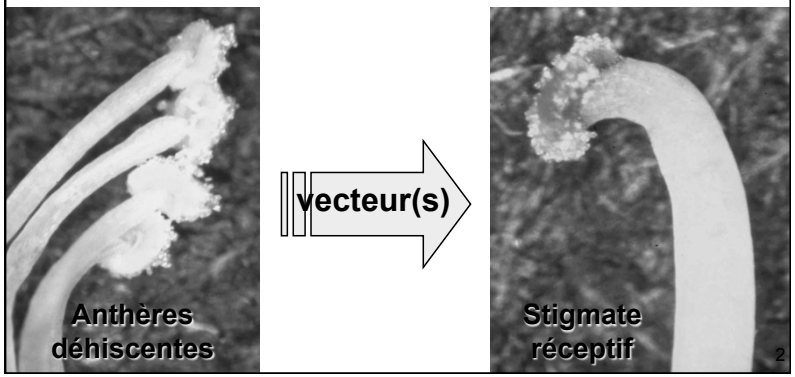
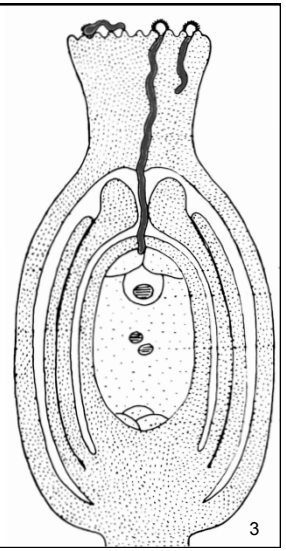
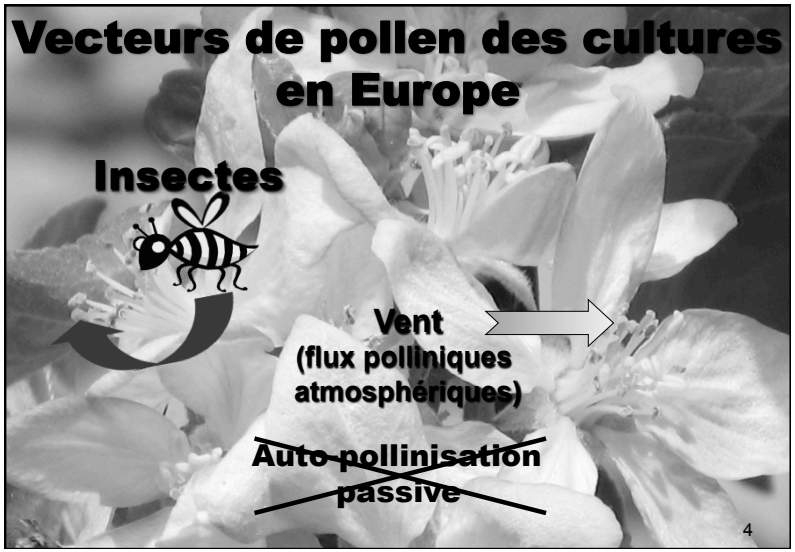
La pollinisation :
le transfert du pollen des étamines productrices aux stigmates

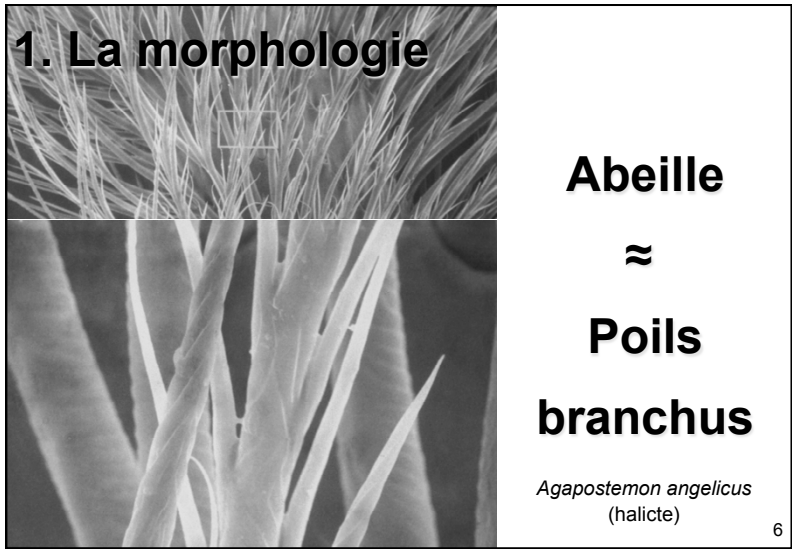


La pollinisation est le préalable incontournable à la fécondation … et donc à la reproduction sexuée des plantes à fleurs



