24-hour surveys of flower-visitor communities reveal complementarities and redundancies in circadian rhythms and foraging behaviours between strawberry pollinators

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Résumé

Differences in pollinator functional traits, such as circadian rhythm or foraging behaviour, allow for complementary contributions to pollination services. These traits vary between pollinator taxa due both to physiological constraints and responses to floral resource diversity and availability. However, little is known about the temporal and behavioural complementarities of flower-visitors in terms of their daily activity. We carried out standardised 24-hour video surveys to track strawberry flower visitors in three study sites in the region of Paris (France). We tested whether different flower-visitor groups were active at different times of day (i.e. temporal complementarity vs. redundancy), and whether foraging behaviour varied between groups and across the day. We focused on spring, a time of the year where little is known about diurnal and nocturnal pollinators' activity, and in urban and suburban areas where pollinator communities on crops remain poorly described. We recorded 29 sessions of 24-hour surveys for a total of 359 flower visitors. We found that most pollinators were active during the day, with ants reported as the main nocturnal flower visitors, and mostly found in the least urbanised site. Moreover, we found a multimodal pattern in the temporal activity of flower visitors in this least urbanised site. Small wild bees were dominant in this site and showed an activity peak in the morning. Activity of other flower-visitors in this site was spread out over the course of day, indicating complementarity in temporal niche. In contrast, in the more densely urbanised sites, a single peak of activity (i.e. an unimodal pattern) occurred during the afternoon, with dominance of honey bees, indicating redundancy in temporal niche. We also found that the flower-visit duration varied substantially between pollinator groups, and over the course of the day. Honey bees and bumble bees showed faster flower visiting behaviour independently of time, while ants showed slower behaviour with speed increasing over the course of the day. These results contribute to bridging the knowledge gaps on the complementarities of flower-visitor circadian rhythms. Our results suggest that the density of urbanisation could impact flower-visitor communities and their associated temporal and behavioural complementarities.

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Mots-Clés: 24 hour monitoring, Circadian rhythm, Foraging behaviour, Nocturnal activity, Plant, pollinator interaction, Pollinator community, Temporal niche