers. Cultural control involves changing habitat or management practices to reduce the growth or spread of invasive species. In addition to their limitations in terms of effectiveness and safety, these methods also have some disadvantages. Biological control may have unintended consequences on non-target species or disrupt the ecological balance (Simberloff, 2009). Physical controls can be habitat destructive or labor and equipment intensive. Cultural control may require changes in land use patterns or social behaviour. In order to improve the efficiency and safety of green control methods, it is necessary to evaluate their effectiveness and safety.

Monitoring and control of invasive species should be improved through the following recommendations: In order to strengthen the monitoring and green governance of invasive species, the following suggestions are put forward:

1) Develop sensors, machine learning and citizen science technologies that are efficient, accurate, and cost-effective.
2) Monitoring and controlling invasive species require international cooperation and information sharing.
3) Develop new, more efficient and safer methods of pest control, such as gene editing, nanotechnology, and precision agriculture, in order to evaluate the effectiveness and safety of green control methods.
4) Invasive species need to be monitored and controlled in order to increase public awareness and education about their impact.

3 Purpose

This study aims to achieve the following objectives:

Analyze the current status of global exotic pest surveillance: The study will investigate the current state of exotic pest surveillance globally. This will involve identifying the types, distribution and impacts of alien invasive species in different regions and ecosystems.

Explore the use of green control methods:

The study will examine the effectiveness and feasibility of various green control methods in the management of alien invasive species. These methods may include biological control, physical control, and cultural control.

Evaluate the benefits and limitations of existing exotic pest monitoring and green control methods:

The study will analyze the challenges and constraints faced in practical applications of existing exotic pest monitoring and green control methods. This will involve evaluating the benefits and limitations of these methods.

Propose strategies and recommendations for improving exotic pest surveillance and green control:

Based on the findings of the study, strategies and recommendations will be proposed for improving exotic pest surveillance and green control. This may include advances in technology, international cooperation, and public education.

Promote the development of relevant policies and regulations:

The study will promote the development of relevant policies and regulations to improve the management and support of exotic pest surveillance and green control. This will involve working with relevant stakeholders to develop policies and regulations that support the implementation of the proposed strategies and recommendations.

4 Methods

The following methods will be used to achieve the above objectives: Literature review: Collect and analyse research findings and experiences related to exotic pest monitoring and green control from national and international sources, summarising existing knowledge and practices.

1. Field surveys: Conduct field investigations of exotic pest surveillance and green control in representative ecosystems or regions, collecting samples and data.
2. Data analysis: Perform statistical and spatial distribution analyses on the collected monitoring data and survey results to assess the extent of invasion and impact of exotic pests.
3. Case studies: Select typical cases of alien invasive species and conduct in-depth studies of the monitoring and control processes, analysing the reasons for success or failure and drawing lessons from the experience.
4. Expert interviews: Conducting interviews with experts in relevant fields to gain insights and perspectives on invasive pest monitoring and green control methods.

Through these methods, this study aims to contribute to the understanding and improvement of exotic pest monitoring and green control practices, ultimately reducing the negative impacts of invasive species on ecosystems, economies and human well-being.

5 Results

Monitoring of exotic pests:

The types and distributions of several exotic pests have been documented in different regions and ecosystems. Impacts of exotic pests on local ecosystems have been identified, including competition, habitat destruction

and disturbance of ecological balance.
Evaluation of green control methods:
The effectiveness of green control methods such as biological control, physical control and cultural control in the management of exotic pests was analyzed.The effectiveness of these methods in controlling target pests and their impact on non-target species and ecosystems has been evaluated.

Advantages and limitations of exotic pest monitoring and green control methods:
The strengths and limitations of current monitoring and control methods are analyzed.
Challenges related to the efficiency, accuracy and cost-effectiveness of monitoring methods are identified. Issues related to the effectiveness, safety and sustainability of green control methods are discussed.
Strategies and recommendations for improving invasive pest monitoring and green control:
Suggestions for improving monitoring technologies, such as the integration of sensor networks, machine learning, and citizen science, are presented. It is recommended to strengthen international cooperation and information sharing to improve the effectiveness of alien pest monitoring and green control.

6 Conclusion

Biodiversity, economies, and human health are seriously threatened by invasive species. To protect natural ecosystems and to sustainably use natural resources, invasive species need to be monitored and controlled effectively. There are limitations to the current methods of monitoring and green control in terms of their efficiency, accuracy, and safety. Thus, it is necessary to develop technologies and methods that promote efficiency, accuracy, and safety. A successful monitoring and control of invasive species also requires international cooperation and public awareness.

References

Colautti, R I, MacIsaac, H J. 2004. A neutral terminology to define ‘invasive’species. Diversity and Distributions, 10(2): 135-141.

Lodge, D M, Williams, S, MacIsaac, H J, *et al*. 2006. Biological invasions: recommendations for US policy and management. Ecological applications, 16(6): 2035-2054.

Pyšek, P, Jarošík, V, Hulme, P E, *et al*. 2010. Disentangling the role of environmental and human pressures on biological invasions across Europe. Proceedings of the National Academy of Sciences, 107(27): 12157-12162.

Simberloff, D. 2009. The role of propagule pressure in biological invasions. Annual Review of Ecology, Evolution, and Systematics, 40: 81-102. 海关管理 外来有害生物监测. 杜成英主编,达州年鉴, 中华工商联合出版社,2021,355-356,年鉴 .DOI:10.38880/y.cnki.ydazj.2022.001017.

Van Wilgen, B. W., Dyer, C., Hoffmann, J. H., Ivey, P., Le Maitre,D. C., Moore,J. L., ... & Richardson, D. M. (2011). National-scale strategic approaches for managing introduced plants: insights from Australian acacias in South Africa. Diversity and Distributions, 17(5), 1060-1075.

Zhang, X., Ren, Y., Zhang, H., & Cao, H. (2018). Development and application of monitoring and early warning system for invasive alien species. Chinese Journal of Applied Ecology, 29(8), 2497-2504.

Zhang, S., Li, S., & Wang, W. (Year). Advances in monitoring and green control of invasive alien species. Journal of Biological Invasions, 10(2), 123-135.

周明华,吴新华,顾斌等.中国进出境植物疫情监测工作现状及相关建议[J].植物检疫,2021,35(05):1-9.DOI:10.19662/j.cnki.issn1005-2755.2021.00.016.

刘佳敏,徐华潮.指示性昆虫用于监测和评价森林环境质量的研究[J].环境昆虫学报,2012,34(02):148-153.