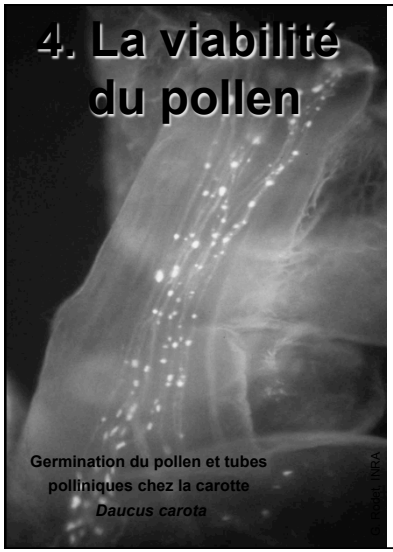



N. Morison, INRA
Beaucoup d'insectes floricoles
ne sont pas
des pollinisateurs
5


1. La morphologie
Abeille
≈
Poils branchus
Agapostemon angelicus (halicte)
6


N. Morison, INRA
2. Le régime alimentaire :
Nectar & pollen
1mm
Halictus scabiosa (halicte) sur capitule de laitue *Lactuca sativa*
7

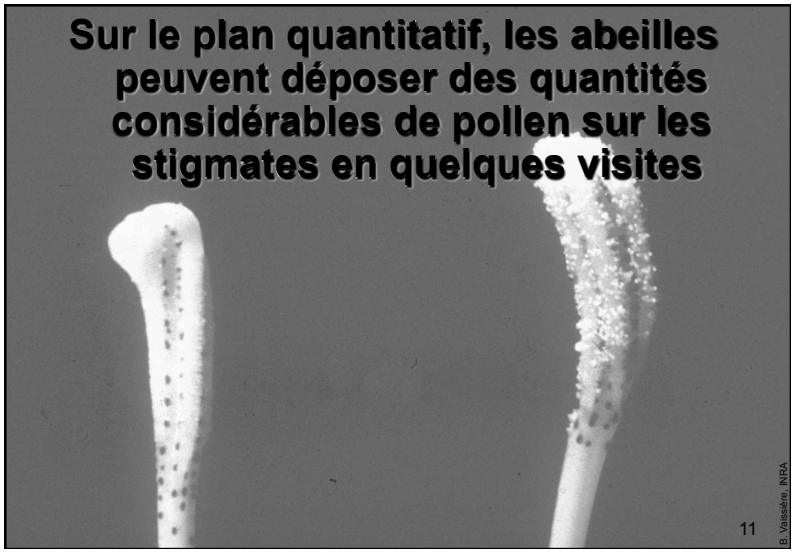

3. Comportement de butinage
Fidélité à une espèce végétale lors d'un voyage
8



Le pollen transporté demeure viable pendant plusieurs heures

9

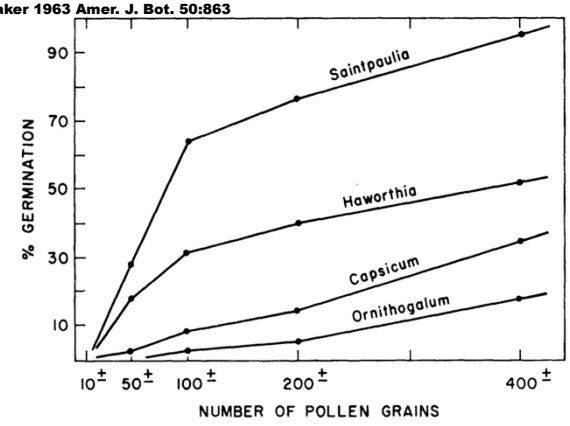
10



11

Relation entre effectif de grains de pollen et taux de germination dans 20 µl de milieu de culture

