Quantifying pollination deficits in kiwi (*Actinidia deliciosa*) in Portugal

Castro, Helena [1] ; Casais, Vinícius [1] ; Castro, Mariana [1] ; Costa, Joana [1,2], Loureiro, João [1] ; Castro, Sílvia [1]

1) Centre for Functional Ecology, Department of Life Sciences, University of Coimbra, Calçada Martim de Freitas, 3000-456 Coimbra, Portugal / **2)** IPN – Instituto Pedro Nunes

Pollination is an important biodiversity-dependent service supporting **food provisioning** and affecting directly the yield and quality of over 75% of crops worldwide.

Actinidia deliciosa is a **dioecious species** and therefore efficient pollination is a key feature in fruit production, fruit caliber and market value. Because of **unpredictable pollination** levels, producers frequently include management practices of pollen application. This practice has however two associated problems: the **high costs** of the pollen and the **dissemination of the bacterial canker** (Psa-*Pseudomonas syringae* pv *actinidiae*).

Aim. Quantifying pollination services in kiwi orchards representing the entire production area of Portugal (Fig. 1) to provide estimates on **pollination deficits** and guide management practices.

Methodology

We set a pollination experiment with the following treatments: 1) open pollination (Fig. 2a), quantifying services provided by current pollination vectors; 2) supplemented pollination (Fig. 2b), quantifying yield under optimal pollination services; and 3) wind pollination (Fig. 2c), quantifying services provided by the wind. The controlled pollinations were applied to 30 female plants in 8 orchards across a North-South gradient in the North and Centre of Portugal (Fig. 1).

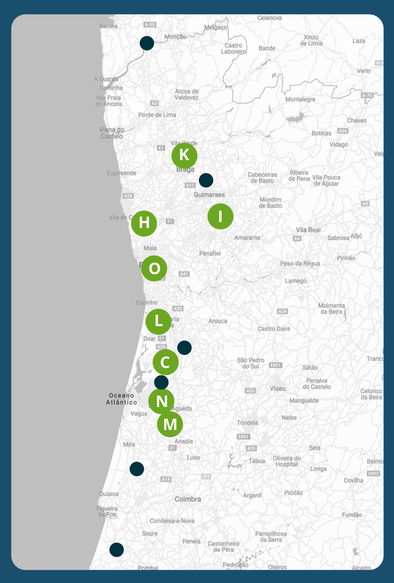

Figure 1. Range of kiwi orchards included in the I9Kiwi project. Orchards selected for controlled pollinations are represented in green.

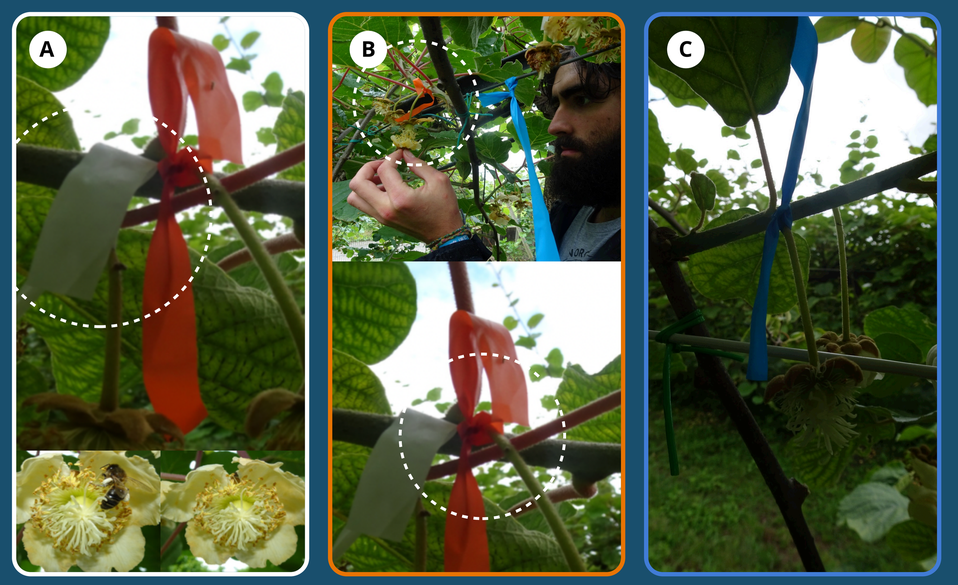

Figure 2. Pollination treatments: a) open pollination; b) supplemented pollination; c) wind pollination.

