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The Pesticide Dilemma in Spice Sector:
Espousing an Enabling Policy Environment

Agrochemicals play an important role in enhancing crop productivity by overcoming the losses caused by pests, diseases and weeds. Chemical pesticide consumption in the country was 62.2 thousand tonnes of pesticides (Technical grade material) during 2020-21, an increase of about 32 per cent from the consumption levels during 2000-01 (Fig. 1). A total of 299 pesticides having 792 pesticide formulations have been registered for use in the country as on 01 July 2021.

Amidst this backdrop, it is important to keep the risks from use of plant protection chemicals within acceptable levels to maximize the benefits from their use. The necessity to address food safety problems, both real and perceived, is also gaining prominence across the globe. This concern is clearly espoused in the case of spices where the existence of complex food commodity chains along with the globalized systems of distribution and possibility of significant time lag between production and consumption obscure the product pathways. Spice commodities have remained an indispensable part of human civilization as food additives, flavouring substances, preservatives and for use in traditional medicines. India has a special status at the global level as the largest producer, consumer and exporter of spices.

One of the major food safety concerns regarding spices produced in India relates to pesticide residues and the presence of non-recommended pesticides in the produce. Apart from the significance of the issue at the domestic level, it also has implications at the international trade level since the spices from the country have a global reach. The spice exports from the country reached more than 185 countries during 2019-20 (Press Information Bureau, Government of India, 2021). The global reach of spices from India and specific nature of spice commodity value chains makes it important to ensure food safety along the entire value chain. In this paper we discuss the nature of pesticide regulatory regime in India and its consequences on spices, which form a unique segment within the food sector.

Pesticide regime in India

In India, registration and use of pesticides were regulated by the Insecticides Act, 1968 and Insecticides Rules, 1971. Accordingly, pesticides intended for production or sale had to be registered with the Central Insecticides Board and the Registration Committee (CIBRC) before reaching the end users. The old Insecticides Act is expected to be repealed and the provisions of the of the Pesticide Management Bill 2020 will henceforth regulate the registration and use of

ICAR – INDIAN INSTITUTE OF SPICES RESEARCH

Santhosh J Eapen
Lijo Thomas
C M Senthil Kumar
Praveena R
Leela N K
& Anees K

pesticides in the country, once the Bill is approved by the Parliament. Accordingly, the Central Pesticide Board, which shall be established under the act has been vested with the responsibility for advising the government on all technical issues related to registration, manufacture and use of pesticides in India. It is mandatory to register a pesticide with the Registration committee before recommending it in a particular crop. The process also requires generation of bio-efficacy data against target pests and data on residues by conducting supervised trials. Once a pesticide is approved for a crop, it is said to have a 'label claim' for that crop or in other words, the formulation has legal sanction for use in that particular crop. Based on label claims, approved use of registered pesticide formulations is restricted to less than 100 crops of the 554 crops (<15%). Some crops are privileged to have a large number of pesticide formulations with valid label claims, while there are many without any label claims, severely limiting the choice of recommending suitable plant protection chemicals. In the case of spice crops, the choice of pesticides in spices is limited due to the low number of pesticides with label claims. This situation leads to several issues restricting and undermining the growth potential of the spices sector in the country.

Pesticide use in spices: context and status

About 63 spice crops are cultivated in India across diverse agro-climatic conditions and these crops were cultivated in 4.5 million hectares with an an estimated output of about 10.5 million tonnes during 2020-21. Even as the export demand for spices has remained robust, the concerns and consciousness about food safety are increasing across the globe. This makes it increasingly important for primary spice producers to supply produce that meet stringent standards and quality parameters set by importing countries. The choice and availability of pesticides gains importance in this context.

Given the diversity of spice crops in terms of their agro-climatic requirements and botanical diversity, one would expect the pests and diseases profile of these crops to be as diverse as in other crops. Several pests and diseases including nematodes are reported to cause severe economic damage in spice crops such as black pepper, cardamom, ginger, turmeric and seed spices. Moreover, with the changing climate scenario, several minor pests and diseases are emerging as economically important. There is no evidence to suggest that the nature of pest and disease problems in spice crops is different or the economic losses are of a lesser magnitude than in other crops. However, the number of approved pesticides for spices is abysmally low (only 15 pesticides have label claim) (Table 1). Black pepper, one of the most valued spice crops, grown in an area of about 1,39,487 ha and susceptible to many insect pests, diseases and nematodes have just two fungicides approved for use. There is not even a single approved pesticide for use in ginger and turmeric, despite India having the largest area under these crops (4,17,998 ha in 2019-20). Seed spices

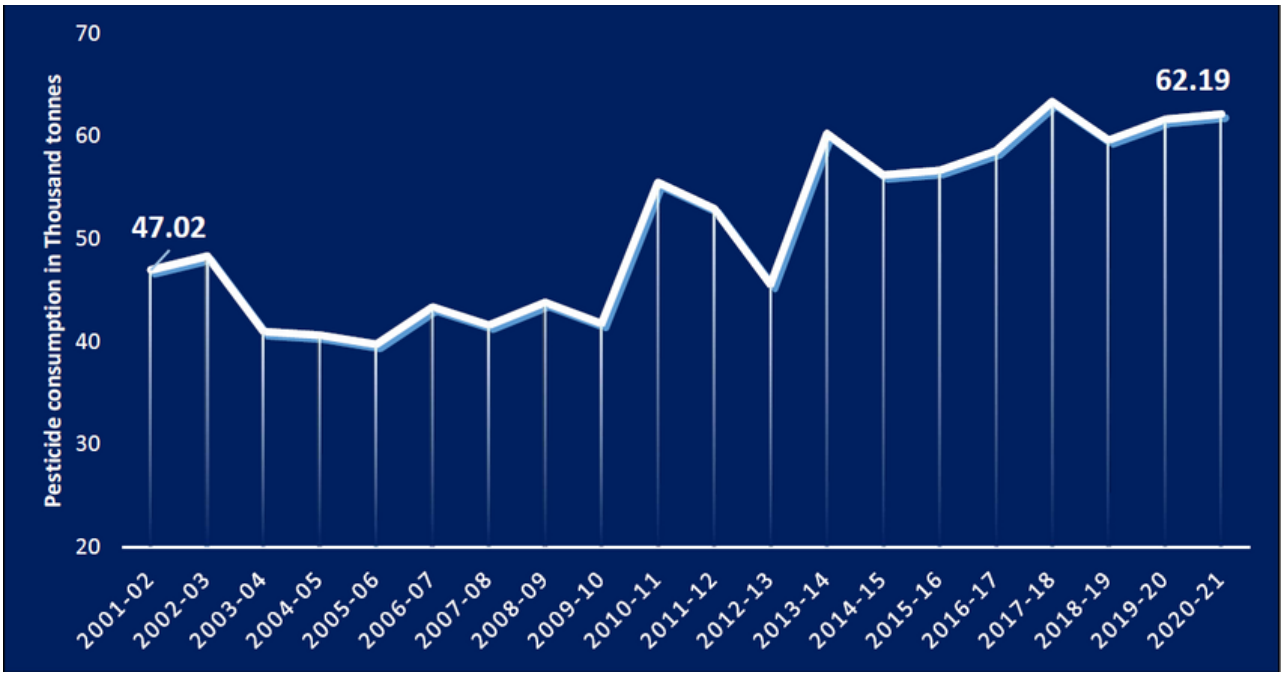

Fig. 1: Trend in consumption of chemical pesticides in India

Table 1:Extent of limited choice: Number of pesticide formulations approved in major spices

Crop	Against fungal diseases	Against insect pests	Against other pests
Black pepper	2	Nil	Nil
Cardamom (S)	1	5	Nil
Ginger & Turmeric	Nil	Nil	Nil
Tree spices	Nil	Nil	Nil
Cumin	7	Nil	Nil
Fennel & Fenugreek	Nil	Nil	Nil

including cumin, coriander, fennel and fenugreek are cultivated in more than 1.7 million hectares, but no insecticide is registered for use in these crops. Similarly, there is no approved pesticide for tree spices grown in an approximate area of 25,680 ha. This highlights the need for urgent approval of new generation, low risk pesticides.

Key issues and consequences

The existence of very few approved pesticides for use in spice cultivation has consequences for the sector. In the absence of registered pesticides, farmers resort to application of pesticides available in the market based on the recommendations of shop owners in a desperate bid to save their crops from complete failure. This is termed as the application of 'off label' chemicals (unregistered pesticides). It would be a violation of the law if a pesticide not having a label claim is recommended to manage pests or diseases in a crop. The limited choice of registered pesticides has created a peculiar situation for scientists and extension personnel. Their hands are tied, when it comes to recommending effective chemical control measures for mitigating pests and diseases in spice crops.

This situation exists, even as several pesticide formulations have been found effective against major pests and pathogens in several important spice crops by Agricultural Universities and research institutions (Table 2). Some of these results have been disseminated through compilations on package of practices and through research publications. However, it does not mean that they are approved within the framework of the insecticide act.

