



Review

Challenges and opportunities for integrated pest management in Europe: A telling example of minor uses



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ABSTRACT

Minor crops include mostly vegetables, fruits, nursery stock and ornamentals. These crops account for an EU production value of over € 60 billion per year, representing more than 20% of the value of EU's total agricultural production. The sustainable production of such crops, from an economic point of view, is vital for both human health and European economies. For minor crops, this sustainability can only be realized by the continued availability of crop protection solutions for pest control. The number of minor crops in Europe without viable solutions for plant protection has increased in recent years. This is mainly due to the lack of pesticides in certain crops, as a number of previously authorized pesticides has not been re-authorized due to a stricter regulation. Also the introduction of tropical or sub-tropical crops and their pests into Europe has contributed to the problem of minor crops without any crop protection solutions as pesticides used elsewhere to protect these crops are not allowed in Europe. The limited range of pesticides available to farmers has increased the risk of resistance development since, in absence of a sufficient number of pesticides with various modes of action, farmers apply repetitively only a narrow spectrum of molecules. The direct economic impact due to the absence of viable plant protection solutions for minor crops has been estimated over a billion Euros per year, impacting 9 million hectares throughout Europe. In light of this, here we discuss the current state of the art of minor crops in Europe and elucidate ongoing efforts to address such problems through Integrated Pest Management (IPM). The information reported is expected to provide relevance of minor crops in Europe and encourage the development and implementation of effective IPM solutions.

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1. Introduction

Based on the extent of its cultivation, a crop can be defined as major if it is widely grown in a given area or minor if its cultivation is restricted only to a few hectares with the production lower than a certain tonnage. Unlike major and minor crops, minor uses refer to the uses of pesticides – in relation to crops and pests – in a particular country. The definition of minor crops and minor uses differs from one region/organization to another. According to the EU Regulation on the placing of pesticides on the market (1107/

2009/EC), minor uses are those uses of pesticides (defined in relation to crops and pests) in a particular Member State on plants or plant products which are: i) either not widely grown in that Member State, or ii) widely grown to meet exceptional plant protection need (European Commission, 2009). Likewise, according to the European and Mediterranean plant protection organization (EPPO), minor uses are those uses of pesticides (defined in relation to crops and pests) in which either the crop is considered to be of low economic importance at a national level (minor crop), or the pest is of limited importance on a major crop (minor pest) (EPPO, https://www.eppo.int/PPP/PRODUCTS/minor_uses/minor_uses.htm). In addition, the North American IR-4 program defines minor crops as any crop grown on 300,000 acres or less (Thompson et al., 2006).

Whilst many major crops, such as cereals and maize, benefit from the access to a variety of pesticides (Kuck and Gisi, 2006), a

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wide range of minor crops grown in Europe suffers by the lack of pesticides. The crop protection industry pursues registration in markets that provide greatest return on investment and the lowest risks and include amongst many factors potential sales volume including competitor products (i.e. potential market share), product stewardship, patent/data protection and product liability. Simply defined, agro-chemical industries consider minor crops as those crops that do not provide sufficient economic return on investment.

Minor crops are typically “high value crops” which not only relate to fruit and vegetable crops, but also to tobacco, ornamental and nursery plants, seed crops, herbs, plants grown for medicinal use and spices. Although the term “speciality crops” is sometimes used synonymously for minor crops, it often refers to a narrower group of minor crops. Minor crops account for an EU production value of more than € 60 billion per year, representing more than 20% of the value of EU's total agricultural production (European Commission, 2014). The fruit and vegetable sector alone accounts for about € 45 billion in EU-27 and a total production of 70 million tons of vegetables and 40 million tons of fruits per year (European Commission, 2014). The market value for ornamental plants is estimated at € 27 billion per year (European Commission, 2014; EUROSTAT, 2012). Sustainable production of minor crops is vital for both human health and national economies as it contributes to agricultural productivity as well as a diverse and nutritional food supply, and food security.

