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Creation of honey bee germplasm repositories across Europe to enhance the protection of honey bee genetic resources

Yániz J., Casalongue M., Santolaria P., Kovačić M., Štavalj J., Bienkowska M., Uzunov A., Aleksovski G., Costa C., Hatjina F., Albertazzi S., Capano V., Di Prisco G., Valenzano V., Galartza E., Boranski M., Rekkas C.
Author affiliations are given in the abstract respectively.

info@bee-guards.eu | www.bee-guards.eu

INTRODUCTION

Honey bee germplasm repositories may play a crucial role in the conservation and improvement of honeybee populations. By preserving genetic material from diverse bee strains, these banks would ensure the maintenance of genetic diversity, which is vital for the resilience and adaptability of honeybee populations in the face of environmental changes, diseases, and pests. They would provide a valuable resource for researchers and beekeepers to access genetically diverse stock, which can be used to breed bees with desirable traits, such as disease resistance or increased productivity. Additionally, germplasm banks help safeguard against the loss of unique or endangered bee species/subspecies, contributing to long-term sustainability in apiculture and pollination services.



Figure 1. Map showing the location of the cryobanks



Within the framework of the BeeGuards project, consortium partners will establish at least six germplasm repositories across six additional countries, encompassing a minimum of six honey bee subspecies: Croatia (A. m. carnica), Greece (A. m. cecropia, A.m. macedonica), Italy (A. m. ligustica, A. m. siciliana), North Macedonia (A.m. macedonica), Poland (A. m. mellifera, A. m. carnica) and Spain (A. m. iberiensis). The repositories will store a variety of biological materials, including semen, tissues for DNA extraction, and whole bee specimens for morphometric and other analyses. Furthermore, the BeeGuards project will advance research on the cryopreservation of honey bee embryos and embryonic cells, potentially opening new avenues for the conservation of a broader range of pollinator species.

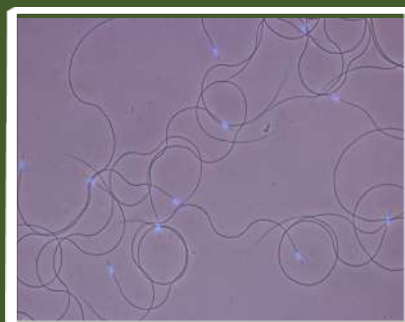


Figure 2. Honeybee drone spermatozoa

CONCLUSION

Cryopreserved samples will support the conservation of endangered subspecies and ecotypes by mitigating inbreeding risks in small, vulnerable populations and facilitating the restoration of biodiversity losses resulting from diverse scenarios such as the introduction of exotic pests, extreme weather events, natural disasters, or excessive genetic introgression due to migratory beekeeping. Moreover, these samples will serve as a genetic resource repository, providing customized responses to emergent challenges in apiculture and ecosystem management. Once established, these germplasm collections will be maintained at a low cost and may qualify for national conservation funding dedicated to the preservation of local genetic resources.



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Jesús Yániz¹, Matías Casalongue¹, Pilar Santolaria¹, Marin Kovačić², Josipa Štavalj², Malgorzata Bienkowska³, Aleksandar Uzunov⁴, Goran Aleksovski⁴, Cecilia Costa⁵, Fani Hatjina⁶, Sergio Albertazzi⁴, Vittorio Capano⁵, Gennaro Di Prisco⁷, Viviana Valenzano⁷, Egoitz Galartza⁸, Mikolaj Boranski⁶, Constantinos Rekkas⁶

¹BIOFITER research group, Environmental Sciences Institute (IUCA), Department of Animal Production and Food Sciences, University of Zaragoza, Huesca, Spain.

²Faculty of Agrobiotechnical Sciences Osijek, Josip Juraj Strossmayer University of Osijek, Osijek, Croatia

³The National Institute of Horticultural Research, Konstytucji 3 Maja 1/3, Skierniewice, Poland

⁴Ss. Cyril and Methodius University in Skopje, Faculty for Agricultural Science and Food, Skopje, Macedonia

⁵CREA-Research Centre Agriculture and Environment, Bologna, Italy

⁶ELGO DIMITRA, Institute of Animal Schience, Department of Apiculture, Ne amoudania, 63200, Greece

⁷CNR-Institute for Sustainable Plant Protection

⁸Department of Genetics, Physical Anthropology and Animal Physiology, University of the Basque Country (UPV/EHU), Leioa-Bilbao, Spain.

Honey bee germplasm repositories may play a crucial role in the conservation and improvement of honey bee populations. By preserving genetic material from diverse bee populations, these repositories can ensure the maintenance of genetic diversity, which is vital for the resilience and adaptability of honey bee populations in the face of environmental stressors. These may include the introduction of exotic pests, extreme weather events, natural disasters, or excessive genetic introgression due to migratory beekeeping. Furthermore, germplasm repositories (cryobanks) help safeguard against the loss of unique or endangered subspecies, contributing to long-term sustainability in apiculture and pollination services. Additionally, cryobanks can provide a valuable resource for researchers and beekeepers to access genetically diverse stock, which can be used to breed bees with desirable traits, such as disease resistance or increased productivity. Within the framework of the BeeGuards project, consortium partners will establish six germplasm repositories across six countries, encompassing six honey bee subspecies: Croatia (*A. m. carnica*), Greece (*A. m. cecropia*, *A. m. macedonica*), Italy (*A. m. ligustica*, *A. m. siciliana*), N. Macedonia (*A. m. macedonica*), Poland (*A. m. mellifera*, *A. m. carnica*) and Spain (*A. m. iberiensis*). The repositories will store a variety of biological materials, including semen, tissues for DNA extraction, and whole bee workers for morphometric and other analyses. Furthermore, the BeeGuards project will advance research on the cryopreservation of honey bee embryos and embryonic cells, potentially opening new avenues for the conservation of a broader range of pollinator species. Cryopreserved samples will support the conservation of endangered subspecies and ecotypes by mitigating inbreeding risks in small, vulnerable populations and facilitating the restoration of biodiversity losses resulting from diverse environmental scenarios. Moreover, these samples will serve as a genetic resource repository, providing customized responses to emerging challenges in apiculture and ecosystem management. Once established, these germplasm collections can be maintained at a low cost and may qualify for national conservation funding dedicated to the preservation of local genetic resources. This work is supported by the EU Horizon Europe (grant 101082073).