Another important facet of the issue is related to the fixing of Maximum Residue Limits (MRLs) in agricultural produce for consumption. The Food Safety and Standards Authority of India (FSSAI) recommends the tolerance limits of various pesticides in food commodities. The non-registered pesticides in crops will not have country MRL values. The importing countries can, and in several cases do, take undue advantage of the absence of country level MRL values and leverage the situation to create technical barriers for trade. In the absence of the MRLs fixed by the exporting country and by the CODEX Alimentarius Commission, the importing country has the advantage of setting its own standards based on their capability to detect the presence of foreign materials in the produce.

Table 2: Plant protection chemicals found effective for various pest and diseases in spice crops

Crop	Fungicides	Insecticides	Others	Target pests/pathogens
Black pepper	5	6	3	15
Cardamom (S)	14	8	3	12
Ginger	9	5	-	9
Turmeric	8	5	-	4
Tree spices	4	2	-	6
Coriander	3	8	-	5
Cumin	6	5	1	5
Fennel	-	5	-	3
Fenugreek	-	5	-	4
TOTAL	**49**	**49**	**7**	**63**

Source: Compiled by authors based on literature search

The case of chillies: An outlier

Chillies has been excluded from our general analysis for this policy brief. Chillies constitute one of the major export commodities as reported by the Spices Board of India. The crop is however, classified under group 12 (Fruiting vegetables, other than Cucurbits) according to the Indian Crop Grouping Plan proposed by the Committee on Crop Grouping with reference to maximum residue limit fixation of pesticides in 2015. The crop was cultivated in 7.3 lakh hectares during 2021, the highest among all spices other than seed spices. Unlike other spice crops, there seems to be no paucity of registered pesticides in chillies with 56 insecticides and 45 fungicides having been registered for use in the crop. The high acreage along with the highly developed commercial cultivation across large geographic tracts has translated into attractive economic incentives for firms to undertake efforts for registration of pesticides. The situation in chilli also highlights the fact that, with right economic incentives in terms of volumes and business potential, more pesticides will be made available for legally sanctioned use in crops. However, waiting for the crop economy to create the right incentives for pesticide registration, rather than opting for astute policy interventions, will prolong the adverse effects on the spice economy of the country.

The low number of registered pesticide formulations is exacerbated by the absence of country level MRLs. Even out of the meagre 15 pesticides with label claims in spices, only six have MRL values fixed by FSSAI. In such situation the only alternative would be to keep the level of pesticide residues below the detection level (usually 0.1 ppm), which is neither scientific nor practical. This situation has ramifications on spice exports from the country since detection of off-label chemicals in exported spices can lead to its rejection at any point in the value chain causing trade disruptions.

Many spice trading houses and extraction industries import spices from other countries, which are subsequently exported along with local produce or after value addition. This specific form of trade, which is fairly active, has also been adversely affected. India imported about 26,230 tonnes of black pepper, 41,100 tonnes of fresh ginger, 28,580 tonnes of turmeric, 27,190 tonnes of clove etc. during 2019-20 from other producing countries. The country of origin for these imports have several approved pesticides for these crops, which are not registered/recommended for use in India. For example, Vietnam, which is one of the largest exporters of black pepper to India, has 17 insecticides, 20 fungicides and 20 pesticide mixtures recommended against various pests and diseases. Indonesia, Malaysia and Sri Lanka have 11, 12 and 5 pesticide formulations, respectively, approved for use in black pepper farming. In the absence of MRL values set by FSSAI, spice produce imported into India cannot be subjected to rigorous testing as done in other developed countries. Thus, the use of approved pesticides in these countries could also become a reason for rejection of spice exports from India, if they are re-exported in value added or blended forms.

Why the pesticides are not registered?

The cost of generating the efficacy data for a specific pesticide-crop pest combination is prohibitive with the need to conduct multi-locational trials spread across at least three crop seasons. The expected benefits from registration of such a specific combination depends on the market potential of the pesticide, which again depends on factors like crop acreage, propensity to use pesticides in the crop etc. The area under spice crops is relatively low in comparison to that of cereals, oilseeds etc. and the pesticide use intensity is also low. If a crop has limited cropping area, pesticide manufacturers will not find it lucrative to invest resources in developing bio-efficacy and pesticide residue data as their investment will not fetch viable returns. The prospects of economic benefits being low, private firms shy away from registering the pesticides for approved usage in spice crops resulting in absence of label claim. The public funded research institutions also find it tough to spare financial resources for the registration process. Further, public institutions, who rarely involve in production of pesticides, have no direct financial benefit from registration.

