

Effect of peach (*Prunus persica* (L.) Batsch.) and almond (*Prunus dulcis* (Mill.) D. A. Webb) orchards on soil fertility and soil pollution in the Portuguese region of Beira Interior

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Abstract

Management practices performed at orchards have a direct impact on soil quality and health and hence on soil long term productivity. However, little is known about the specific effects of pesticide use and microplastics in the soil. Several orchard operations may have a positive impact in the soil fertility. However, the use of organic and inorganic fertilizers and the accumulation of pesticide residues and microplastics may affect negatively both the human and the ecosystems health. This work intends to evaluate the influence of fruit production in soil contamination with microplastics and pesticide residues, with a special focus on copper, manganese and zinc as parts of fungicides. The field work will be conducted in peach and almond orchards from the Portuguese region of Beira Interior, which is the main region of peach production and where, in recent years, a growing investment in almond production is being witnessed. This work will be conducted from July 2021 to June 2025.

Objectives

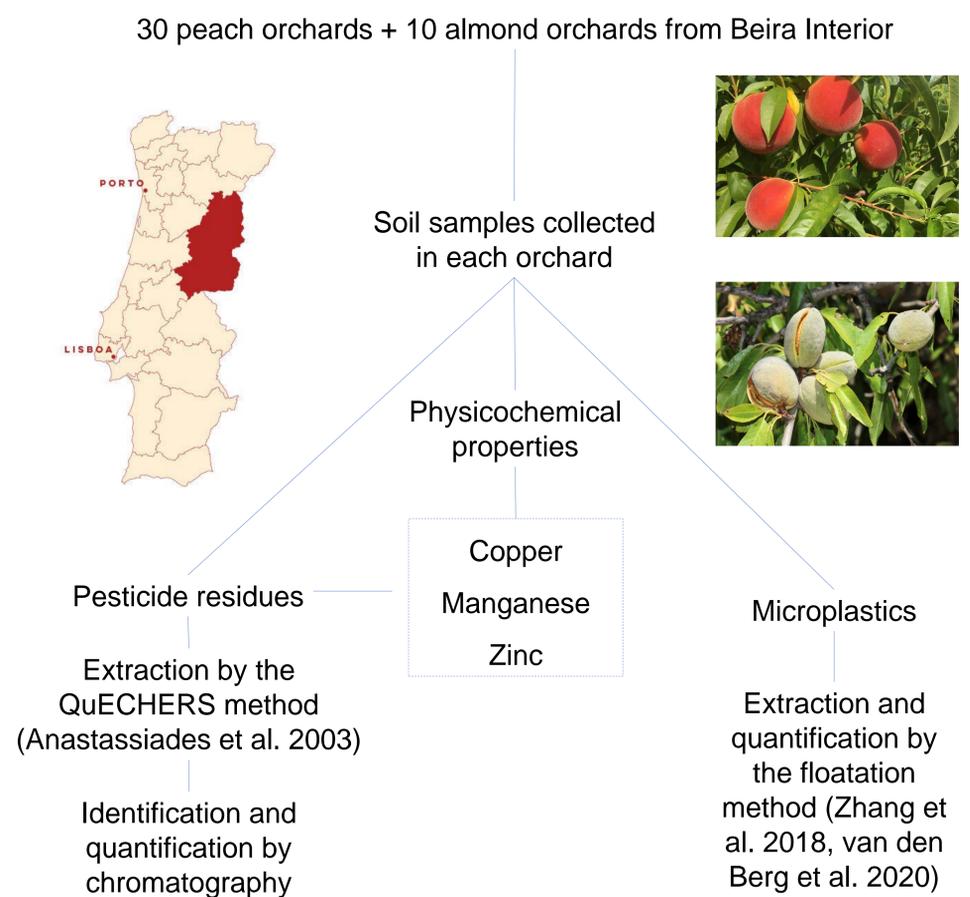
1. Identification and characterization of possible soil contamination sources.
2. Identification of the main agricultural practices performed in the 40 selected orchards with a special focus on the soil, fertilization, pesticide application and irrigation.
3. Soil characterization in terms of its physical and chemical properties, including copper, manganese and zinc content.
4. Characterization of the irrigation water used in the orchards and search for its role as a source of organic/inorganic contaminants;
5. Comparison of the indicators obtained in 1 with the agricultural practices from the monitored orchards. It is also intended to relate those indicators with the plant growth and production.
6. Identification and development of good agricultural practices for the protection and conservation of the orchards soil in this region. In order to achieve this, some laboratorial tests concerning the behaviour of the contaminants identified in the soil samples collected at the orchards can be conducted.



Background

- Beira Interior is the main Portuguese region of peach production (1187 ha in 2019) and, in recent years, has registered a sharp increase in almond production, from 967 ha in 2009 to 3784 ha in 2019 (INE 2021).
- Fruit production consumes high quantities of pesticides which can be a threat for both soil and consumers.
- Copper, manganese and zinc are present in several commercially available fungicides.
- Due to perennial life of orchards, fruit production may have a positive effect in soil, particularly when pruning residues are incorporated (Montanaro et al. 2017).
- Microplastics are particles smaller than 5 mm with high persistence in soil, increasingly present in several ecosystems and expected to interfere negatively in life cycles of soil organisms (Machado et al. 2018; van den Berg et al. 2020).
- The pervasive problems related with pesticides and microplastics are poorly known in Portuguese agriculture, and specially in almond and peach orchards.

Methodology



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