An overview of seed functional ecology: focusing on accelerating progress in the tropics

Fernando A. O. Silveira
Professor of Plant Ecology & Conservation. Federal University of Minas Gerais, Brazil

Abstract

Seed science has long been central to agriculture, with major advances in seed physiology supporting crop production. In parallel, seed functional ecology has emerged as a complementary framework aimed at understanding how seed traits influence plant regeneration, community assembly, and ecosystem functioning. While these fields have developed largely independently, they share common ground in the study of key processes such as dispersal, dormancy, germination, and persistence. Integrating these perspectives offers an opportunity to extend insights from well-studied crop systems to the vast diversity of wild species. Over the past decades, advances in seed functional ecology have been driven by the development of standardized protocols and an increasing availability of trait data. Initiatives such as the handbook for standardized measurements of plant regeneration traits are expanding our capacity to quantify and compare seed traits across species and environments. However, most existing knowledge is derived from temperate regions and from a relatively small subset of species. This limitation is particularly acute in tropical ecosystems, which harbour most of the world's plant diversity but remain underrepresented in integrative seed research. Moreover, within the tropics, open ecosystems such as savannas, grasslands, and wetlands have received far less attention than forests. These biases constrain the development of general frameworks capable of capturing the full diversity of seed strategies. In this talk, I provide an overview of seed functional ecology with a focus on recent advances and persistent challenges in tropical systems. I will present the Tropical Seed Traits Database (TSTD) and highlight opportunities to accelerate progress through standardized methods, coordinated data collection, and stronger integration between physiology and ecology. Bridging these fields will be essential for developing globally relevant frameworks and for informing conservation, restoration, and sustainable management under ongoing global change.