Marie Skłodowska-Curie Postdoctoral Fellowship (MSCA-PF) Proposal
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PLANT-VEC

Abstract

The PLANT-VEC project addresses the urgent need for sustainable, eco-friendly vector control solutions in the face of rising arboviral threats. Rooted in the principles of Planetary Health, this research investigates the plant-feeding ecology of *Aedes aegypti* mosquitoes in the rapidly urbanising context of Kathmandu, Nepal. By identifying key plant species that contribute to mosquito survival and reproduction, and by characterising attractive volatiles for sugar bait optimisation, the project aims to inform novel, nature-based vector management strategies. Through interdisciplinary methods that integrate molecular ecology, spatial ecology, behavioural assays, and citizen science, PLANT-VEC will produce actionable knowledge for the development of botanically relevant Attractive Sugar Baits (ASBs) and urban planning tools. This approach aligns with global efforts to reduce reliance on chemical insecticides, mitigate vector-borne disease risks, and promote biodiversity-conscious public health interventions.

PART B1: Excellence

1.1 Quality and pertinence of the project's research and innovation objectives
The project PLANT-VEC aims to investigate and characterise plant-feeding behavior of *Aedes aegypti* in the urban context of Kathmandu, Nepal, a dengue-endemic area. Sugar feeding is a vital but underexplored component of Aedes ecology. Understanding local plant use by *Ae. aegypti* will provide empirical data to guide the design of botanically relevant Attractive Sugar Baits (ASBs) and inform vector management through urban vegetation planning.

Objectives:
1. Identify dominant plant species contributing to mosquito sugar intake in Kathmandu.
2. Quantify sugar-feeding rates in wild *Ae. aegypti* across seasons and habitats.
3. Assess nutritional and behavioral value of local plant species.
4. Determine plant volatiles attractive to *Ae. aegypti*.
5. Map spatial overlap of sugar sources and mosquito activity using high-resolution ground surveys.
6. Engage communities through citizen science for local data collection and intervention uptake.

1.2 Soundness of the proposed methodology
The project will integrate molecular ecology, chemical ecology, entomology, and spatial ecology, with a participatory citizen science component.
- Year 1: Field collections across Kathmandu's urban gradients. Use anthrone assays and DNA barcoding (trnL, ITS2) to identify plant taxa in mosquito guts. Citizen volunteers will assist with site-level vegetation and mosquito sampling.
- Year 2: Lab assays on mosquito survival and fecundity using selected plant species. Volatile profiling by GC-MS and attractiveness testing via 4-choice olfactometer and semi-field setups.
- Year 3: High-resolution vegetation mapping and analysis through systematic ground-based surveys and mobile GIS. Development and field evaluation of plant-optimised ASBs.

1.3 Quality of the supervision and the hosting arrangements

- Host institution: Institute of Tropical Medicine (ITM), Antwerp

- Global leader in vector-borne disease research
- Advanced insectaries, molecular and analytical laboratories
- Integration in the Entomology Unit of ITM under Prof. Ruth Müller

- Field partner: Planetary Health Research Center

- Expertise in dengue ecology, urban health, GIS and field entomology

- Chemical analysis: UA? RKI?

1.4 Capacity of the researcher to reach and re-enforce a position of professional maturity

The applicant has a PhD in entomology with a strong track record in mosquito ecology and behaviour. They have experience in both molecular and field methods and have published in peer-reviewed journals. The fellowship will strengthen their interdisciplinary profile and enhance their potential for future leadership in ecological vector control.

PART B2: Impact

2.1 Enhancing the potential and future career prospects of the researcher

This project provides the researcher with:

- Interdisciplinary training in molecular plant identification, spatial ecology, and chemical ecology.
- Supervised experience in international, field-based vector control research.
- Opportunities for publishing, grant writing, and policy engagement.
- Strategic positioning for academic and translational leadership in vector ecology.

2.2 Contribution to the expected impacts of the fellowship

- Empowers development of novel, ecologically grounded vector control tools.
- Enhances EU research leadership in mosquito ecology and One Health.
- Lays foundation for follow-up Horizon Europe or EDCTP projects.

2.3 Communication, dissemination and exploitation of results

Activity	**Audience**	**Timing**
Peer-reviewed articles	Scientific community	M12, M24, M36
Data repository and open-source bait formulation	Researchers and NGOs	M30
Stakeholder workshops	Municipal authorities, health programs	M36
Community engagement, video “Join MSCA researcher for a day” and public talks	General public	Annually
Citizen science newsletters and training kits	Local volunteers	M6, M18

3.1 Coherence and effectiveness of the work plan

WP	**Title**	**Timeline**	**Objectives**
WP1	Field surveys and plant identification	M1–M12	Identify sugar sources and feeding patterns with citizen input
WP2	Fitness assays and chemical ecology	M6–M24	Evaluate nutritional benefits and volatile profiles
WP3	Spatial mapping and bait development	M18–M36	Map vegetation (ground surveys), mosquito overlap, and formulate baits
WP4	Dissemination and stakeholder engagement	M12–M36	Publish results and promote uptake, include citizen science outputs

3.2 Appropriateness of the allocation of tasks and resources

- Personnel: 100% FTE postdoc
- Lab supplies: Molecular and chemical reagents, sampling materials
- Equipment: Access to GC-MS, 4-choice olfactometer, GIS tools (host institution)
- Field operations: Supported by local partner and citizen science volunteers

3.3 Infrastructure and institutional environment
- ITM offers state-of-the-art lab and insectary facilities, mentorship, and integration into the Entomology Unit and collaboration with modelling hub in the department of Public Health.
- PHRC provides regulatory support, field entomology expertise, botanical expertise, and community access in Nepal.
- UA? RKI? Provides access to GC/MS

Ethics and Security
- Ethical approvals will be obtained for all field and animal work.
- Community consent will be secured in Nepal, aligned with ITM's ethics policy.
- Plant DNA and spatial data will be handled in compliance with the Nagoya Protocol and GDPR.

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