

# Green and sweet: How plant sugars influence malaria transmission

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*Anopheles* females is shown feeding on extra floral nectar of *Barleria lupulina*.  
Credit: Hien et al.

Female mosquitoes are well known blood-feeders, but they also consume

sugar sources such as nectar, fruits and tree sap. A study published on August 4th in *PLOS Pathogens* suggests that the plant-based part of their diet affects malaria transmission by influencing the host-pathogen interaction between *Anopheles* mosquitoes and *Plasmodium* parasites.

Recent studies have shown that *Anopheles* females, which can transmit the [malaria parasite](#) *P. falciparum*, locate and display preferences for natural sources of plant sugar. These studies also suggested that environmental sugars influence the lifespan and blood-feeding rate of mosquitoes, and thereby their malaria transmission potential. Whether plant sugar choice could also affect the malaria host-pathogen interactions directly is not known.

To find out, Domonbabele Hien and Thierry Lefevre, from the Institut de Recherche en Sciences de la Santé in Bobo Dioulasso, Burkina Faso, together with colleagues, examined the impact of plant diversity on mosquito susceptibility to malaria parasites. The researchers studied the natural interactions between the *P. falciparum* parasite, the *Anopheles coluzzii* mosquito (a major vector of *P. falciparum* in Africa), and several natural plant-derived sugar sources growing in the vicinity to human dwellings in Burkina Faso. The latter included two ornamental flowering plants (*B. lupulina* and *T. neriifolia*) as well as mangoes and the grape-like fruit from the *Lannea microcarpa* tree.

The researchers raised groups of *Anopheles* mosquitos in cages and provided each of them with a different plant sugar source or with a 5% glucose solution (i.e., sugar water). Sugar-fed mosquitoes were then starved for 24 hours before being offered a parasite-containing blood meal. The blood was drawn from healthy *Plasmodium*-infected local human volunteers and diluted to a consistent concentration of parasites.

Blood-fed female mosquitoes were housed in a biosafety room and continued to be fed their assigned plant sugar source. Seven or fourteen

days after the blood-meal, roughly 30 mosquitoes from each group were examined under the microscope for traits that influence malaria transmission. Different sugar sources, the researchers found, had different effects on all traits examined, including the infection and survival rates of the mosquitoes and the survival rate of the parasites seven days after the blood meal. The plant sugar source also influenced the proportion of mosquitoes harboring sporozoites (the *Plasmodium* stage that can infect humans) and the timing of sporozoite release.

To predict the relative contribution of the different plants to overall malaria transmission, the researchers used the various experimental results in an epidemiological model. This suggested that, indeed, plant sugar source can be a significant driver of malaria transmission dynamics. Compared to the baseline scenario with the 5% glucose solution, both *L. microcarpa* and *B. lupulina* increased malaria transmission by an estimated 30 and 40%, respectively, mainly because of increased infection rates among [mosquitoes](#) exposed to parasites through their blood-meal. In contrast, *T. neriifolia*, with its negative effect on infection rate and decreased longevity, was predicted to decrease [malaria transmission](#) by 30% compared with sugar water.

Discussing their findings in context, the researchers say, "previous research has revealed the role of sugar in providing energy for flight, increasing mosquito survival and fecundity, and decreasing biting rate on vertebrate hosts. Our findings add a more direct effect of epidemiological importance by showing that plant-derived sugars can modulate mosquito-*Plasmodium* interactions". Consequently, they suggest that "planting of anti-*Plasmodium* plant sugar sources may represent a promising alternative strategy to contribute to the control of malaria".

**More information:** Domonbabele F. d. S. Hien et al. Plant-Mediated Effects on Mosquito Capacity to Transmit Human Malaria, *PLOS*

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