

# Bibliographic review of phytopharmacovigilance actions and measures on plant protection products in Morocco

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**Abstract.** Plant protection products present major risks to human health. Like other countries, Morocco is adopting phytopharmacovigilance measures. These steps are part of Morocco's integrated approach aiming the rational use of pesticides. A census of the various actions and measures undertaken by Morocco through the National Food Safety Office (ONSSA) in terms of monitoring and controlling the use of pesticides for agricultural use will be presented. Between 2018 and 2020, Morocco proceeded with the withdrawal of 15 active substances and 48 pesticides and the discharge of 10 tons of imported pesticides that did not comply with standards with a review of 10 active substances harmful to humans and animals. A quantity of 17641 tons of food products unfit for consumption by excess of pesticides, 136 tons of potatoes and 125 tons of mint were sent back and destroyed due to high maximum residue limits or use of unauthorized pesticides. In the same context, training workshops for farmers on the proper use of pesticides and the management of potential risks of poisoning are organized. As well as the adoption by the Moroccan government in 2020 of a law project to limit the use of dangerous pesticides and promote alternative methods.

## Introduction

Plants are constantly attacked by harmful organisms such as viruses, bacteria, fungi, insects and weeds. These harmful organisms constitute a major cause of yield losses of agricultural products intended for the human or animal food [1].

Pesticides are widely used in agriculture to control a broad spectrum of devastating pests that spoil the crop [2]. These chemicals are crucial for warranting economic development and food security and their unsafe and heavy use could be a significant threat to human and environmental health [3].

Several studies around the world have already proven that most of plant protection products substances are harmful to health and the environment, paraquat for example, would be acutely toxic for agricultural workers who use it. Direct contact with the substance could cause weakened lung function, Parkinson's disease or various forms of leukemia [4].

The objective of phytopharmacovigilance is to detect as early as possible the signals which may lead to the taking of measures to prevent or limit the risks associated with plant protection products [1,5].

To meet this objective, phytopharmacovigilance is based on three fundamental and complementary methods of data collection and knowledge production: a network of surveillance or vigilance bodies, ad hoc studies and the collection of spontaneous reports [5,6].

## Surveillance or vigilance bodies

Phytopharmacovigilance is based on the systematic and regular collection of information produced by existing surveillance and vigilance bodies, in the areas it covers: the adverse effects of plant protection products on humans, farm animals and wild animals (including the honey bee), ecosystems in their entirety (biodiversity, crops, fauna, flora, air, water, soil) but also food and the appearance of phenomena of resistance to plant protection products.

### Ad hoc studies

Ad hoc studies are carried out on the undesirable effects of plant protection products when the information provided by the surveillance and vigilance bodies is identified as warranting clarification. The first studies put in place should allow a better knowledge of cultivation practices and the use of plant protection products, the acquisition of human impregnation data within the framework of the biomonitoring program.

### Reports from professional players

Reports are mainly from professional players such as marketing authorization holders, manufacturers, importers, distributors or professional users of plant protection products, advisers and trainers for these users. These declarations are essential for phytopharmacovigilance since these actors are directly in contact with professionals in the field.

The pooling of information from surveillance or vigilance systems, ad hoc studies and spontaneous reports allows the achievement of the three objectives set by phytopharmacovigilance [5,6]:

- allow, if necessary, the adaptation of marketing authorization conditions for products currently marketed (for example by reducing doses, adapting application conditions or withdrawing a marketing authorization) ;
- define transversal management measures, for example for the protection of people near the treated areas;
- help ensure compliance with the bans on the use of products, in particular those whose active substances are no longer approved.

In Morocco, a body responsible for plant and consumer phytosanitary monitoring has been set up, namely the National Office for Food and Health Safety (ONSSA). It acts as a phytosanitary police force for plant and animal health and thus for consumers [8].

ONSSA is a public establishment, under the supervision of the Ministry of Agriculture, Maritime Fisheries, Rural Development and Water and Forests, created by Law No. 25-08 and endowed with legal personality and financial autonomy. Since 2010, the office exercises on behalf of the State the powers relating to the protection and the preservation of consumer health, animals and plants [1,9]. This establishment ensures the permanent phytosanitary watch of plants and plant products at the borders and within the Kingdom [10].

This work aims to carry out a census of the actions and measures of the Moroccan kingdom concerning the phytosanitary monitoring of pesticides and materials used for plants protection.

#### **Materials and methods**

A census of the various actions and measures undertaken by Morocco through the National Food Safety Office (ONSSA) in terms of monitoring and controlling the use pesticides for agricultural uses will be presented.

#### **Results**

Plant protection products can present risks to human health, ecosystems and living organisms which should be identified in order to monitor them [11]. The purpose of setting up a phytopharmacovigilance system is to monitor the undesirable effects of plant protection products available on the market and covers both environmental contamination, exposure and impacts on living organisms and ecosystems and monitor the adverse effects of plant protection products on the market [12,13].

