



Pathways to phase-out contentious inputs from organic agriculture in Europe

Organic-PLUS is an EU Horizon 2020 project involving 25 partners in 12 countries (EU and non-EU), working to find alternatives to some of the contentious inputs currently permitted in certified organic production, including copper fungicides, mineral oils and sulphur, with a special focus on perennial Mediterranean crops such as citrus and olives, and greenhouse crops like tomato and aubergine

WHAT ARE THE ALTERNATIVES TO CONTENTIOUS INPUTS IN MEDITERRANEAN ORGANIC OLIVE GROWING?

OLIVES



This factsheet provides an overview of some alternative treatments and methods to replace or reduce the use of contentious inputs (namely copper, mineral oils and sulphur) that are used to control diseases and pests in olive crops. Alternative compounds cannot be considered as one-for-one substitutes of contentious inputs, but they should be integrated within more complex strategies for crop protection. In general, plant health should rely on preventive and indirect care measures in preference to off-farm inputs. The choice of varieties adapted to local conditions, the use of resistant varieties and other general measures which ensure a resilient agricultural system, strongly contribute to reduce dependency on external inputs to control pests and diseases.

Olive trees are a defining characteristic of the Mediterranean landscape. Ancient olive groves, intensive olive plantations and even monumental olive trees are a key part of the cultural heritage and culinary traditions of the region. Europe has around 5 million hectares of olive trees, which worldwide account for 70 to 75% of all olive oil production and more than one third of table olives.

Yields are threatened by a variety of pathogens and pests, which limit productivity in the field and post-harvest shelf life. Common phytopathogenic fungi and bacteria (*Colletotrichum gloeosporioides*, *Spilocaea oleaginea*, *Mycocentrospora cladosporioides*, *Verticillium* spp., *Pseudomonas savastanoi*) commonly found throughout the Mediterranean region compromise olive production. In addition, there is a new threat; *Xylella fastidiosa*, a quarantine bacterium under Commission Implementing Decision [EU] 2018/927, in the Salento area of southern Italy. This emerging disease represents a new and serious threat to olive growers in the region.

In organic olive orchards, pathogens are mainly controlled by regular spraying with copper-based products. The demonstrated noxious effect of copper on soil microbial communities and other soil fauna has led to regulatory restrictions of its use in the EU. The use of copper for crop protection purposes was permitted in the EU to a maximum amount of 6 kg/ha/yr of metal Cu up to the end of 2018 but was reduced to 4 kg/ha/yr from January 2019.

According to data collected by interviewing experienced advisors in 2018, the old 6 kg limit was found to be acceptable to the majority of olive growers. Many alternative compounds to reduce or replace copper use are under development, but few are currently available on the market and even fewer are being used by growers to any significant extent.

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WHAT ARE THE ALTERNATIVES TO CONTENTIOUS INPUTS IN MEDITERRANEAN ORGANIC OLIVE GROWING?

ALTERNATIVES TO COPPER

For Mediterranean olive crops, the previous copper limit of 6 kg/ha/year was generally accepted.

Low copper grade formulations, with reduced copper content (2-6%), allow a smaller amount of copper to be distributed per hectare.

Natural alternative formulations, applied to replace or reduce copper dosage, used alternatively or in combination with copper. Some of them are included in Annex II to Commission Regulation (EC) 889/2008, permitted for plant protection in organic crop production.

- **Inorganic substances:** sprayable zeolite and Kaolin for abiotic stress protection and olive fruit fly protection; K_2SiO_3 .
- **Plant defence stimulators**, including calcium and silicon.
- **Biological control agents**, with a variety of mechanisms of action against fungal and bacterial pathogens and stimulating effects on plant defenses. *Trichoderma* spp., *Bacillus subtilis* strains, *Glomus* spp. are some example of BCAs available on the market.
- **Chitosan**, a natural polymer obtained from chitin, reported active against a variety of microorganisms, with a good direct effect combined with stimulation of plant defence mechanisms.
- **Compost/compost teas:** compost tea enriched with Oriental Plane leaves (*Platanus orientalis*), vermicompost and vermicompost tea.
- **Lime-sulphur**, used as a spray to control fungal infections with some effect on insects and bacteria.



ALTERNATIVES TO MINERAL OILS

Mineral oils derived from petroleum are applied to control insects and mites. Their application ranges between 30-90 litres/ha/year. Though not widely used in olives, their wide spectrum of effectiveness makes them more versatile than their alternatives:

- **Organic oils** (e.g. rapeseed)
- **Zeolite and Kaolin** for olive fruit fly protection

ALTERNATIVES TO SULPHUR

The use of sulphur in Mediterranean olive groves is generally low, approximately 15-20 kg/ha/year.

No alternatives are currently adopted.

Main goals of Organic-PLUS in relation to olives

Alternatives to Cu (lime sulphur, plant defence stimulators, products based on Ca and Si, natural extracts) will be tested in open field trials and monitored for 2 years.

Field trials will evaluate: (a) incidence/severity, (b) susceptibility to diseases, (c) impact on crop production and fruit quality, (d) best application strategy, and (e) phytotoxicity.

Effectiveness of other alternatives to Cu (*Glomus intradices*, K_2SiO_3 , *Bacillus subtilis* EU007, compost tea enriched with *Platanus orientalis* leaves, Maxicrop, moldy bread peaces) will be evaluated in comparison with $CuSO_4$ both in growth chamber and, for more promising treatments, in the open field. Timings of promising alternative applications will be determined by means of a disease forecasting system that will be established on the field trial area.

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