

Managing cadmium in food crops in New Zealand



Ministry for Primary Industries
Manatū Ahu Matua



Fertiliser Association
Shaping profitable and sustainable farming

This practical fact sheet has been developed by the Cadmium Management Group to provide growers with advice about managing cadmium in their food crops.

What is cadmium?

Cadmium is a naturally occurring metal element, present in small amounts in soils, rocks, plants and animals. Cadmium is absorbed by plant roots and transported to different parts of the plant, and in this way can enter the food chain. Typically, cadmium accumulates more in leaves than in roots and grains, with fleshy fruit accumulating the least.

Why can it be an issue?

Cadmium can accumulate in humans and livestock, mainly through food consumption. Excessive long-term daily intake of cadmium can lead to health problems in humans and animals. New Zealand, via Food Standards Australia New Zealand, has set maximum levels (MLs) for cadmium in food products. Where an ML for cadmium is exceeded, those food products may not legally be sold and the Ministry for Primary Industries will take action to alert the supplier. Non-compliance with MLs in exported food products could result in rejected shipments and may negatively affect the international reputation of New Zealand food products.

What are the sources of cadmium?

The main source of cadmium in agricultural soils is from phosphate fertilisers, which contain cadmium as an impurity from phosphate rock. New Zealand soils contain little cadmium naturally, from less than 0.1 to 0.6 mg/kg. Composts and manures may also contain cadmium. While they generally contribute less cadmium to soils than phosphate fertiliser, management of cadmium should still be considered if these products are used.

How is cadmium managed in New Zealand?

A National Cadmium Management Strategy sets out the approach to managing cadmium in the primary sector. This includes managing the accumulation of soil cadmium in agricultural production land through the Tiered Fertiliser Management System, which sets out increasingly stringent restrictions on the choice and rate of phosphate fertiliser

as soil cadmium increases (www.fertiliser.org.nz/site/resources/tools). Cadmium in food, soil and fertiliser is regularly monitored by government and industry agencies.

How can I manage for low cadmium in food crops?

Monitoring of edible produce is required to work out when management options are required and, once implemented, whether they have successfully managed the risk. Soil properties such as pH, organic matter and clay content can significantly affect how much cadmium is taken up by plants. Soil tests for cadmium, pH, organic matter and Olsen P provide valuable information for monitoring and managing cadmium accumulation in plants.

Reducing cadmium inputs – don't over-fertilise!

Phosphate fertilisers are the primary source of cadmium in agricultural soils, so reducing their application rate and/or switching to lower-cadmium containing fertilisers will reduce the input of cadmium to soils. Olsen P is a key indicator of phosphate fertiliser requirements and phosphorus fertiliser can be reduced where the Olsen P is at or above recommended levels for your crop and soil type. Advice on the appropriate rate can be obtained by soil testing, from your soils and fertility advisor and by using nutrient management models or the reference guide 'Nutrient Management for Vegetable Crops in New Zealand' available from www.vri.org.nz/research/ or www.fertiliser.org.nz/Site/resources/booklets

Phosphoric-acid-derived fertilisers (e.g. triple super-phosphate, DAP) typically have less cadmium than those derived from sulphuric acid (e.g. superphosphate) and rock phosphate. Those derived from nitric acid (e.g. complex products, with NPK in each prill) generally have the least cadmium. Composts and lime may also be sources of cadmium, so ensure products with low cadmium are used.

Crop and cultivar selection

Cadmium uptakes vary between plant species, and between varieties or cultivars of the same species. Some crops accumulate greater amounts of cadmium. Spinach, silverbeet, carrots, celery, leeks, and wheat generally accumulate more cadmium than onions or potatoes. New Zealand-specific research also found that spinach

typically accumulates more cadmium than a range of lettuce varieties. This means that some stages in a crop rotation cycle may risk non-compliance with MLs.

Different crop varieties or cultivars can accumulate cadmium at different rates. Testing in New Zealand of a range of wheat and potato cultivars in industry and research trials showed some higher- and lower-accumulating cultivars.

Improving soil conditions

In general, plant uptake of cadmium can be reduced by:

- increasing soil pH to the high end of the optimal range for your specific crop (often this is around pH 6.2)
- increasing soil organic matter (if using composts or manures, ensure low-cadmium products are used)
- addressing any zinc deficiency (international studies have shown this to be important) – zinc status is best measured in plant material.

New Zealand-specific research identified a decrease in cadmium concentration in onions as soil pH increased, suggesting that maintaining pH at the maximum optimal pH will help to reduce cadmium accumulation. For bunching spinach there was a decrease in cadmium concentration with increasing organic matter, suggesting compost addition may help to reduce cadmium accumulation in this crop. For wheat, observed relationships between the zinc:cadmium ratio and cadmium levels in grain suggest that zinc addition could help to reduce cadmium accumulation, and potentially in other cereal crops.

Cadmium is generally more available to plants in soils with a low clay content. Therefore, the risk of high cadmium in produce is greater for sandy soils than clay soils. Plant uptake of cadmium is also generally lower in Granular and Allophanic (volcanic) soils than in non-volcanic soils.

Next steps

The Cadmium Management Group encourages you to assess how to include the management of cadmium in your farm management plan. As first steps, talk with your soils and fertility advisor about including cadmium in your next soil test, and talk to your sector group about monitoring the crops and cultivars you are growing.



Additional resources

www.mpi.govt.nz (search cadmium)
www.fertiliser.org.nz (search cadmium)
www.VRI.org.nz (search cadmium)
www.potatoesnz.co.nz www.onionsnz.com
www.freshvegetables.co.nz www.far.org.nz

For more information, contact your sector group.

This fact sheet is one in a series of guides and sector fact sheets produced by Manaaki Whenua - Landcare Research for the Cadmium Management Group in 2020.



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