Morocco and through its control and monitoring body, has undertaken a set of measures and actions aiming to anticipate, detect, analyze and prevent the adverse effects of plant protection products.

In 2019, the services of the National Office for Sanitary Safety of Food Products (ONSSA) carried out 74,799 operations. These involved a total of more than 13 million tons of food products, of which 17,641 tons were destroyed or turned back. Also, 2,243 offense reports were drawn up and sent to the Public Prosecutor's Office. The reasons for destroying these products unfit for consumption are due to their unknown origin, non-compliance with the conditions of conservation and storage, expiration of the expiry date and non-compliance with the labeling [14].

At the import level, more than 8.4 million tons of food products were checked, of which 11,388 tons of non-compliant products were turned back [14].

Regarding the control of imported plants, more than 256 million plants were checked including berry plants, fruit plants and ornamental plants [15].

On export, more than 3 million tons of food products were checked and resulted in the issuance of 139,845 sanitary and phytosanitary certificates [14,15].

Regarding the granting of health authorizations, 3,199 requests were processed by ONSSA services during 2019, and resulted in the issuance of 1,157 new authorizations. In the same vein, and within the framework of the monitoring and control program of establishments authorized in terms of health by ONSSA, the services of the Office carried out 3,218 visits to control health compliance of authorized establishments, and this, in order to verify compliance with sanitary requirements [16]. Following these checks, the competent services of the Office suspended 40 health authorizations, and the withdrawal of health authorizations from 89 establishments. In addition, 154 certificates for international transport and 10,911 health approval certificates for the national transport of perishable products were issued [14,15].

Regarding the use of pesticides, the regional services of the National Food Safety Office (ONSSA) of the Oriental region destroyed, in the presence of representatives of the provincial authorities and the Royal Gendarmerie, 136 tons of potatoes in Berkane, then that the reports of infringements were drawn up against the violators and transmitted to justice [17].

The move follows test results which revealed that the potatoes were treated with pesticides not approved for potatoes [17].

This operation is part of the monitoring and control plans for the use of pesticides in fruits and vegetables, adding that the ONSSA services in Berkane took samples of potatoes stored in warehouses approved by the Office and others kept outside those warehouses with a view to subjecting them to the same analyzes. The results of the analyzes showed that the potatoes, stored in approved warehouses, comply with and respect the residue levels of approved pesticides, while those stored elsewhere have been treated with pesticides not approved for potatoes [14,16].

The Office informs the public that "controls on fruit and vegetables are being tightened and that this action will not be limited only to the Oriental region, but to all regions" [17].

This measure comes after the results of analyzes of several samples revealed the use of unauthorized pesticides on mint cultivation and this finding cannot be generalized to all mint production put on the local market [16].

The monitoring and sanitary control of mint crops will remain maintained at the level of production and distribution, in order to guarantee a product that complies with sanitary safety standards and the wholesale, large and medium markets were called upon to require analysis reports that conform to the safety of mint [14].

The ONSSA services carried out the control of mint farms as part of the reinforced health control of mint and this plan is implemented in the main mint-producing regions, namely the region of Rabat-Kénitra, Tanger-Tétouen-Al

Hoceima, Casa-Settat, Souss-Massa, Marrakech-Safi and Fès-Meknes [14].

Following the recent publication of a report by non-governmental organizations on the export of unauthorized pesticides in Europe to 85 countries, including Morocco, the National Office for the Sanitary Safety of Food Products "ONSSA" underlines that Moroccan imports in pesticides used in agriculture represent only 2% of total European Union (EU) exports of these products. These are mainly pesticides based on 1,3 Dichloropropene, Paraquat and Hydrogen cyanamide [18].

1,3-Dichloropropene (1.3 D) alone represents 87% of these imports. It is a nematocidal pesticide, used to disinfect soil against nematodes well before cultivation. This pesticide is currently registered and used in several countries around the world, including the USA, Japan, Australia. In addition, 1,3-Dichloropropene is currently under review in Europe with a view to its possible re-approval based on new scientific data [18].

Moreover, out of the 41 active substances mentioned in the said report, the Moroccan agricultural sector is concerned by 8 active substances, 4 of which have already been withdrawn from the national market (Propargite, Atrazine, Carbendazime and Acetochlor). Also, ONSSA has scheduled in 2021 the review of Paraquat, 1,3-Dichloropropene, Hydrogen cyanamide and Triasulfuron [19].

It should be noted that ONSSA regularly reviews active substances. Indeed, between 2018 and 2020, the Office withdrew 15 active substances from the national market in particular Chlorpyrifos-ethyl, Chlorpyrifos methyl, Dinocap, Amitrole, Trichlorfon, Carbofuran, Propargite, Dichlorvos (DDVP), Methidathion, Iprodione, Difluidazine, Ethoprophos, Linuron, Propineb and certain preparations containing Glyphosate [20].

