Winter squash

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HEAVY METAL INDEX · INGREDIENT PROFILE October 2026

DOI 10.83376/hmi.ingredient.winter-squash

CITE AS

Pendergrass, K. (2026). Winter squash. Heavy Metal Index. https://doi.org/10.83376/hmi.ingredient.winter-squash

CORRESPONDENCE

Corrections are logged publicly on the article page, each with its date, the affected value, and the source that resolved it.

KEYWORDS

heavy metals, food safety, dietary exposure

PUBLICATION HISTORY

This revision 2026-10-22.

Abstract

Winter squash in the HMI library has 247 reported results for lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, monomethylarsonic acid, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, Ba, Mo, Sr and Ti from 26 sources. WHO GEMS/Food submissions reported lead in winter squash as sold from 443 results in 4 reporting regions, with subgroup medians from 1.3 to 70 µg/kg. In the US Total Diet Study, cooked winter squash had a median lead result below 4 µg/kg across 27 composites from 2017-2020.

1 | Winter squash overview

Across 5 other studies of ordinary farms and markets, reported lead means and medians on an as-sold or fresh-weight basis ranged from 6 µg/kg (Antoine et al. 2017) to 4,230 µg/kg (Chowdhury et al. 2024).[3,5] For cadmium, 7 studies on an as-sold or fresh-weight basis reported means and medians from 2.2 µg/kg (Spungen et al. 2024) to 402 µg/kg (Chowdhury et al. 2024).[5,8] Higher results came from contaminated or exposed settings rather than ordinary supply. Winter squash as sold from evening purchase had lead higher at 840 µg/kg, against 430 µg/kg for all samples in the same study.[7]

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

2 | What counts as winter squash

This page covers winter squash in 4 forms kept separate in every comparison: winter squash as sold (213 results), cooked winter squash (16 results), winter squash flour or meal (11 results) and winter squash oil (7 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 winter squash

The evidence on how metals reach winter squash comes from studies that compared exposed and ordinary settings. Winter squash as sold from evening purchase had lead higher at 840 µg/kg, against 430 µg/kg for all samples in the same study.[7]

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

For cadmium, the HMI reference cooked median was lowest for winter squash (1.6 µg/kg) and highest for winter squash as sold (3 µg/kg); forms differ in water content, so this compares foods as sold or eaten, not uptake.[1,2,10,11,12] The HMI reference for lead in winter squash as sold pools 58 subgroup units from 3 sampling families, with a median of between 1 and 4 µg/kg and a middle half spanning 1 (lower quartile) and between 4 and 4.55 µg/kg (upper quartile).[1,11,12] cooked for lead in winter squash, the reference median was below 4 µg/kg, with a middle half from below 4 to below 4 µg/kg across 28 units.[2,8] for lead in winter squash as sold, the reference median was 535 µg/kg, with a middle half from 70 to 3,000 µg/kg across 4 units.[1,13]

Among GEMS/Food reporting regions, winter squash as sold had the lowest lead subgroup median in PAHO (1.3 µg/kg) and the highest in AFRO (70 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in PAHO (3 µg/kg) and the highest in AFRO (350 µg/kg).[1] For inorganic arsenic, the lowest regional median was in EURO (4.17 µg/kg) and the highest in EURO (81.3 µg/kg).[1]

In one study, chromium across 4 groups of winter squash ranged from 700 µg/kg (sampling phase 2, Kawran Bazar, Dhaka) to 1,200 µg/kg (sampling phase 4, Kawran Bazar, Dhaka); the lowest is the lowest observed in that study, not an established sourcing preference.[13]

5 | Processing, cooking and preparation

Processed or prepared forms were compared only with unprocessed winter squash in the same study and group. Cooked winter squash (market samples, Konya Province, turkey (2021 products)) had lead higher at 668 µg/kg, against 288 µg/kg for the unprocessed form in the same group (winter squash as sold).[14]

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

6 | Mitigation for winter squash

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.[7] 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 winter squash for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.83 µg/kg (Altıkulaç et al. 2025) to 3,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,15] Reporting limits for cadmium ranged from 0.5 µg/kg (WHO GEMS/Food) to 2,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1] Reporting limits for total arsenic ranged from 2.79 µg/kg (Altıkulaç et al. 2025) to 200 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,15]

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

9 | Buying and verifying winter squash

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

10 | Exposure from winter squash

No source in the library converted winter squash 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 winter squash was decided on its content: 26 occurrence extracted, 26 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 | Winter squash FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, dimethylarsinic acid, monomethylarsonic acid, total mercury, nickel, chromium, aluminum, tin, antimony, uranium, Co, Cu, Fe, Mn, Zn, V, Se, Ba, Mo, Sr and Ti in winter squash, most often lead, cadmium and total arsenic.[1,2,3,4] WHO GEMS/Food submissions reported lead in winter squash as sold from 443 results in 4 reporting regions, with subgroup medians from 1.3 to 70 µg/kg.[1]

In the studies available, winter squash from contaminated or exposed settings carried more metal than winter squash from the same study's control.[7] winter squash as sold from evening purchase had lead higher at 840 µg/kg, against 430 µg/kg for all samples in the same study.[7]

For cadmium, the HMI reference cooked median was lowest for winter squash (1.6 µg/kg) and highest for winter squash as sold (3 µg/kg); forms differ in water content, so this compares foods as sold or eaten, not uptake.[1,2,10,11,12]

Among GEMS/Food reporting regions, winter squash as sold had the lowest lead subgroup median in PAHO (1.3 µg/kg) and the highest in AFRO (70 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in PAHO (3 µg/kg) and the highest in AFRO (350 µg/kg).[1]

Only comparisons between forms in the same study are available, not before-and-after measurements of the same winter squash.[14] cooked winter squash (market samples, Konya Province, turkey (2021 products)) had lead higher at 668 µg/kg, against 288 µg/kg for the unprocessed form in the same group (winter squash as sold).[14]

Inorganic arsenic, the more toxic form, was measured in 8 results from 4 sources, far fewer than total arsenic.[1,-16,17,18] Laizu 2007 reported inorganic arsenic at 700 µg/kg (mean ± 600 SD) in winter squash as sold from fruiting vegetables, local market, Dhaka.[16]

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STATUS AND LICENCE

Editorially reviewed in-house; no external peer review has been completed on this ingredient profile. Published as an institutional technical report with its review state tracked on the article page. Released under CC BY 4.0.

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/winter-squash#sources.

PUBLICATION HISTORY

This revision 2026-10-22. The full dated record is maintained at https://heavymetalindex.com/ingredients/winter-squash.