HSPI The Open Access Publisher

J P S P JOURNAL OF PLANT SCIENCE AND PHYTOPATHOLOGY
ISSN 2575-0135

Research Article

Genetic Diversity Preservation: Integrating Human Genetic Banking with Plant Sciences

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Abstract

This study aims to explore the intersection between human genetic banking and plant sciences, highlighting shared methodologies, goals, and ethical considerations.

Results: Both fields employ similar cryopreservation protocols, long-term storage strategies, and genetic analysis tools. Human genetic banking focuses on preserving DNA, reproductive cells, and somatic tissues, while plant sciences utilize seed banks, *in vitro* tissue cultures, and cryopreservation to maintain endangered species and agricultural varieties.

Conclusion: Integration of human and plant genetic banking practices offers potential for methodological exchange, improved conservation strategies, and interdisciplinary collaboration. Ethical considerations, including consent, privacy, and access to genetic resources, are central in both domains.

More Information

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Submitted: October 07, 2025
Approved: October 14, 2025
Published: October 15, 2025

How to cite this article: Grzegorczyk M. Genetic Diversity Preservation: Integrating Human Genetic Banking with Plant Sciences. J Plant Sci Phytopathol. 2025; 9(3): 088-089. Available from: https://dx.doi.org/10.29328/journal.jpsp.1001159

Keywords: Genetic banking; Cryopreservation; Biodiversity; Ethical considerations; Plant sciences

Introduction

Genetic banking is a key tool in protecting biodiversity and biological resources. In humans, it involves storing DNA, reproductive cells, and other tissues to preserve genetic diversity, protect against diseases, and enable scientific research [1]. In botany, seed banks, *in vitro* collections, and tissue cryopreservation preserve endangered species and agricultural varieties [2].

Genetic diversity preservation

Genetic diversity is fundamental to adaptation and survival in both human populations and plant species. Human gene banks protect populations from hereditary diseases and provide material for medical research and gene therapy [3]. In plants, genetic diversity allows for the selection of varieties resistant to climate change, diseases, and pests [4].

Techniques for genetic material preservation

Cryopreservation both human and plant gene banks use cryopreservation, storing biological material at extremely low temperatures, usually in liquid nitrogen (-196 °C). This technique minimizes metabolic processes and genetic material degradation [5].

Storage of Dried Seeds and Cell Plants can be stored as dry seeds under controlled humidity and temperature conditions, ensuring long-term genetic stability [6]. Humans store sperm, oocytes, and somatic cells for research and therapeutic purposes [7].

Protection against diseases and extinction

Genetic banking protects both humans and plants. Human DNA and cell banks enable the study of rare or hereditary diseases [8]. Plant seed banks protect endangered species and preserve agricultural varieties against genetic erosion and disease [2].

Genetic research and evolution

Analyzing human and plant genetic material allows an understanding of evolutionary processes, gene flow, and population variability. Both fields employ molecular tools such as DNA sequencing, genetic markers, and genome analysis [9,10].

Ethics and legal regulations

Storing human and plant genetic material poses ethical and legal challenges. In humans, concerns involve privacy, consent, and ownership [11]. In plants, issues include access to genetic resources, intellectual property, and international

regulations [12]. Research involving humans or animals must comply with IRB or ethical committee approval, and participant consent must be documented.

Integration of fields

Collaboration between human geneticists and plant scientists offers mutual benefits. Shared cryopreservation techniques, bioinformatics, and genomic analysis can be adapted across disciplines. An interdisciplinary approach facilitates global strategies for genetic diversity conservation.

Conclusion

Human genetic banking and plant sciences share the common goal of preserving genetic diversity and ensuring biological resources for future generations. Integrating these fields enables the exchange of methodologies, experience, and technologies, which can enhance biodiversity protection and advance medicine and agriculture.

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