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Editor's Choice: How can pollination be enhanced for optimal fruit set?

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Garibaldi, L. A., Bartomeus, I., Bommarco, R., Klein, A. M., Cunningham, S. A., Aizen, M. A., Boreux, V., Garratt, M. P. D., Carvalheiro, L. G., Kremen, C., Morales, C. L., Schüepp, C., Chacoff, N. P., Freitas, B. M., Gagic, V., Holzschuh, A., Klatt, B. K., Krewenka, K. M., Krishnan, S., Mayfield, M. M., Motzke, I., Otieno, M., Petersen, J., Potts, S. G., Ricketts, T. H., Rundlöf, M., Sciligo, A., Sinu, P. A., Steffan-Dewenter, I., Taki, H., Tscharntke, T., Vergara, C. H., Viana, B. F., Woyciechowski, M. (2015), Trait matching of flower visitors and crops predicts fruit set better than trait diversity. *Journal of Applied Ecology*. doi: 10.1111/1365-2664.12530

Some plants are pollinated. *But how?*

This simple question masks many theoretical and applied challenges. First, while it is well known that pollinated plants interact with flower visitors, understanding what makes this interaction efficient is not trivial. The number and abundance of flower visitors is one thing and it was already known that increasing the number of pollinators and maximizing their abundance tended to increase the success of pollination. Fine. But acknowledging these effects does not tell us how a species and a plant actually interact. For two sets of pollinators with the same number of species and individuals, which one is more efficient in terms of fruit production? One expects that those flower visitors with specific traits matching the traits of their targeted plants will make the best interacting system. You must have the right keys for the proper locks. But is it enough? Or are richness and abundance still playing a role?

Examples of plant–pollinator interactions (from top to bottom, from left to right): Halictidae on Solanum melongena, Oxaea sp. (Andrenidae) on Bixa orellana, Xylocopa frontalis (Apidae) on Bixa orellana, and Oxaea sp. (Andrenidae) on Bixa orellana. Photo credit: Thiago Mahlmann.

Second, this question is a central issue in the modern and intensified agricultural era. Agricultural landscapes are both losing pollinators and still under strong pressure to maximize their productivity. The mutualistic network of plants and pollinators is known to be central, but we don't really know how and why it should really be maintained. Using broad-spectrum pesticides is thus still a rule of thumb in conventional farmland practices. Understanding and respecting the fine interactions between plants and pollinators is thus crucial to replace blind and careless habits with more ecological ones.

Garibaldi *et al.* build a strong case for this major issue and their contribution is significant in several aspects. They use a very impressive dataset in which 33 crop systems distributed among 469 fields are considered. This provides them with a very powerful collection of information, sampling different communities of plants, flower visitors, agricultural practices, and field trajectories. Their conclusions reach a high level of generality. They also use a clever and very detailed approach in which few, simple, and relevant traits are quantified to capture pollinator activities with respect to specific plants. They do not work on pollination but directly on crop fruit set and they do not simply test whether trait matching and the diversity or abundance of flower visitors increase seed production but rather try to unpack the interactions between these variables.

Their general conclusion is important and easy to understand: to have better fruit set trait matching matters, and even more when species richness and per capita abundance (evenness) are optimal. In brief, the integrity of the biotic community taken as a whole must be maintained. But this general conclusion also has specific applied consequences for each particular field because a better understanding and identification of what each species is doing is made available.

This paper is exemplary in showing how best applied ecology combines clear predictions and good analytical framework to answer simple but crucial questions. How do plants get pollinated? What are the consequences for seed production? Ask Garibaldi *et al*!

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Different body sizes and tongue lengths for bees, which were the main traits analysed in the paper. Bee genus' are as follows (from bottom to top, from left to right): Bombus, Apis, Euglossa, Megalopta, Megachile, Ceratina, Coelioxys and Nannotrigona. Photo credit: Thiago Mahlmann.