

Operational Group 'PoliMax' - Entomophilous pollination in fruit production: the specific case of cherry, apple, and pear trees

Researching pollinators to optimise direct pollination techniques to correct pollination deficits and improve agricultural profitability through practical nature-based solutions.

EAFRD-funded projects

Location: Oeste and Beiras and Serra da Estrela, Portugal

Programming period: 2014-2020

Priority: P2 - Competitiveness

Focus Area: Farm performance, restructuring & modernisation

Measures: M16 - Cooperation

Funding:	Total budget	353 139 (EUR)
	EAFRD	225 126 (EUR)
	National/Regional	39 728 (EUR)
	Private/own	88 285 (EUR)

Timeframe: 01/01/2018 - 31/12/2022

Project promoter: Centro Operativo e Tecnológico Hortofrutícola Nacional - Centro de Competência (COTHN-CC) *

* The project promoter/beneficiary is an [EIP-AGRI Operational Group](#)

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training, workshops, conferences and webinars were aimed at raising awareness and improving collaboration between fruit producers and beekeepers.

Summary

The project was launched when field technicians of the producer organisation, Cerfundão, Lda in Portugal identified a significant decline in the quantity and quality of fruit production concerning 'Rocha' pears, 'Fuji' and 'Reineta' apples, and 'Folfer' cherry trees.

The aim of the project was to explore what role and impact natural pollinators have on fruit production and agricultural profitability with a particular focus on the three cultivars. A further key objective was to better understand whether nature-based solutions offered suitable and practical solutions to help enhance the efficiency of natural pollination to achieve an optimisation of pollination, fruit production and, most importantly, improved fruit quality.

The project researched natural pollinators and their pollination process and explored how pollination techniques could be optimised through practical nature-based solutions. Open days,

Project results

The research showed that:

- Each fruit tree cultivar attracts a specific community of functional natural pollinators with different floral preferences across the range of cultivars. This resulted in different pollination efficiencies for each of the cultivars used in the project (i.e. apple, pear and cherry trees).
- When the most effective natural pollination takes place, a significant improvement in fruit formation and quality can be obtained, ranging between 8.1% and 21.6%, depending on the cultivar.
- A significant deficit in production and quality was prevented through the implementation of pollination techniques and natural-based solution in some orchards.



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Key lessons and recommendations

- The implementation of nature-based solutions was welcomed. Here, the alignment of agricultural practices between fruit growers and beekeepers was most important, particularly regarding the use of phytopharmaceuticals in fruit production.

Context

When field technicians of the producer organisation, Cerfundão Lda, in Portugal, identified a significant decline in the quantity and quality of fruit production ('Rocha' pears, 'Fuji' and 'Reineta' apples, and 'Folfer' cherry trees), an Operational Group formed to investigate the relationship between natural pollinators and fruit production in the regions of Oeste, Beiras and Serra da Estrela.

Natural or entomophilous pollination (pollination undertaken by insects) determines the functioning of terrestrial ecosystems. Around 75% of agricultural crops worldwide are directly affected by this type of pollination. Therefore, agricultural productivity depends on efficient natural pollination, which is determined by the genetic compatibility between the pollen and the natural pollinator. It is this complex biological process that forms fruit and subsequently transforms fruit into seeds. The genetic make-up of seeds controls cellular and metabolic processes that lead to fruit formation influencing its morphology, organoleptic flavour, chemical/metabolic balance and nutritional value.

Pollinators of fruits are mostly insects, both wild and domestic (e.g. honeybees). However, natural pollinators are currently threatened by numerous factors including the intensification of agricultural practices, abusive use of phytopharmaceuticals, over-exploitation of natural resources and climate change. These factors are

responsible for the loss and/or fragmentation of habitat leading to a sharp decrease in general biodiversity.

The Operational Group 'PoliMax' was set up to better understand the impact of natural pollinators on agricultural profitability and whether sustainable, nature-based solutions could promote the effectiveness of natural pollinators and thereby optimise the quantity and quality of fruit production.