Results and Discussion

Table 1. Fruit set aproximately 1 month after the application of pollination treatments in the selected orchards.

Fruit set								
	K	I	H	O	L	C	N	M
Open	93.55	88.57	87.50	80.00	48.39	90.00	93.33	90.00
Supplement	96.77	91.43	93.75	93.33	96.77	96.67	96.67	90.00
Wind	77.42	91.43	81.25	-	75.00	-	47.83	-

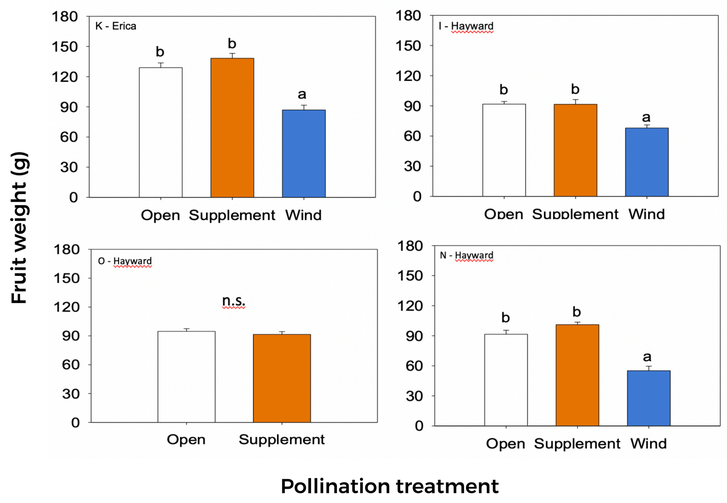

Figure 3. Mean fruit weight (+SE) at harvest. Signinficant diferences among treatments are indicated by different letters ($P < 0.05$).

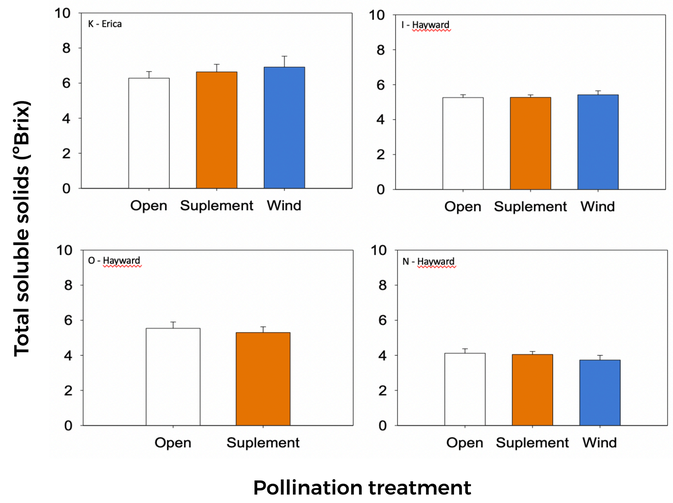

Figure 4. Mean (+SE) total soluble solids (ºBrix) at harvest.

- High fruit set for open and supplemented pollination
- Pollen supplementation increased fruit set in most orchards
- Wind pollination was highly variable and resulted in lower fruit set
- Fruit weight was not significantly different between open and supplement, while wind pollinated fruits were always smaller.
- Fruits resulting from wind pollination fall into non-standard supply or smaller calibers.
- Fruit from open and supplement fell in the same caliber category.
- ºBrix was not significantly different among pollination treatments.

Figure 5. Fruits resulting from the pollination treatments.

Overall, data shows that pollination services during 2018 flowering period were sufficient in most of the selected orchards. Wind pollination contributed significantly for fruit set, but was insufficient resulting in lower caliber fruits. Further analyses need to take into consideration factors such as orchard characteristics, management practices and surrounding vegetation patches.

Funding: Joana Costa acknowledges financial support by postdoctoral grants from Fundação para a Ciência e Tecnologia (FCT) SFRH/BPD/112157/2015. Aitana Ares acknowledges financial support by postdoctoral grants from FCT/MEC through national funds and the co-funding by the FEDER, within the PT2020 Partnership Agreement, and COMPETE 2020, within the project UID/BIA/04004/2013.

Work carried out under Action 1.1 Operational Groups "I9K - InovKiwi - Development of strategies for the sustainability of the kiwi sector through the creation of a value-added product" promoted by the PDR2020 and co-financed by the FEADER under the Portugal 2020

Acknowledges: