RAPID RISK ASSESSMENT - Pesticides in Cumin

I. SUMMARY OF EVENT

Very recently, Malta's health directorate issued a warning on Jeera cumin seeds from India that it may contain elevated levels of pesticides. The Central laboratory shared a two-weeks reading of pesticides in cumin samples imported from India, Bangladesh and Qatar for a risk assessment, as to the possible impacts on Health associated with exposure to these elevated readings of pesticides in imported Cumin

II. RISK ASSESSMENT

Hazard Identification:

Cumin commonly named as jeera is one of the major seed spices used in dishes all over the world, including Gulf countries. The main producers of cumin are India (particularly Gujarat and Rajasthan) and Iran. Insect infestation of aphids and thrips during cumin cultivation is highly likely to occur. To control such infestation a wide selection of pesticides is used. Pesticides are chemical substances widely used in agriculture production for managing invasive pests to reduce or eliminate yield losses and maintain high product quality. However, farmers who lack education or awareness may not follow prescribed dosages and therefore could lead to increased pesticide residues (MRL) in cumin seeds effecting human health. This risk assessment will examine 11 pesticides found in cumin that slightly exceeded the MRL required and their potential effect on human health.

Hazard Characterization:

Exposure to pesticides can occur through occupational exposure and from residues in food and drinking water, but primarily through the latter. The effect of Pesticide exposure on human health has a wide spectrum of outcome/effects ranging from acute symptoms that may occur right away (eg. headache, nausea, vomiting, fatigue etc.) or can take several hours after exposure or even chronic illness, that can build up for years before going noticed, like cancer. Fetuses, infants, growing children, pregnant and nursing mothers, and women of childbearing age are most at risk for adverse health outcomes from exposure to pesticides. The major concern for pesticide exposure is related to acute health effects.

***The Acceptable Daily intake (ADI) is an estimate of chemical substances (food additives, pesticide residue and veterinary drugs) in food or water that can be consumed daily over a lifetime without presenting any risk to health.**

ADIs were used as toxicological reference values or Health Based Guidance Values (HBGVs) to assess the health risk of eleven pesticides that did not meet the MRL levels during the two-week monitoring program for cumin. **Table 1** displays the ADI for the concerned pesticides provided by EFSA. It is important to note that the consumption of an additive including pesticide above its ADI on a given day is not cause for concern since large built-in safety factors are accounted for. ADI are set for long-term consumption events over the years.

Where an acute toxicological reference dose existed, this value was compared to the ADI (chronic exposure) and the lowest value i.e. the one leading to the most sensitive response was chosen as a HBGV.

Name of pesticide	Acceptable Daily Intake (ADI) | Acute reference dose (If available) mg/kgbw/d	
Clothianidin	0.097	0.1
Difenoconazole	0.1	0.16
Flonicamid	0.025	0.025
Hexaconazole	0.005	
Imidacloprid	0.06	
Kresoxim-methyl	0.4	
Picoxystrobin	0.043	
Thiamethoxam	0.006	0.35
Tricyclazole	0.0042	0.05
Azoxystrobin	0.2	
Propiconazole	0.04	

Exposure Assessment:

CFL tested various pesticide compounds found in cumin seeds and found a slight elevation from the MRL required which may cause a concern. To estimate the risk, an average exposure from food (cumin) was calculated and compared against the ADI reference (table 1). **The average consumption of cumin in India was found in the literature to be 0.8g/day however, 1 g will be used in the calculations, to account for different dishes that use cumin in Qatar.**

The highest reading for **Clothianidin** residue was 0.14mg/kg with an uncertainty ±0.056. in order to account for the uncertainty, it is assumed the highest reading to be **0.196 mg/kg**. Assuming the average consumption of cumin is 1g (0.001kg) a day in our population, this equates to approximately $1.96*10^{-4}$ mg of intake. Divided by the average weight of 70 kgs leading to 0.0000028 ($2.8*10^{-6}$) mg/kg bw per day which is significantly lower than the ADI limit set by EFSA.