Objectives

The aim of the project was to explore the impact of natural pollinators on the quantity and quality of fruit production and agricultural profitability with a particular focus on pear, apple and cherry tree cultivars. A further key objective was to understand better whether nature-based solutions offered suitable and practical solutions to help enhance the efficiency of natural pollination to achieve an optimisation of pollination, fruit production and, most importantly, improved fruit quality. In this context, aspects such as the preservation capacity, nutritional quality, food safety and resistance of the fruits to pathogenic agents i.e. bacteria, fungi, and/or viruses were relevant characteristics to research.

Overall, the aim was to significantly contribute to the sustainable development (social, economic and environmental) of the fruit production sector and raise awareness of appropriate methods.

Activities

In a number of selected orchards across the Portuguese regions of Oeste, Beiras and Serra da Estrela, the project implemented a range of activities. This included the characterisation of natural pollinators (bees and syrphids) and their pollination process. In addition, a study was carried out exploring how to optimise pollination techniques for domestic pollinators (for example for honeybees helping them to adapt to the taste of the cultivars and cope with the density of hives) and for wild pollinators (i.e. the remaining bees and syrphids, to attract them to the orchards through vegetation and shelter placement).

A number of open days and demonstration activities were organised in the orchards. These events offered in-situ observation of the activity and diversity of the pollinators at work and demonstrated directed pollination techniques for honeybees and wild bees. The results of numerous project task findings were also presented. Open participation was encouraged and involved technicians from producer organisations, representatives from agricultural ministries and general directorates, fruit growers, beekeepers, and the general public.

The project also implemented workshops and training/knowledge transfer actions. These activities were exclusively targeted at fruit growers and beekeepers to (a) align each other's practices (e.g. application of phytopharmaceuticals), (b) learn about directed natural pollination techniques and (c) acquire know-how in creating ecological infrastructures that support natural pollinators, especially bees and syrphids.

The organisation of conferences and webinars was targeted at the general public to raise awareness about the importance and relevance of entomophilous/natural pollinators in influencing the quantity and quality of fruit production.

The project also created ecological infrastructures. This included planting vegetation cover between rows, lines and on the edges of orchards and building shelters for wild bees.

Main results

- Each fruit tree cultivar attracts a specific community of functional natural pollinators with different floral preferences (e.g. visitation rates) across the range of cultivars. This resulted in different pollination efficiencies for each of the cultivars used in the project (apple, pear and cherry trees).
- Especially in larger orchards, the most central areas show a deficit in fruit production and quality because pollinators are unable to reach these central areas in time to perform effective pollination (i.e. at the peak time of flowering).
- When the most effective natural pollination can take place, a significant improvement in fruit formation and quality can be obtained, ranging between 8.1% and 21.6%, depending on the cultivar.
- A significant deficit in production and quality was prevented through the implementation of pollination techniques and natural-based solutions in some orchards. For example, this included planting vegetation cover and providing shelters for the cultivars' functional pollinators. These practical solutions effectively contributed to an improved quantity and quality of fruit production.

Key lessons and recommendations

- Implementation of the nature-based solutions and measures was generally very well received and welcomed by fruit growers and beekeepers. Here, the alignment of agricultural practices between fruit growers and beekeepers is most important, particularly regarding the use of phytopharmaceuticals in fruit production.
- Any transfer of the knowledge obtained by the project must take into consideration the cultivar, the agricultural system and the environmental context of the location of the orchard since the functional pollinator community is different from cultivar to cultivar.
- The use of nature-based solutions, such as growing vegetation cover and shelters for pollinators, proved to be effective in correcting the pollination deficits experienced in the selected orchards of the project. However, the same approaches might not lead to the same results in other areas due to the biogeographic and bioclimatic differences.

Quote

"A significant way to change our world, using only what already exists".

Project beneficiary

Additional information:

Project website:

<https://poli-max.webnode.pt/>