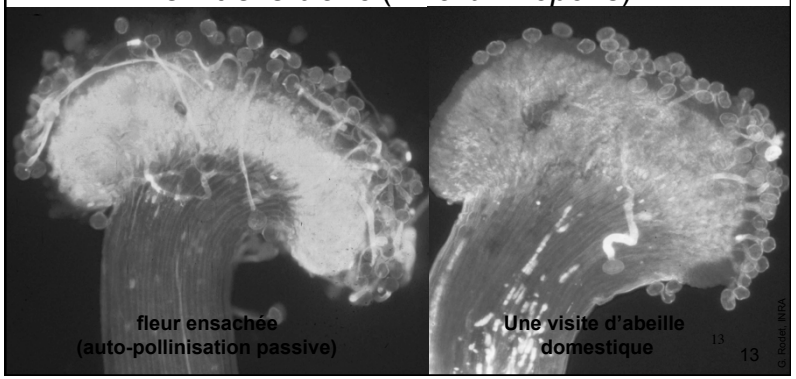
Brewbaker 1963 Amer. J. Bot. 50:863



12

Sur le plan qualitatif, les abeilles déposent du pollen d'origine génétique variée (allo-pollen compatible)

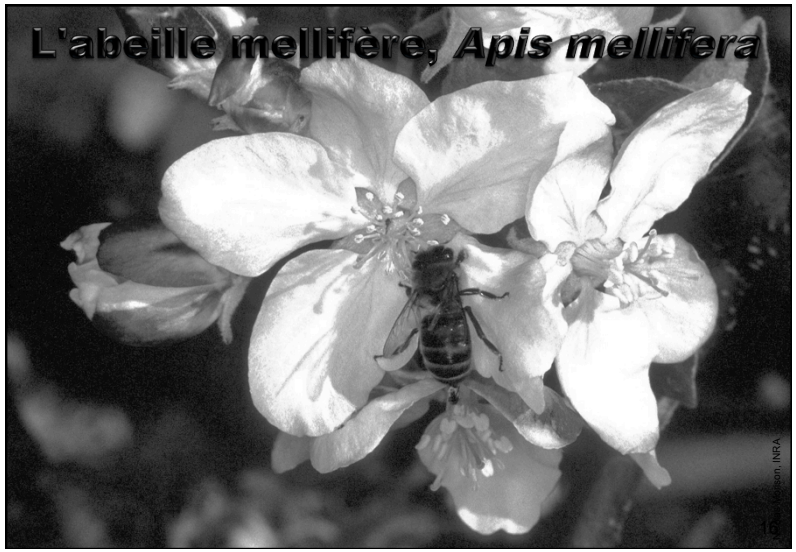
ex. trèfle blanc (*Trifolium repens*)



13

Quels insectes pollinisateurs pour l'agriculture aujourd'hui?

15



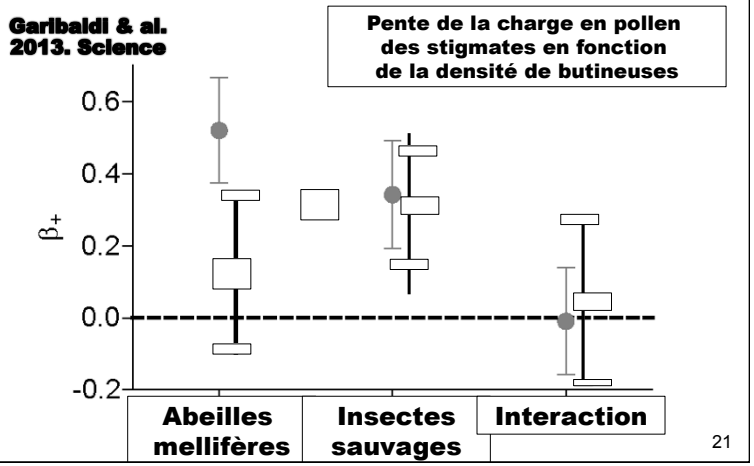

Le bourdon terrestre, *Bombus terrestris*
17


les autres abeilles ?
18


Et les mouches (syrphes)...
19

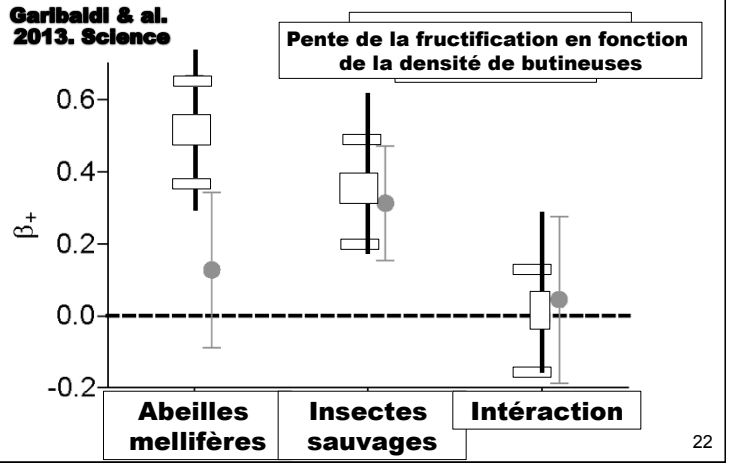

Sciencexpress
Reports
EMBARGOED UNTIL 2:00 PM US ET THURSDAY, 28 FEBRUARY 2013
Wild Pollinators Enhance Fruit Set of Crops Regardless of Honey Bee Abundance
Importance des insectes pollinisateurs sauvages
20

Effet des visites d'abeilles mellifères et des insectes pollinisateurs sauvage sur la pollinisation



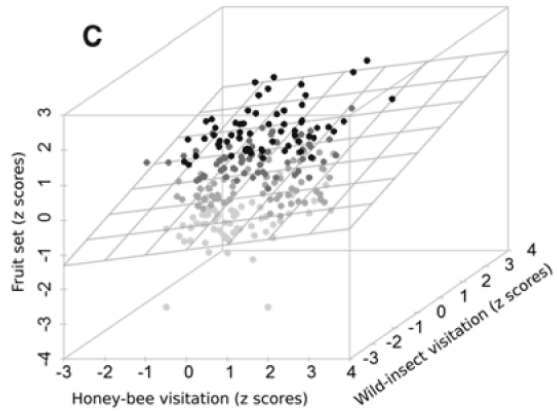
21

Effet des visites d'abeilles mellifères et des insectes pollinisateurs sauvage sur la pollinisation



22

Pas d'interaction & complémentarité entre abeilles sauvages et abeilles mellifères



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Pollinisation intégrée des cultures entomophiles

Service écologique (faune sauvage)

Pratique culturale (colonies en complément)

24

Agriculture, Ecosystems and Environment 184 (2014) 34–40

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journal homepage: www.elsevier.com/locate/agee

Avoiding a bad apple: Insect pollination enhances fruit quality and economic value☆

M.P.D. Garratt[a,*], T.D. Breeze[a], N. Jenner[b], C. Polce[c], J.C. Biesmeijer[c,d], S.G. Potts[a]

[a] Centre for Agri-Environmental Research, School of Agriculture, Policy and Development, University of Reading, UK
[b] Norman Collett English Fruit Marketing, Norman Collett House, Kent, UK
[c] Faculty of Biological Sciences, University of Leeds, Leeds, UK
[d] Naturalis Biodiversity Center, The Netherlands

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ABSTRACT

Insect pollination is important for food production globally and apples are one of the major fruit crops which are reliant on this ecosystem service. It is fundamentally important that the full range of benefits of insect pollination to crop production are understood, if the costs of interventions aiming to enhance pollination are to be compared against the costs of the interventions themselves. Most previous studies have simply assessed the benefits of pollination to crop yield and ignored quality benefits and how these translate through to economic values. In the present study we examine the influence of insect pollination services on farmgate output of two important UK apple varieties; Gala and Cox. Using field experiments, we quantify the influence of insect pollination on yield and importantly quality and whether either may be limited by sub-optimal insect pollination. Using an expanded bioeconomic model we value insect pollination to UK apple production and establish the potential for improvement through pollination service management. We show that insects are essential in the production of both varieties of apple in the UK and contribute a total of £36.7 million per annum, over £6 million more than the value calculated using more conventional dependence ratio methods. Insect pollination not only affects the quantity of production but can also have marked impacts on the quality of apples, influencing size, shape and effecting their classification for market. These effects are variety-specific however. Due to the influence of pollination on both yield and quality in Gala, there is potential for insect pollination services to improve UK output by up to £5.7 million per annum. Our research shows that continued pollinator decline could have serious financial implications for the apple industry but there is considerable scope through management of wild pollinators or using managed pollinator augmentation, to improve the quality of production. Furthermore, we show that it is critically important to consider all production parameters including quality, varietal differences and management costs when valuing the pollination service of any crop so investment in pollinator management can be proportional to its contribution.

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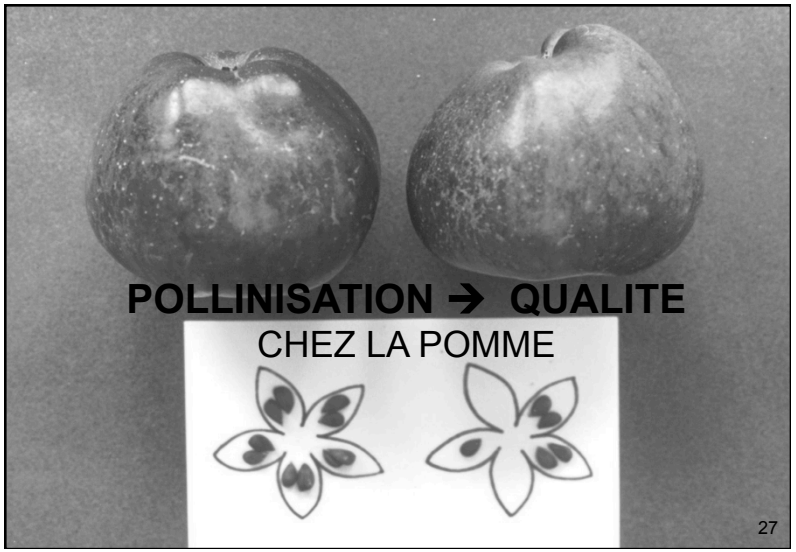

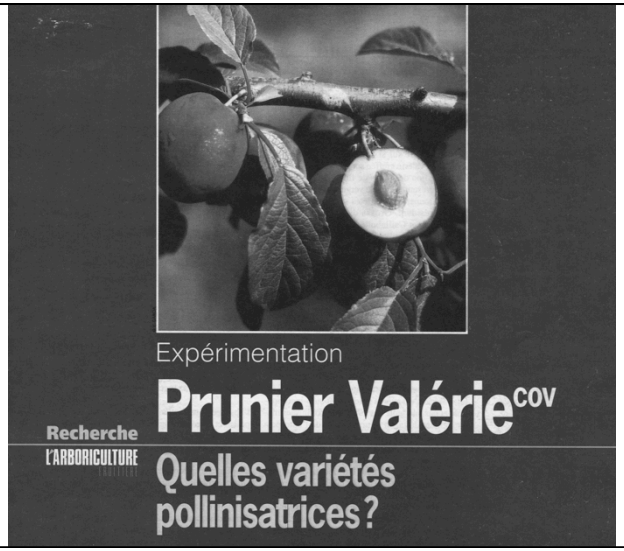
Recherche
L'ARBORICULTURE
Expérimentation
Prunier Valérie COV
Quelles variétés pollinisatrices ?


Dossier kiwi
LA POLLINISATION DE L'ACTINIDIA DELICIOSA
var. deliciosa Chev. (Actinidiaceae)
BERNARD VAISSIÈRE, JEAN-PAUL TORRE GROSSA, GUY RODET & FRÉDÉRIC MALABCEUF *
16
Pour maximiser la quantité et le rendement dans son verger le kiwiculteur doit élaborer et mettre en oeuvre une stratégie de pollinisation raisonnée.
Le calibre des fruits est devenu un facteur essentiel dans la rentabilité économique de la kiwiculture et les poids seuils des catégories 1er choix et Extra sont maintenant fixés par la CEE à 70 g et 90 g, respectivement (Mac Sharry, 1990). Le kiwi est une plante non parthénocarpique en conditions naturelles et la nouaison et le développement d'un fruit sont fonction du nombre de graines qu'il contient. Ainsi, la taille d'un fruit à la récolte varie étroitement avec son contenu en graines comme l'ont montré de nombreux travaux (McKay, 1976; Blanchet & Roubault, 1986; Pyke & Alspach, 1986; Hopping 1990) ainsi que les résultats obtenus dans le Gard depuis 1990 (Fig. 1; Vaissière et al., 1991). Le kiwi est une liane dioïque, c'est-à-dire qu'il existe à la fois des plantes mâles et des plantes femelles, et non apomictique, ce qui signifie que la fécondation d'un ovule est nécessaire pour obtenir une graine. De ce fait, le nombre de graines d'un fruit dépend directement des transferts de pollen viable des fleurs mâles aux fleurs femelles et la pollinisation constitue un facteur de production essentiel qui intervient tant au niveau des rendements que de la qualité des fruits.
On sait néanmoins encore peu de choses sur les mécanismes réels de cette pollinisation et les pratiques empiriques actuelles


RECHERCHE
L'ARBORICULTURE
Expérimentation
Incidence des filets paragrêle sur les abeilles et la pollinisation des pommiers


Recherche
L'ARBORICULTURE
Abricot
Les distributeurs de pollen améliorent-ils la pollinisation des vergers ?
Les distributeurs de pollen placés à l'entrée des ruches sont de plus en plus utilisés en vue d'améliorer

Journal of Horticultural Science & Biotechnology (2012) **87** (4) 353–359

Adding bumblebees (*Bombus terrestris* L., Hymenoptera: Apidae) to pear orchards increases seed number per fruit, fruit set, fruit size and yield

By A. H. ZISOVICH[1], M. GOLDWAY[1,2], D. SCHNEIDER[1], S. STEINBERG[3], E. STERN[3] and R. A. STERN[1,2*]
[1]MIGAL, Galilee Technology Center, P.O. Box 831, Kiryat Shmona 11016, Israel
[2]Department of Biotechnology, Faculty of Life Sciences, Tel-Hai College, Upper Galilee 12210, Israel
[3]Bio Bee Sde Eliyahu Ltd., Kibbutz Sde-Eliyahu, Emek Hamaayanot 10810, Israel
(e-mail: Raffi@migal.org.il) *(Accepted 7 March 2012)*

SUMMARY
The European pear (*Pyrus communis*) cultivars 'Spadona' and 'Coscia' exhibit full self-incompatibility, and therefore fruit production depends entirely on cross-pollination, which is carried out mainly by honeybees (HB), the ultimate pollinators of pear. To increase the efficiency of HB pollination, colony numbers are doubled or introduced sequentially; nevertheless, yields remain relatively low and fruit are small due to the low number of seeds per fruit. In the present research, we studied the effect of adding bumblebees (BB) to the HB colonies. Adding BB hives to pear orchards 10 d before bloom, at a density of ten hives ha^{-1}, improved the percentage fruit-set, fruit size, and also sometimes, fruit yield. These positive results were due to a large increase in seed numbers per fruit, especially in 'Spadona' which had only one-to-three seeds per fruit when pollinated only by HB, compared to four-to-six seeds after pollination with HB + BB. There was a strong positive correlation between the number of BB visits $tree^{-1}$ min^{-1} and the number of seeds $fruit^{-1}$, and a similar correlation between seed number and fruit size.


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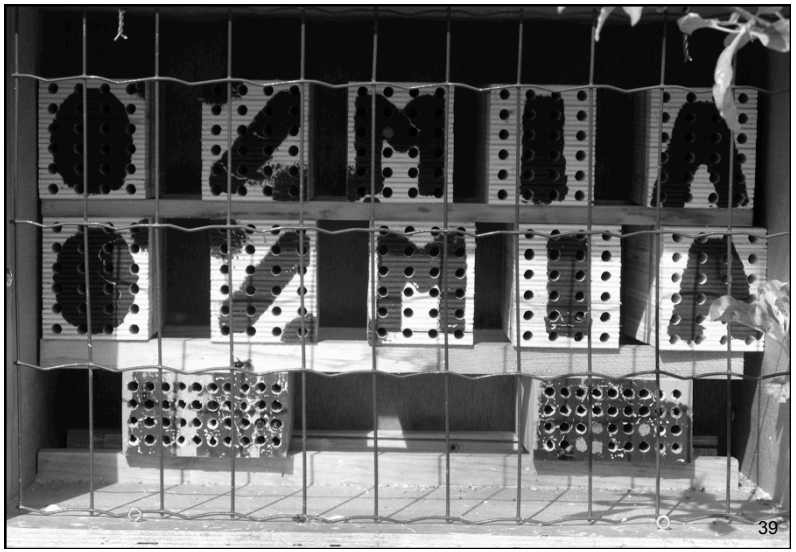
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RESEARCH | *REPORTS*

