Non Rice Grains

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Abstract

Non rice grains in the HMI library has 1,415 reported results for lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, B, Ba, Ca, CrIII, CrVI, K, Mg, Mo, Na, P, Rb, S and Sr from 42 sources. WHO GEMS/Food submissions reported lead in non rice grains as sold from 3,702 results in 4 reporting regions, with subgroup medians from 2.5 to 110 µg/kg. For cadmium, GEMS/Food gave subgroup medians from 1 to 210 µg/kg from 4,135 results.

1 | Non rice grains overview

Across 4 other studies of ordinary farms and markets, reported lead means and medians on an as-sold or fresh-weight basis ranged from 9.58 µg/kg (Bielecka et al. 2022) to 84 µg/kg (X-D et al. 2016).[3,4] For cadmium, 6 studies on an as-sold or fresh-weight basis reported means and medians from 10 µg/kg (Caridi et al. 2021) to 65.7 µg/kg (Bielecka et al. 2022).[3,8] Higher results came from contaminated or exposed settings rather than ordinary supply. Non rice grains as sold from Location B1 (industrial-affected area) had total mercury higher at 56.1 µg/kg, against 0.28 µg/kg for Control (grocery store >55 km from any power plant) in the same study.[9]

For a buyer the practical points are the form bought, the basis a result is reported on, where the non rice grains came from and the laboratory’s reporting limit. Testing finds contamination but does not remove it.

2 | What counts as non rice grains

This page covers non rice grains in 5 forms kept separate in every comparison: non rice grains as sold (1,138 results), non rice grains flour or meal (238 results), cooked non rice grains (29 results), non rice grains peel or outer layer (5 results) peeled or flesh and non rice grains (5 results).[1,2,3,4,5,6]

Results stay on the basis each source reports: as sold or fresh weight, dry weight, or unstated. Dry-weight, as-sold and unstated results are never pooled, and no moisture conversion is applied.

3 | How metals reach non rice grains

The evidence on how metals reach non rice grains comes from studies that compared exposed and ordinary settings. Non rice grains as sold from Location B1 (industrial-affected area) had total mercury higher at 56.1 µg/kg, against 0.28 µg/kg for Control (grocery store >55 km from any power plant) in the same study.[9] In another study, non rice grains flour or meal from conventional had lead higher at 30,100 µg/kg, against 260 µg/kg for conventional in the same study.[13] A third study found that non rice grains as sold from variety EUFM401 (experiment) had Fe higher at 294,000 µg/kg, against 107,000 µg/kg for variety ie3779 raw (control) in the same study.[14]

These are observational comparisons from single studies; the size of the difference depends on the site, metal and distance.

4 | Which forms and regions measured lower

The HMI reference for lead in non rice grains as sold pools 53 subgroup units from 4 sampling families, with a median of below 4 µg/kg and a middle half spanning below 1.3 (lower quartile) and 8,330 µg/kg (upper quartile).[1,6,15,16] for lead in non rice grains as sold, the reference median was between 15 and 18.6 µg/kg, with a middle half from below 10 to between 24.5 and 33.1 µg/kg across 199 units.[1,3] for cadmium in non rice grains as sold, the reference median was 22.6 µg/kg, with a middle half from 11.1 to between 27.5 and 28 µg/kg across 160 units.[1,3,17]

Among GEMS/Food reporting regions, non rice grains as sold had the lowest lead subgroup median in PAHO (2.5 µg/kg) and the highest in EURO (110 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in AFRO (1 µg/kg) and the highest in AFRO (210 µg/kg).[1] For total arsenic, the lowest regional median was in AFRO (2 µg/kg) and the highest in EURO (12 µg/kg).[1]

Targeted non rice grains as sold samples in EURO had cadmium lower at 26 µg/kg, against 70 µg/kg for EURO in the same study.[1] In another study, targeted non rice grains as sold samples in EURO had cadmium lower at 23 µg/kg, against 70 µg/kg for EURO in the same study.[1]

In one study, lead across 24 groups of non rice grains ranged from 1 µg/kg (Couscous) to 11 µg/kg (Buckwheat); the lowest is the lowest observed in that study, not an established sourcing preference.[16]