Crop yield losses due to pests (pathogens, animal pests and weeds) can be significant (Oerke, 2006). This is also the case for minor crops. For some minor crops, besides the harvestable yield losses there are also the marketable yield losses due to a lower quality of the product. To prevent severe yield losses due to pests, farmers should have tools available to protect their crops. Currently pesticides are the tool that most farmers rely on. Pesticide use should be economic on the one hand and safe to human health and the environment on the other. Concomitantly, an effort is needed to further develop resilient cropping systems where the principles of Integrated Pest Management (IPM) are applied. Hence, there is a need that policy makers, researchers and stakeholders are jointly committed to reduce the use of synthetic pesticides in agriculture and at the same time develop robust non-chemical IPM tools. This is especially true for minor crops which may markedly benefit from an increased availability of non-chemical crop protection solutions. As minor crops are mainly produced for direct human consumption the residue issue is more important in minor crops than in major crops. In addition, in many cases minor crops are not processed and therefore any visible damage, due to pest attacks, may compromise the sale of the product as consumers are often attracted by visual appearance. Thus, minor crop producers face, on the one hand, the challenge to ensure sufficient and stable yields and on the other to ensure marketing blemish-free products. The main objective of this paper is to call for intensified research efforts in the field of minor uses. Efforts based on integrated approaches are expected to help develop practical and sustainable solutions for European farmers but first we will provide a status on minor uses in Europe and worldwide.

2. Factors affecting the registration of plant protection products for minor uses in the EU

Minor use problems arise from the fact that the potential use of a pesticide (chemical or non-chemical) on a scale is not sufficiently large to justify registration of that use from an agro-chemical company perspective alone.

A minor use in one country or region may be a major use in another country, and in the EU it is for each EU Member State to

define national minor uses. This difference exists due to considerations of use at the local level for reasons of economic return to an applicant. However, in order to avoid misunderstandings and confusions, limits have been officially established to define major, minor or very minor crops (Table 1). Given that minor uses include the use of pesticides in minor crops as well as uses in major crops the authors, hereafter, primarily use the term ‘minor uses’ (MU) as it is used both by the EU and EPPO.

The major factor hindering the regulatory approval of MU is the lack of data for the risk assessment. The majority of risks are evaluated in the risk assessment of the major uses of the pesticides. For the MU purpose in most cases only supplemental residue data are requested but even this can be a significant cost considering the potential use of the pesticides for that particular MU. Efficacy data is no longer required for registration of MU and the grower is therefore fully responsible for any damage caused by the use of pesticides registered for MU. Within the EU, Member States may take measures to facilitate or encourage the submission of applications for MU by extending the authorization of pesticides already used also for MU. In some Member States growers' associations or even a group of growers can apply for MU in line with Article 1107/2009/EC.

Differences in MU determinations can arise when considering the ‘economic return approach’ compared to the ‘risk assessment approach’. Whilst the volume of crop production may provide some idea into the potential market size, this alone may not determine which use would provide greater economic return to an applicant (and therefore more attractive to register). This may also be influenced by factors such as level of pest pressure and/or value of the commodity. Firstly, the crop that is subjected to greater pest pressure will likewise have an associated greater potential need of pesticides and be a market of greater interest to agro-chemical industries. Secondly, if the value of the commodity is high it in turn will determine growers' decisions on input costs for their crop production and protection (therefore be of greater interest to agro-chemical industries).

3. Importance, constraints and ongoing efforts to address MU in and outside Europe

European Member States have been facing major difficulties in crop protection in general and in MU in particular. MU without viable solutions increased in recent years, due to the introduction of new crops and pests into Europe (EPPO, https://www.eppo.int/PPPRODUCTS/minor_uses/minor_uses.htm). Moreover, a drastic decrease in the availability of previously used pesticides has markedly increased the risk of resistance development since, in absence of a sufficient number of pesticides with different modes of action, farmers apply repetitively the same type of pesticide (Brent and Hollomon, 2007; Johnson et al., 2009). Only in the EU, more

Table 1

Criteria used in the European Union to classify a crop or a product as major, minor and very minor (Source: SANCO document 7525/VI/95 rev. 9).

Crop classification	Parameters	Extent
Major	daily dietary intake contribution ^a cultivation area production	>7.5 g/day >10,000 ha >200,000 t/year
Minor	daily dietary intake contribution cultivation area production	<7.5 >1.5 g/day <10,000 >600 ha <200,000 t/year
Very minor	daily dietary intake contribution cultivation area production	<1.5 g/day <600 ha very low

^a This refers to the daily consumption over the population for a 60 kg person.

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