What needs to be done?

The absence of approved pesticides for use in spice crops pose significant technical challenges in crop protection. Apart from this, the use of unapproved spices has the potential to disrupt trade and raise the concerns of food safety. Spices are consumed in very low quantities with a per capita consumption of less than 0.5% of total food intake and may pose negligible risk to the consumers. However, fixation of domestic as well as international MRLs for spices is a must to enhance food safety, overcome trade barriers and to promote quality of traded spices. The regulation of pesticide use regime in spices through prudent policies can play a vital role in ensuring food safety in the spice based food value chains. The following measures are suggested below. A concerted effort involving the Government agencies, research organizations, export and processing industry and trade organizations is the need of the hour to address these perennial issues in spice economy.

Label expansion

There is an urgent need to enhance the number of registered pesticides and setting up of MRL values for the pesticides used in spices. As the cost involved in getting pesticide formulations registered for each and every crop would be prohibitive, expansion of label claims of existing pesticide formulations, which have been found effective by research organizations and universities, need to be explored and expedited.

AINP Pesticide Residues to include spice stakeholders

The All India Network Project on Pesticide Residues under ICAR, New Delhi is vested with the mandate of conducting supervised trials for fixing MRLs. However, some of the key stakeholders in the spices sector are not part of this project. This situation needs to be addressed.

Enhance accredited labs

At present there are only 31 NABL accredited laboratories under the central sector scheme "Monitoring of Pesticide Residues at National Level". For a country like India, it would be highly impractical for just 31 centres to monitor the presence of pesticide residues in the produce produced within the country as well as those imported. Hence it is imperative to enhance the number of accredited test laboratories by including crop specific laboratories in the public sector to monitor pesticide residues.

Crop grouping

The crop grouping approach to develop MRL values for spices need to be pursued vigorously. Even this approach could take considerable time as the requisite data and information for representative crops itself is lacking.

Collaboration

Collaboration among key spice producing countries need to be actively pursued to explore the possibility of data sharing and fast tracking the approval/ registration of pesticides and fixing of country MRLs based on prior approvals and standards in other producing countries.

Decentralize pesticide registration

Decentralization of pesticide registration need to be considered as a policy alternative to increase the number of registered pesticides. Institutions like commodity boards and commodity focused research institutes can be given this mandate. For this, appropriate provisions along with proper checks and balances need to be established under the Pesticide Management Bill 2020.

Pest grouping strategy

An evidence based approach for allowing expansion of label claim of existing pesticides by grouping of pest at the level of family or genus need to be explored. It would mean that a specific pest-crop combination with label claim can be used to legalize the application of the pesticide across crops where the specific pest or a pest of the same genus/family is causing economic damage and research data on its efficacy is available. . This would complement the label claim expansion based on the crop grouping approach.

Fast track MRLs

Considering the time and cost involved in generating data for fixing MRLs, it would be prudent to fast track these processes in spices. Methodology to fix MRLs based on the monitoring data available can be further standardized and approved. For this, collection of farm gate samples than market samples need to be ensured. Alternately, actual daily intake (ADI) of spices being very low, risk assessment of pesticides based modern approaches like Hazard Index (HI) should be explored, which can replace the arbitrary MRLs.

Simplify biopesticide registration

A focussed approach to promote biopesticides, which are proved globally safe to human beings and the environment, needs to be implemented. Current registration process for biopesticides is cumbersome and needs to be revisited and the submission requirements should be streamlined to bring down the costs and to speed up the process following international registration standards.

The views expressed by the authors in this brief are personal and do not necessarily reflect the official policy or position of the organizations they represent.

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Santhosh J Eapen (Santhosh.Eapen@icar.gov.in) is Head, Division of Crop Protection; N K Leela (Leela.NK@icar.gov.in) & C M Senthil Kumar (Senthilkumar.CM@icar.gov.in) are Principal Scientists; Lijo Thomas (Lijo.Thomas@icar.gov.in) & R Praveena (Praveena.R@icar.gov.in) are Senior Scientists and Anees K (Anees.Kaprakkadan@icar.gov.in) is Scientist at ICAR-Indian Institute of Spices Research, Kozhikode

ICAR-Indian Institute of Spices Research
Marikunnu Post, Kozhikode
Kerala - 673 012, India

0495-2731410

director.spices@icar.gov.in

www.spices.res.in