

Understanding MRLs

by
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The benefits of agrochemicals seem to go largely unrecognised these days, except by those that use them. There are a few balanced reports of benefits versus risks in mainstream media, but for the most part it's the potential or perceived risks that are making the headlines and grabbing the public's attention. Why is this?

It may be because risk exaggeration is more newsworthy than risk reduction, or perhaps that the numerous opponents of our industry tend to exaggerate the perceived risks to help reinforce their arguments. One area where perception has greatly exceeded reality is regarding the minute traces of pesticides that are sometimes detected in farm produce. Pesticide residue issues are enormously important to modern agriculture. The plant science industry has a responsibility to assist farmers to produce crops that are acceptable to the food chain and consumers alike.

Health Impact

It is clear that pesticide residues in farm produce should be kept as low as practicable, and eliminated whenever possible through Good Agricultural Practices (GAP). However, when we weigh the real costs of residue reduction strategies, we need to consider the levels of adverse effects resulting from the existing levels of pesticide residues in food.

Upon consideration, we discover that there are no adverse effects as a result of pesticide residues in food today. There are no known diseases

MRLs are set for trading purposes, they are not safety levels. Different countries have different trading levels, but generally do not have different safety standards.

initiated by pesticide residues in food. There are no statistics on hospital admissions due to inadvertent contamination of food with pesticide residues. On the contrary, there is significant evidence that pesticides can contribute to food safety by enabling the proper control of crop pests, and limiting the presence of dangerous mycotoxins.

Acceptability of Produce

In market surveys conducted around the world, the percentage of farm produce samples containing pesticide residues varies greatly within a given type of produce (from 0 - 96.8 %, Hamilton, 1997) but an average value of around 40 %, as recently reported in the European Union (*Agrow*, No. 426, pp.8, 2003) is fairly typical.

When governments report these statistics, they make it very clear that there are large margins of safety and residue detections within legal limits pose no health concerns. There is no suggestion from responsible governments or international institutions, that farm produce is contaminated or unhealthy when residues are within legal limits and one must question the motives of individuals or companies making claims to the con-

trary.

The MRL

To understand the basis for the reassurance about the safety of the food supply, it is necessary to look at just how the maximum allowable residue limits are derived and the mechanisms in place to ensure that they are consistent with safety standards.

Firstly, a few definitions. The MRL is the maximum concentration of a pesticide residue (expressed as mg/kg) that is legally permitted in, or recognised as acceptable in, or on, a food commodity as set by CODEX or a National Regulatory Authority. It is often referred to as the legal trading limit. It is derived from an assessment of the residues found when the crop is treated according to good agricultural practice (GAP).

The ADI is the acceptable daily intake of a pesticide that can be ingested over a lifetime without appreciable risk to health. It is expressed in mg/kg body weight/day. Clearly exposure to the public from residues in food cannot be allowed to exceed this ADI value.

The MRL is set by national governments on a conservative principle to ensure the farmer uses as lit-

tle as possible of the chemical to achieve the desired result on the pest, a type of precautionary approach to minimise any potentially harmful effects. The MRL is not determined directly from the ADI.

Setting MRLs

The MRL will vary from country to country according to the agronomic need for the product, the required use rate, interval before harvest, etc. This is why harmonisation of MRLs across countries is not a practical proposition; it would require enforcement of a standard set of use practices regardless of local cultural and agronomic practices, which would be undesirable and impractical.

National MRLs are set generously to cover the worst-case findings in a series of field trials. When an MRL for a crop-chemical combination has been established, the rate of violation is usually very low, unless farmers consistently and grossly misuse the product. This is not common, as testified by monitoring results around this world. Therefore, it is most unlikely that a consumer would consistently eat produce with levels at or above this MRL. It should be pointed out that the risk assessment process does take into account that some individuals eat large amounts of the same food on a daily basis over their lifetime.

How about consumers eating several types of food per day, each with levels at the MRL? This is also taken into account in the MRL-setting process. New MRLs (new uses) are not approved if consumption of all food combined would exceed the allowed exposure level or ADI. In the majority of cases, these combined intake levels are below 10 % of the ADI. Such a scenario is seen in Australia and Taiwan, where it is rare for dietary intake of residues to approach a fraction of the allowable ADI (Hooper 2003; Wong *et al.*, 2003).

ADI Safety Factor

One additional built-in safety factor is that the ADI is set conservatively, usually at 100 times lower

Table 1: Selected CODEX MRLs for Methamidophos

Crop	CODEX MRL (mg/kg)
Brussel sprout	1
Cauliflower	0.5
Chilli pepper	2
Sweet pepper	1
Potato	0.05
Tree tomato	0.01
Watermelon	0.5

Table 1: CODEX MRLs for Methamidophos. If MRLs were set as safety levels, they would be similar for produce that clearly can be consumed at similar levels.

than the level observed to cause the slightest indication of an adverse health effect in animals. Where the effects of this chemical in humans have been studied, the margin may be reduced to 10, but in these cases, the effects of the chemical must be extremely well characterised. There are usually additional margins between exposure levels that might be used to set an ADI e.g. sensitive blood tests, and those that cause symptoms of illness.