The ONSSA services withdrew in 2019 five (5) active substances used in the composition of pesticides. This brings to 48 the number of pesticides withdrawn from the Moroccan market. Likewise, 10 tons of non-compliant pesticides were also returned in 2019 [18].

This is part of an integrated approach aimed at the rational use of pesticides to contribute to the development of sustainable agriculture.

It is within this same framework that ONSSA has already initiated in July 2020 the review process of 10 other active substances to submit them to the opinion of the interministerial commission of March 2021 and has informed the companies holding the approvals of these produced in accordance with the regulations and procedures in force. This pesticide review approach is adopted by ONSSA whenever necessary, particularly in the light of scientific data, the status of pesticides internationally and phytopharmacovigilance data at the national level [19].

This re-examination of active substances risks displeasing importers of pesticides, which generate annual sales of nearly 2 billion MAD. It is possible that the profession is lobbying to put pressure on ONSSA. In the meantime, "the registration of products containing any of the above active substances is frozen throughout the review period."

The fate of these ten inputs was decided on March 2021, on the advice of the interministerial commission [19].

However, Morocco had at the beginning of the year 2020 adopted a law project aimed at strengthening the capacities of the competent authorities in risk assessment and control of plant protection products. The aim is to limit the use of the most dangerous products, encourage the use of low-risk products and promote the replacement of chemicals by alternative methods [1,21].

The report by Greenpeace UK and Public Eye points out in particular the Swiss company Syngenta, "by far the biggest exporter of pesticides banned from the EU", but also the German ones Bayer, BASF and Alzchem and the Italian Finchimica [1].

The French Constitutional Council validated in early 2020 the ban on the production in France and the export of plant protection products containing substances banned by the EU from 2022 [5].

On the other hand, a formal ban on the export of the incriminated pesticides "would not automatically lead third countries to cease the use of these products: they could import them from elsewhere. Convincing them not to use such pesticides would be a more effective strategy and that is part of the Union's "green diplomacy" efforts. ONSSA annually implements health surveillance plans for plant products in all regions of the Kingdom, including fruits, vegetables and herbs [5].

The reasoned use of pesticides contributes to the fight against pests of mint (diseases, insect pests, weeds), further affirms the ONSSA, calling on farmers to use only approved products and to scrupulously respect the method of their employment [15].

Failure to comply with current pesticide regulations will result in administrative penalties and legal proceedings, the press release concludes [15].

In addition, ONSSA supervision activities are mainly focused on the following actions:

The organization of basic training sessions on agricultural pesticides application techniques for the benefit of extension workers, technicians and dealers.

The organization of practical days demonstrations in the field for the benefit of technicians, extension workers, farmers and sons of farmers.

These actions come after the 2018 report of the Court of Auditors which identified innumerable breaches of the ONSSA in its attributions, removing the veil on its inability to fulfill its missions of protecting the health of the consumer, animals and plants [22].

Organic agriculture is presented as one of the alternatives to the current production systems [23]. The number of products that are allowed for use to control insects and diseases in organic farming is limited and respecting the environment with all its components contrary to conventional ways [24].

Organic production has been on the rise for several years now. The "organic" empire in the market seems tantalizing to farmers who are increasingly trying to keep up.

Morocco has more and more brands offering organic products, small traders or large and medium distributions [25].

Thus, on a given product, even if the Bio logo is affixed to it, it is better to check the presence of the various guarantee codes (operator + certifier). This does not prevent that there are little cheaters here and there because organic is now fashionable. The key to recognizing an organic product is the mention of the certifier - in general Ecocert or CCPB - and the identification number of the producer, if these two things do not exist, that means that it is not organic at all.

Morocco follows European legislation closely; any certified organic European product is automatically equivalent to Moroccan regulations. There is the existence of an equivalence order for the products of the EU imported to Morocco. The converse is not yet relevant [25].

The price difference is expected to be offset by certification subsidies, granted by the Ministry of Agriculture, but which are still not activated. It is 70% for producers who have a certified area of more than 5 hectares and 90% for those who have less than 5 hectares. Producers are eagerly awaiting the states bio products subsidy, especially as many areas of cultivation could be considered organic (ex. argan trees, olive trees [25]).

### Conclusion and perspectives

Phytopharmacovigilance constitutes a new integrative approach for collecting and interpreting signals of adverse effects of plant protection products on humans and the environment. Moreover the undertaken actions by the state, dietary exposures of consumers must be part of the observed data. To be interpreted, they must be compared to other sources and routes of exposure such as the airways or skin. Impregnation data, that is to say the concentrations of substances or their metabolites in tissues or biological fluids, must be linked with dietary exposure data and residues in food to be interpreted. These residues must also be linked to agricultural practices and imports to understand their origin.

An integrative approach to exposure and risks is therefore necessary in this field of plant protection products, which requires from the part of phtopharmacovigilance a network operating mode with many partners from diverse and complementary backgrounds and disciplines.

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