
Pollinators contributions to crop production in two important mass flowering crops: empirical and experimental assessments under realistic field conditions over four years

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Abstract

Global food production strongly relies on insect pollination. More than two thirds of crop plants depend on pollinators for their pollination. Oilseed rape (*Brassica Napus L.*) and sunflower (*Heliantus Annuus L.*) are two important mass-flowering crops often found in European landscapes. Their yield was previously shown to rely on insect pollination but the contributions of pollinators varied strongly between studies from null to doubling the yield. Moreover, assessments of pollinator contributions have mostly been conducted on a small scale or under simplified conditions, which do not represent the real contributions at the field scale and do therefore not reflect the importance of pollinators for farmers. In our study, we quantified the contributions of pollinators for these two crops under real field conditions, i.e. directly in the fields of farmers. These estimations were realized at the field scale in order to correctly estimate the contribution of pollinators to yield as well as at the plant scale to understand mechanisms that permit the increase of crop yield. This study also allows identifying pollinators implicated in crop pollination. We show that oilseed rape and sunflower share honeybees as effective pollinators. In addition, wild bees and particularly the genus *Lasioglossum* also increased oilseed rape yield but this was not found for sunflower. We estimated that pollinators increase yield for oilseed rape and sunflower by up to 35% and 40% respectively by comparing yields between fields with low and high pollinator abundances. For both two crops at the field scale, pollinators increased seed fructification success of flowers which increased seed production at plant scale. This study confirms the crucial role of pollinators in crop production and thus the importance to promote them in agricultural landscapes for a sustainable production.

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