

Insects, Horses, and One Health: Lessons from an Extensive System in Central Spain

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INTRODUCTION & AIM

Insects are central components of horse production systems. They transmit pathogens, cause skin lesions and behavioral stress, and strongly affect animal welfare. Current control strategies rely mainly on individual protection (repellents, fly masks, short-lived insecticides), which often address symptoms rather than environmental drivers and may entail ecological risks.

From an **ecological perspective**, many pest insects behave as opportunistic species, whose populations increase under specific environmental and management conditions. Understanding these drivers is therefore essential for developing preventive strategies. These interacting drivers are summarized in Figure 1.

This work proposes a multi-scalar ecological approach integrating entomological knowledge and ecosystem-based management to reduce insect pressure in extensive horse systems.

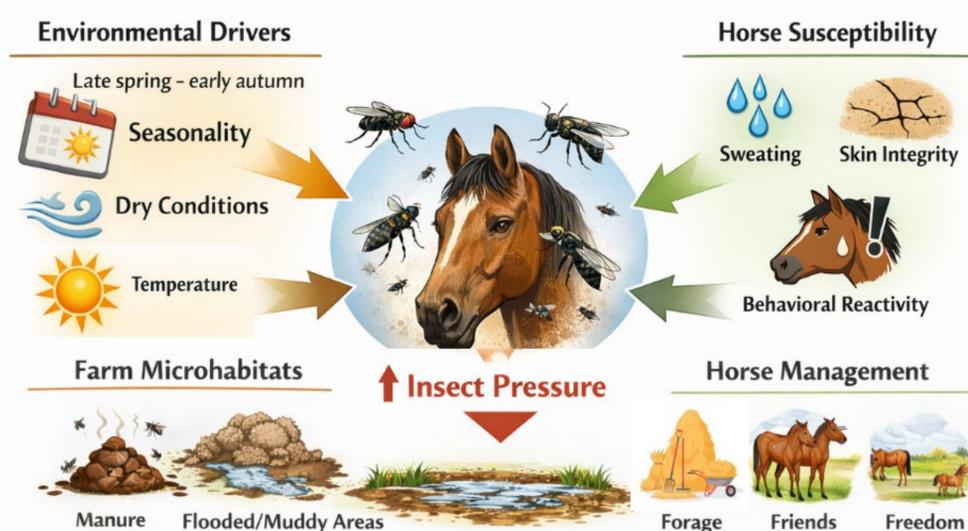


Figure 1. Conceptual framework showing how environmental drivers, farm microhabitats, horse susceptibility, and management practices interact to regulate insect pressure in extensive horse systems.

METHOD

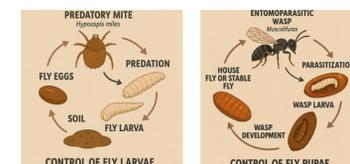
A targeted review identified the main pest taxa affecting horses in Mediterranean systems (*Culex* spp., *Simulium* spp., *Tabanus* spp., *Stomoxys* spp., *Musca domestica*).

Field observations were conducted during 2024-2025 in a semi-arid extensive horse farm in central Spain ("La Nebulosa"). Observations focused on insect activity patterns, environmental conditions, and horse responses during the late spring-early autumn period, when biting pressure was highest.

Based on these observations, multi-scalar preventive interventions were implemented:

Micro-scale (host level)

- Targeted biocontrol
- Stage-specific insect traps
- Systematic fly-mask use to prevent ocular irritation



Meso-scale (farm infrastructure)

- Adaptation of paddocks
- Reduction of soil moisture in high-risk areas by mulching



Macro-scale (ecosystem level)

- Enhancement of insectivorous biodiversity
- Aromatic plant deterrence



RESULTS & DISCUSSION

Preliminary outcomes indicated reduced fly pressure across paddocks, fewer skin lesions in susceptible horses, and no conjunctivitis cases during the current season (vs. two cases the previous year). Among micro-scale interventions, predatory mites (*Hypoaspis miles*) applied in active bedding showed greater persistence and lower cost than parasitoid wasps. At the farm scale, managing soil moisture through mulching with farm residues (sacks, cardboard) and local organic materials (dry leaves, straw) reduced suitable sites for insect development. Additionally, promoting insectivorous birds and predatory insects contributed to broader ecosystem regulation, supporting a shift toward preventive ecological control.

CONCLUSION

This study concludes that insects can transition from indicators of degradation to co-managers of ecological resilience, enabling preventive biocontrol with welfare and ecological co-benefits. Shifting from reactive control to ecosystem-based management can reduce insect pressure while promoting ecological balance and system resilience.