5 | Processing, cooking and preparation

Processed or prepared forms were compared only with unprocessed non rice grains in the same study and group. Non rice grains flour or meal (product subgroup) had lead higher at 19.3 µg/kg, against 17 µg/kg for the unprocessed form in the same group (non rice grains as sold).[3] In another study, non rice grains flour or meal (retail samples, Austria) had lead higher at 8 µg/kg, against 4 µg/kg for the unprocessed form in the same group (non rice grains as sold).[15] A third study found that non rice grains flour or meal (Madeira market) had cadmium higher at 275 µg/kg, against 42.5 µg/kg for the unprocessed form in the same group (non rice grains as sold).[12]

Forms differ in water content, so a per-kilogram difference is not by itself a measured removal or gain of metal.

6 | Mitigation for non rice grains

Lot testing against the applicable limit is the check that can be verified.

7 | Trade-offs and limits of controls

Avoiding exposed growing areas lowered the metal measured in the studies available, but no study measured the cost or supply effect of doing so.[9] Metals do not move together, so a lot that passes a lead limit says little about cadmium, arsenic or nickel unless those are tested as well.

8 | Testing non rice grains for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.16 µg/kg (Bielecka et al. 2022) to 200 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,3] Reporting limits for cadmium ranged from 0.017 µg/kg (Bielecka et al. 2022) to 50 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,3] Reporting limits for total arsenic ranged from 0.019 µg/kg (Bielecka et al. 2022) to 2,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,3]

A useful lot result names the form, the basis and a quantification limit well below the limit that applies.

9 | Buying and verifying non rice grains

No maximum level for metals in non rice grains was verified from primary text for this page; buyers should confirm the limit that applies in the destination market.

10 | Exposure from non rice grains

No source in the library converted non rice grains concentrations into a verified estimate of intake for a defined population. Concentrations describe the food, not individual risk.

11 | Evidence review and remaining gaps

Every source record that names non rice grains was decided on its content: 42 occurrence extracted, 42 records in all. The occurrence table renders every extracted result; held values remain visible with their reason.

References identify the sources used in these answers. The Sources index preserves additional discovery links; inclusion there does not mean a source has been reviewed for this assessment. Corrections, completed searches, new direct evidence and changes in requirements should reopen the relevant answer.

12 | Non rice grains FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, B, Ba, Ca, CrIII, CrVI, K, Mg, Mo, Na, P, Rb, S and Sr in non rice grains, most often lead, cadmium and total arsenic.[1,2,3,4] WHO GEMS/Food submissions reported lead in non rice grains as sold from 3,702 results in 4 reporting regions, with subgroup medians from 2.5 to 110 µg/kg.[1]

In the studies available, non rice grains from contaminated or exposed settings carried more metal than non rice grains from the same study's control.[7] non rice grains as sold from granulate I (experiment) had lead higher at 710 µg/kg, against 370 µg/kg for control (unamended soil, no granulate) in the same study.[7]

Among GEMS/Food reporting regions, non rice grains as sold had the lowest lead subgroup median in PAHO (2.5 µg/kg) and the highest in EURO (110 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in AFRO (1 µg/kg) and the highest in AFRO (210 µg/kg).[1]

Only comparisons between forms in the same study are available, not before-and-after measurements of the same non rice grains.[3] non rice grains flour or meal (product subgroup) had lead higher at 19.3 µg/kg, against 17 µg/kg for the unprocessed form in the same group (non rice grains as sold).[3]

Inorganic arsenic, the more toxic form, was measured in 31 results from 3 sources, far fewer than total arsenic.[1,18,19] Consumer Reports Food Safety and Sustainability Center 2014 reported inorganic arsenic at 6.2 µg/kg (mean) in non rice grains as sold from all samples.[18]

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STATUS AND LICENCE

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COMPETING INTERESTS

The Heavy Metal Index reports what the peer-reviewed and regulatory literature supports. It is operated separately from any certification program, does not evaluate or endorse brands, and does not use certification thresholds as evidence for the statements made here.

DATA AVAILABILITY

Every source behind this ingredient profile is listed with its own source record at https://heavymetalindex.com/ingredients/non-rice-grains#sources.

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