The remaining 10 pesticides are calculated using the same approach with a constant average consumption of 1g (0.001kg) and an average weight of 70kg.

Difenoconazole: 0.32 mg/kg (+0.128 U) * (0.001 kg/d)/70 kg bw = **0.0000064 mg/kgbw/d**

Flonicamid: 0.3 mg/kg (+0.12 U) * (0.001 kg/d)/70 kg bw = **0.000006 ($6*10^{-6}$) mg/kgbw/d**

Hexaconazole: 0.4 mg/kg (+0.16 U) * (0.001 kg/d)/70 kg bw = **0.000008 ($8*10^{-6}$) mg/kgbw/d**

Imidacloprid: 0.22 mg/kg (+0.088 U) * (0.001 kg/d)/70kgbw = **0.0000044 ($4.4*10^{-6}$) mg/kgbw/d**

Kresoxim-methyl: 0.5 mg/kg (+0.2 U) * (0.001 kg/d)/70 kg bw= **0.00001 ($1*10^{-5}$) mg/kgbw/d**

Picoxystrobin: 0.4 mg/kg (+0.16 U) * (0.001 kg/d)/70 kgbw= **0.000008 ($8*10^{-6}$) mg/kgbw/d**

Thiamethoxam: 3.6 mg/kg (+1.44) * (0.001 kg/d)/70 kgbw= **0.000072 ($7.2*10^{-5}$) mg/kgbw/d**

Tricyclazole: 1.79 mg/kg (+0.716 U) * (0.001 kg/d)/70 kgbw = **0.000036 ($3.6*10^{-5}$) mg/kgbw/d**

Azoxystrobin: 0.56 mg/kg (+0.224)* (0.001 kg/d)/70 kgbw= **0.000011 ($1.1*10^{-5}$) mg/kgbw/d**

Propiconazole: 0.1 mg/kg (+0.04) * (0.001 kg/d)/ 70 kgbw = **0.000002 ($2*10^{-6}$) mg/kgbw/d**

From the above estimation, **the estimated intake values are several orders of magnitude lower than any Health Based Guidance Value.**

Even if consumption patterns were to be much higher than the estimated 1 g / day, it is not expected that the intake would exceed the established HBGVs for any of the pesticides reported.

Aggravating factors:

None

Mitigating factors:

It is not expected that the distribution of the products would lead to much higher exposure, considering the action taken by the MoPH to withdraw the products, based on their non-compliance.

Risk Characterization:

Considering the high margin of exposure (much lower values of intake in comparison to the established HBGVs), exposure to Cumin included in food products made in Qatar, with the level of these pesticides as reported would represent a low risk to human health and correspond to a health risk category 3.

Recommendations:

N/A

HEALTH RISK CATEGORIES WITH DEFINITIONS

Health Risk 1

Represents a situation where there is a reasonable probability that the consumption/exposure of/to a food could lead to adverse health consequences which are serious or life threatening or that the probability of an outbreak situation is considered high.

Health Risk 2

Represents a situation where there is reasonable probability that the consumption/exposure to a food could lead to temporary or not life threatening health consequences or that the probability of serious adverse consequences is considered remote.

Health Risk 3

Represents a situation where there is a reasonable probability that the consumption/exposure to a food is not likely to result in any adverse health consequence.

The situation identified may be an indication of a breakdown in:

- *Good Manufacturing Practices – for example: sanitation, quality issues, etc.*
- *Good Agricultural Practices – such as: pesticide residue in food above the established MRL.*
- *Good Practices in Veterinary Medicine – e.g. animal drug residue in food above the MRL.*
- *Some other relevant factor – examples include: food containing non-permitted nutrients or food additives above the permitted levels, nutrients that do not meet label claims, health-related labelling infractions, etc.*