

Why use vertical stratification and directionality to assess insect foraging behaviour on trees?

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The studies on foraging behaviour of pollinators on different crops have been made by observing the number of insects visiting marked plots per unit time. This holds true for crop plants where the plants have the same height and the crop is uniformly distributed, where observations can be made on marked plots randomly selected in the crop. The observations can also be made by using the line transect method, where the observer walks along the strip of the crop and records insects. However, in tree plants, flowers are located at different heights and in different directions, and more or less have different microclimatic conditions facing east, west, north, and south. Therefore, investigations are needed to explore the pollinator behaviour in relation to the height of the plant as well as the directionality of inflorescences. In tree-type plants, it is recommended to record observations across different canopy strata to obtain accurate estimates of pollinator diversity and abundance. Recording observations by observing one set of branches is unlikely to yield good results. The concentration of floral resource composition in different canopies supports the different faunal communities.

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Some understanding can be gleaned from observing the foraging behaviour of individual insects. For example, honeybees display a pattern of 'horizontal movement', in which individuals typically move between plants of similar height^{7,8}. A preference for flowers at specific heights has also been observed in solitary bees^{1,2} and wasps⁹. Maintaining a constant flight altitude may offer energetic advantages, allowing flower visitors to forage more efficiently¹⁰. Additionally, flowers located near the ground might be less attractive to some insects, as visiting them necessitates manoeuvring through plant stems, which can be difficult in dense vegetation¹. Flowering height influences this selection process. In stratified tropical forests, bee species often restrict their foraging activity to certain strata¹¹⁻¹⁷. This behaviour appears to be linked to body size, with larger bees tending to forage in the canopy, while smaller species are more active in the lower strata. The orientation of plants plays a crucial role in shaping pollinator movement and the resulting gene flow. Studies have shown that pollinators tend to move in both east-west and north-south directions, with significant movement both along and across rows from the central block. Pollinators typically visit the nearest adjacent inflorescence¹⁸⁻²¹, primarily moving between the closest neighbouring flowers²². However, the directionality of their foraging can change based on factors such as flower orientation^{23,24}, plant density^{18,25,26}, prevailing wind direction, and the presence of other pollinators²². Pollinators are more inclined to move across rows when the closest flower lies in that direction rather than continuing