Unforeseen Risks

Are there adverse effects of pesticide residues that we don't yet know about or populations with special sensitivities? Like everything else in life there are no absolute certainties, but with the extensive testing and regulation of agrochemicals currently in place, there should be no cause for undue concern.

When there are a multitude of obvious food safety issues such as food-borne disease, naturally occurring organic and inorganic contaminants, mycotoxin contamination, micronutrient deficiencies etc., public health resources should be prioritised and target the most significant concerns. The totality of the safety factors built into the risk assessment process for pesticide residues in farm produce explains the very high level of confidence in the official pronouncements of the safety of the food supply and the rationale why responsible govern-

ments do not promote organic farming as a health initiative.

Trading Standards

The dependence of National MRL values on local agronomic practices explained above begs the question, how can countries trade freely with each other if they adopt different use practices and set different national MRLs for the same chemical-crop combinations?

The answer is that they can negotiate bilateral agreements with trading partners or can request the International Food Standards Authority, the CODEX Alimentarius, to create an MRL for international trading purposes, known as the CODEX MRL. This is proposed by a panel of international experts to encompass uses in all nominated countries, at the same time ensuring that food safety is not jeopardised with food consumption patterns in any global region. CODEX MRLs are sometimes seen as globally harmonised MRLs, this is incorrect. They should more accurately be portrayed as the level that will meet all currently supported National needs and allow free trading in raw agricultural commodities.

CODEX MRLs are not permanent, they can be raised (or lowered) on request of countries if new uses are proposed or old uses become defunct. CODEX MRLs have no legal status except as a reference standard whereas National MRLs are of-

Table 2: MRLs for Iprodione

Commodity	MRL in mg/kg				
	Codex	Singapore	Australia	Canada	Japan
Onion	0.2	0.1	-	-	0.5
Black Currant	10	3	-	-	3
Cucumber	2	5	-	0.5	5
Capsicum	5	-	-	-	10
Tomato	5	5	2	0.5	5
Kiwi fruit	5	5	10	0.5	5

Table 2: Variation in MRLs set by different countries, as illustrated by MRLs for Iprodione in various fruits and vegetables. Source: Dr. Cheah Uan Boh.

ten enshrined in legal documents, and their amendment may not be a simple process. Prosecutions based on excess residues are very rare because it is usually impossible to identify the cause of the problem and because MRLs are not safety standards most governments view MRL violations not in a punitive sense, but as warning signs that use practices need closer examination.

MRLs & Safety

It should be emphasised that MRLs are set for trading purposes, they are not safety levels. The fact that MRLs are not safety standards is well demonstrated in **Table 1** (previous page) showing selected MRLs for a single chemical, methamidophos. Clearly if the MRLs had intended to represent safety levels, they would be similar for produce that can be consumed at similar levels. This is clearly not the case.

Another illustration of the lack of direct relationship between MRLs and safety standards is the great diversity that sometimes appears in MRL levels between various countries as illustrated above in **Table 2** for Iprodione. (Table courtesy of the late Dr. Cheah Uan Boh.)

The Way Forward

Given the wide margins explained above between allowable residue levels and safety levels, and the International recognition that

agrochemical residues in farm produce pose no significant health issue, what can be done to address this misconception and the multiplicity of issues raised by this disconnect?

Better Communication

There needs to be more consistent communication by our industry, by governments and food authorities to satisfy consumers that pesticide residues in food pose no significant health threat. Some governments have made this very clear, others should follow. Governments should be very cautious at endorsing “safe”, “clean”, “green”, “unpolluted” food-labelling schemes and consider the implications for the majority of lower-priced food in the retail chain that does not carry such labelling.

Policy-Maker Understanding

There needs to be more understanding in governments when export produce is rejected in overseas markets because of residue issues. These rejections are often based on trade protection, or unavailability of supporting data, slowness of the CODEX MRL setting system etc., very rarely on real health issues. Governments should thoroughly investigate all aspects of issues before endorsing solutions such as restricting product availability, which may appear to resolve the trade issue, but often just deflect it and at the same time impose extra costs on the do-

mestic growers.

Niche Market

The organic food industry is growing rapidly and is seen by some as raising the value of basic foods, which have allegedly sunk to low relative levels in recent years. The sustained growth of “chemical free” food depends upon consumer mistrust of “artificial” chemical residues and some organic food companies are fuelling this mistrust. Clearly some consumers may be prepared to pay for the perceived benefits of “organic” food, but this methodology, with its lower yields and higher real risk of food-borne disease should be a personal choice, it should not become national policy or a public health necessity. To do so condemns consumers to produce with higher price, generally lower quality, and no real benefits.

Consumer Demands

Consumers are demanding higher quality produce all-year round at affordable prices. CropLife companies and grower groups must form stronger links to promote best practices in agricultural productivity, and continue to bring innovative new products to the market. At the same time, they must provide the assurance that high quality food can be produced without compromising food safety.

References

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