PLANT STRATEGIES FOR SEED DISPERSAL IN TROPICAL HABITATS: PATTERNS AND IMPLICATIONS

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Contents

Summary

Seed dispersal is a key process for plant reproductive cycle. In this way, this chapter presents an overview of the strategies adopted by tropical plants to maximize the chances of fruit/seed removal, and the implications of these strategies in terms of resource allocation and efficient seed dispersal. First, we discuss the constraints relative to fruit/seed size in determining the frugivore assemblage capable of removing fruits, and the role of fruit attributes and phenological strategies in the attraction of different frugivore guilds. We also comment on cases of plant-animal strict specializations and diffuse interactions and their implications for seed dispersal efficiency. Since dispersal efficiency is not solely determined by frugivore attraction and fruit removal, this chapter discusses the interplay between frugivore behavior and seed deposition patterns. We also point out general patterns of fruit choice and discuss the consequences of these patterns for the plant reproductive success. Finally, we conclude this review by discussing an approach to accelerate forest succession and restoration of degraded ecosystems. This approach is based on the enhancement of the seed dispersal process, which increases seed rain and plant recruitment in those areas.

1. Introduction

Dispersal is a crucial process for plants at several scales, because it connects the end of the reproductive cycle of adult plants with the establishment of their offspring. In order to maximize reproductive success, plants may adopt a variety of seed dispersal mechanisms, such as anemochory, barochory, hydrochory, autochory and zoochory. The proportion of plant species adopting each dispersal strategy may vary within floristic types and micro-habitats, usually according to plant strata. For example, understorey and sub-canopy species usually present fleshy colorful fruits, in order to attract dispersal agents, while canopy species generally rely on the wind to disperse their seeds. The latter strategy is more efficient in deciduous forests, where the chances of collision with vegetation elements is reduced, thus increasing the odds of long-distance dispersal. At a larger scale, this proportion is different when comparing biomes and geographical zones, such as tropical and temperate regions.

In tropical regions, zoochory seems to be the most common and efficient seed dispersal mechanism. Zoochoric fruits can be dispersed by attachment to disperser's body via barbs and hooks, although this is rare in tropical environments, or through fruit/seed consumption and subsequent seed deposition. As a corollary, tropical plants exhibit a wide variety of phenological strategies and produce fruits presenting an amazing diversity of forms and colors. Once seed dispersal by animals involves an interaction between pairs of species, it is possible that attributes leading to higher fruit removal and successful seed dispersal are under positive selective forces. This hypothesis implies that differences in the ecology and behavior of dispersers induce corresponding differences in fruit species favored by these dispersers, in a way that fruits may be packed in groups according to characteristics that facilitate their dispersal by a particular group of animals. Such idea was first discussed by van der Pijl in 1969, who defined those specific groups of characteristics as dispersal syndromes (see Table 1). These syndromes could be viewed as evidence for the process of coevolution between dispersers and plants, although several factors may limit tight coevolutionary relationships. However, the effect of seed dispersers on the evolution of fruit traits remains controversial. Several studies failed to find any evidence of coevolution between dispersers and plants, suggesting that fruit traits are accidentally well-matched exaptations rather than the result of coevolution. On the other hand, other studies supported the predictions of the dispersal syndrome hypothesis.

Dispersal syndrome	Fruit color	Fruit/seed size	Odor	Pulp composition	Other
Other mammals (terrestrial and arboreal)	violet[a], brown/black[b], orange[a], green[b]	large	strong	protein and sugar rich	no data
Bats	green, brown, dull-colored	large	strong	lipid and starch rich	pending position
Birds	bright colors (purple, red, black, blue)	varied	absent	lipid, sugar and protein rich	arils
Reptiles	bright colors	small	strong	generalist	no data
Ants	no data	small	absent	lipid rich	elaiosome

[a] mainly diurnal mammals, [b] mainly nocturnal mammals

Table 1. Seed dispersal syndromes by different frugivore guilds

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Biographical Sketches

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