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CURRENT USE OF COPPER AND MINERAL OILS INPUTS IN ORGANIC PRODUCTION ACROSS 10 COUNTRIES IN EUROPE

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Abstract: The use of contentious inputs in organic growing was mapped across Europe in the H2020 project Organic-PLUS (GA774340) during 2018. This paper presents results on the use of copper and mineral oils linked to plant protection in several horticultural crops grown across 10 countries in Europe. Among the investigated crops (mainly citrus, olive, tomato, potato, strawberry), large amounts of copper are used mainly by Mediterranean growers in citrus, olive and potato. For crops like citrus and olives the limit of 6 kg per ha and per year may not be always respected. Tomato producers apply high amounts of copper in winter crops (greenhouses). The project aims to develop alternatives to these contentious inputs, which will be presented.

Introduction: The Organic-PLUS project provides scientifically informed decision support to assist EU, national and regional policy makers in phasing out contentious inputs from organic production across Europe. In addition to copper and mineral oils, the project evaluates the use of peat, plastic and animal-derived fertilisers and animal production inputs (antibiotics, synthetic vitamins etc.). Relevant alternative solutions are tested, and assessments made of phase-out scenarios. 10 universities, 6 research institutes and 10 multi- actor organisations from 12 European countries collaborate in this 4.1m Euro project (2018-2022). This paper presents results from work package (WP) PLANT, and describes the current use of copper and mineral oils in organic growing and some promising alternatives.

Material and methods: During 2018, two project WPs (PLANT, SOIL) collaborated to map the current use of inputs for plant protection (Katsoulas et al. 2018), and the use of peat in growing media, plastic use e.g. for mulching, and commercial fertilisers, especially those derived from animal by-products or manure from non-organic farms (Løes et al. 2018). The mapping used expert knowledge and a per-crop approach. From 14 crops in 10 countries, information was received from experienced advisors and/or farm managers. Spreadsheet-tables were filled in to describe the typical use of inputs during the growing cycle. The crops selected are important organic crops in the respective country. In total, 60 questionnaires were received, comprising of the following crops: apple, broccoli, cabbage, carrot, cereals, citrus,

cucumber, eggplant (aubergine), lettuce, olive, potato, pepper, strawberry and tomato. The information was analysed per topic and country, and general findings were highlighted. After the mapping activity, studies have been designed to test alternatives to copper and mineral oils.

Results: Copper-based products are used in plant protection as bactericides and fungicides. Copper is the only active ingredient with a strong antimicrobial effect and a wide range of action that is approved for use in organic farming particularly for grape, potato and apple crops. Recently, the demonstrated adverse effects on the environment (on soil organisms and auxiliary species) have led to a reduction in its use in several European countries.

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In the case of Norway, the use of copper and mineral oil were not permitted for organic growing until March 2017, when the EC regulations were implemented. However, the national limit for copper in Norway is 4 kg per ha and year, thus it is easier for these growers to comply with lower limits of copper use than those in EU.

In Denmark, copper is not used in organic agriculture at all because national authorities have not (yet) been asked to approve any commercial product containing copper, or they have not approved it.

Many alternatives to copper are under development, but few are already available on the market, and fewer still are currently used by growers to a substantial extent. Alternatives with a low concentration of copper ion are demonstrating good levels of efficacy. Possibly, a reduction of the concentration of copper, together with more efficient formulations, could reduce the presence of copper in the crops (and soils). Nevertheless, abandoning copper cannot be easily achieved through a simple substitution strategy (for instance, replacing copper by biocontrol products); it requires a more or less profound reconstruction of the crop production system, including changing cultivars (in favour of resistant ones), developing prophylaxis and sanitation measures, adjusting fertilisation, etc. This requires an integrative approach, which is still under-developed.

Regarding sulphur, this substance is very common for organic vegetable growers, especially for greenhouse growers. The uses of sulphur can move from 10 to 100 kg/ha/year depending on the production system and the incidence of pests. However, it is seldom considered that the use of sulphur is problematic, except as a main component of sulphites in wine production. It is a sort of universal phytosanitary product: repellent to pests, killer of mites, and effective against powdery mildews. However, it is not selective, and it has harmful effects on beneficial arthropods. So, the use of sulphur can limit biological control. Alternatives to sulphur are not currently applied mainly for economic reasons since sulphur is cheap compared to other compounds. Moreover, since sulphur can be an alternative to mineral oil, its use is not easily reduced.

Mineral oils are applied to exclusively control insects and mites in citrus and olive orchards and occasionally in tomato. There are not many data available for the use of mineral oils but from the data presented it was found that in some cases (e.g. in citrus) they are considered as the main contentious input. The wide spectrum of this substance makes it more versatile than other alternatives. In other cases, mineral oils are of minor use, and can easily be replaced by organic oils.

Discussion: The increased restrictions on the amount of copper growers can apply, together with the looming threat of a total ban at the European level, presents a challenge for organic growers who cannot replace it by other synthetic pesticides. A recurrent demand thus exists for research on “alternatives” to copper. As a result, the question of “alternatives” to copper has been the focus of considerable research and R&D activity, including three major European research programs since the beginning of the 2000s alongside numerous other prominent, but more limited, research efforts in different parts of the world. Countless trials of alternative methods and products have been conducted, both by

technical centres and by growers themselves, to evaluate the potential of different molecules and/or formulations. Other research has focused on elucidating the underlying biological mechanisms involved (in particular the elicitation of plant defences, the ecology of disease organisms and of biocontrol agents, etc.).
While a significant number of scientific and technical references has thus been accumulated, practical adoption of these potential innovations remains limited. Relevant findings are scattered across a variety of sources, are often fragmentary in nature, and are not always readily accessible. No complete critical synthesis of this research has been published to date. Scientists and technicians alike lack access to a consolidated “state of the art” on the topic, one which offers a scientific evaluation of the efficacy and limitations of the various possible alternatives to copper. Such a review could assist in identifying research priorities and developing recommendations for the practical implementation of these alternatives
Alternatives to copper and mineral oils are intensively studied in the Organic-PLUS project and will be presented.
References: Katsoluas N. et al. (2018): Pathways to phase-out contentious inputs from organic agriculture in Europe. Deliverable 3.1: Version 1.1. Current use and legal status of crop protection inputs. Available at https://organicplusnet.files.wordpress.com/2019/02/d3.1-o-current-use-of-contentious-inputs-wp-plant.pdf
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Disclosure of Interest: None Declared

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