POLLINATOR DIVERSITY

Mutually beneficial pollinator diversity and crop yield outcomes in small and large farms

Lucas A. Garibaldi,[1*] Luísa G. Carvalheiro,[2] Bernard E. Vaissière,[3] Barbara Gemmill-Herren,[4] Juliana Hipólito,[5] Breno M. Freitas,[6] Hien T. Ngo,[7] Nadine Azzu,[4] Agustín [illegible],[8] [illegible],[9] [illegible],[10] Katja Biochtein,[11] Damayanti Buchori,[12] [illegible],[13] [illegible] Oliveira da Silva,[14] Kedar Devkota,[15] Márcia de Fátima Ribeiro,[16] Leandro Freitas,[17] Maria C. Gaglianone,[18] Maria Goss,[19] Mohammad Irshad,[20] Muo Kasina,[21] Alípio J.S. Pacheco Filho,[6] Lucia [illegible],[22] [illegible] Kiill,[23] [illegible],[24] [illegible],[25] [illegible],[23] Vivia [illegible],[26] Ranju [illegible],[27] [illegible],[26] Ann [illegible],[26] [illegible],[7] Ruan Veldtman,[28,29] Flandina F. Viana,[5] Sidia Witter,[30] Hong Zhang[10]

Ecological intensification, or the improvement of crop yield through enhancement of biodiversity, may be a sustainable pathway toward greater food supplies. Such sustainable increases may be especially important for the 2 billion people reliant on small farms, many of which are undernourished, yet we know little about the efficacy of this approach. Using a coordinated protocol across regions and crops, we quantify to what degree enhancing pollinator density and richness can improve yields on 344 fields from 33 pollinator-dependent crop systems in small and large farms from Africa, Asia, and Latin America. For fields less than 2 hectares, we found that yield gaps could be closed by a median of 24% through higher flower-visitor density. For larger fields, such benefits only occurred at high flower-visitor richness. Worldwide, our study demonstrates that ecological intensification can create synchronous biodiversity and yield outcomes.

Science
22 janvier 2016

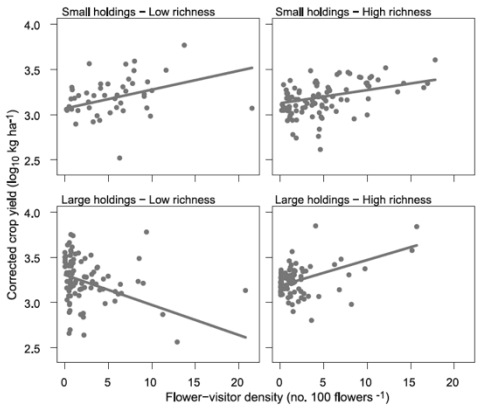

Fig. 2. Worldwide, the benefits of flower-visitor density to crop yield are greater for smaller than larger holdings, and when flower-visitor richness is higher. Moreover, high richness can compensate this negative influence of field size. Each point is a field within a crop system; lines are the fixed-effect predictions from the best hierarchical model without covariables. Small (<2 ha) versus large holdings, and low (<3 species) versus high richness, are categories only for graphical purposes, while the model considers field size and species richness as quantitative variables. By using the same protocol, we could express density as number of visitors in 100 crop flowers, avoiding standardizations to integrate results from different crop systems. Because yield (kg ha^{-1}) is harvested in different magnitudes for different crop species (e.g., coffee versus tomatoes), we present the crop yield after subtracting the random intercept for each crop system.