Grapes

Karen Pendergrass · Heavy Metal Index, Institute of Contaminant Standards

HEAVY METAL INDEX · INGREDIENT PROFILE October 2026
DOI 10.83376/hmi.ingredient.grapes

CITE AS

Pendergrass, K. (2026). Grapes. Heavy Metal Index. https://doi.org/10.83376/hmi.ingredient.grapes

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

Grapes in the HMI library has 804 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, Ag, As, B, Ba, Be, Hg, Mg and Tl from 38 sources. WHO gems/food submissions reported lead in grapes as sold from 2,586 results in 4 reporting regions, with subgroup medians from 4.85 to 275 µg/kg. In the US Total Diet Study, grapes as sold had a median lead result below 4 µg/kg across 27 composites from 2017-2020.

1 | Grapes overview

Across 7 other studies of ordinary farms and markets, reported lead means and medians on an as-sold or fresh-weight basis ranged from 0.719 µg/kg (S-T et al. 2024) to 750 µg/kg (Guerra et al. 2012).[4,8] For cadmium, 4 studies on an as-sold or fresh-weight basis reported means and medians from 0.4 µg/kg (Rusin et al. 2021) to 240 µg/kg (Sembratowicz et al. 2010).[7,9] Higher results came from contaminated or exposed settings rather than ordinary supply. Grapes as sold from processed product, Poland retail/official control had lead higher at 70 µg/kg, against 5 µg/kg for fresh product, Poland retail/official control in the same study.[7]

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

2 | What counts as grapes

This page covers grapes in 6 forms kept separate in every comparison: grapes as sold (686 results), peeled or flesh grapes (77 results), dried grapes (15 results), grapes oil (12 results), grapes flour or meal (8 results) and grapes juice (6 results).[1,2,3,4,5,6] Foods made from grapes that have their own pages, such as grape jelly and grape juice, are covered there.

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 grapes

The evidence on how metals reach grapes comes from studies that compared exposed and ordinary settings. Grapes as sold from processed product, Poland retail/official control had lead higher at 70 µg/kg, against 5 µg/kg for fresh product, Poland retail/official control in the same study.[7] In another study, grapes as sold from microwave-cooked 10 min had nickel higher at 4,430 µg/kg, against 361 µg/kg for boiled 15 min at 102 C in the same study.[13]

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 grapes as sold pools 109 subgroup units from 4 sampling families, with a median of below 4 µg/kg and a middle half spanning below 4 (lower quartile) and 60 µg/kg (upper quartile).[1,2,9,16] dried for lead in grapes, the reference median was 15 µg/kg, with a middle half from below 3.33 to 34.5 µg/kg across 6 units.[1] for lead in grapes juice, the reference median was between 0.7 and 1.2 µg/kg, with a middle half from below 1 to 8.5 µg/kg across 4 units.[1]

Among GEMS/Food reporting regions, grapes as sold had the lowest lead subgroup median in PAHO (4.85 µg/kg) and the highest in EURO (275 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in EURO (8.5 µg/kg) and the highest in EMRO (11 µg/kg).[1]

Targeted grapes as sold samples in EURO had aluminum lower at 796 µg/kg, against 1,300 µg/kg for EURO in the same study.[1]

In one study, lead across 5 groups of grapes ranged from 30 µg/kg (Retail shop 3 (Prince Bazar, Mirpur-1), Dhaka) to 160 µg/kg (Retail shop 5 (Meena Bazar, Shyamoli), Dhaka); the lowest is the lowest observed in that study, not an established sourcing preference.[12] In another study, lead across 4 groups of grapes ranged from 14.4 µg/kg (amateur farmers; washed with 10% acetic acid vinegar) to 24.4 µg/kg (vegetable and fruit market; washed with 5% acetic acid vinegar); the lowest is the lowest observed in that study, not an established sourcing preference.[3]

5 | Processing, cooking and preparation

Processed or prepared forms were compared only with unprocessed grapes in the same study and group. Peeled or flesh grapes (all samples) had lead higher at 370 µg/kg, against 240 µg/kg for the unprocessed form in the same group (grapes as sold).[17]

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

6 | Mitigation for grapes

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 grapes for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 0.7 µg/kg (WHO GEMS/Food) to 3,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1] Reporting limits for cadmium ranged from 0.1 µg/kg (Nie et al. 2016) to 1,000 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,18] Reporting limits for total arsenic ranged from 1.7 µg/kg (WHO GEMS/Food) to 500 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1]

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

9 | Buying and verifying grapes

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

10 | Exposure from grapes

No source in the library converted grapes 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 grapes was decided on its content: 38 occurrence extracted, 38 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 | Grapes 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, Ag, As, B, Ba, Be, Hg, Mg and Tl in grapes, most often lead, cadmium and total arsenic.[1,2,3,4] WHO gems/food submissions reported lead in grapes as sold from 2,586 results in 4 reporting regions, with subgroup medians from 4.85 to 275 µg/kg.[1]

In the studies available, grapes from contaminated or exposed settings carried more metal than grapes from the same study's control.[7] grapes as sold from processed product, Poland retail/official control had lead higher at 70 µg/kg, against 5 µg/kg for fresh product, Poland retail/official control in the same study.[7]

Among GEMS/Food reporting regions, grapes as sold had the lowest lead subgroup median in PAHO (4.85 µg/kg) and the highest in EURO (275 µg/kg); reporting regions are markets, not growing areas.[1] For cadmium, the lowest regional median was in EURO (8.5 µg/kg) and the highest in EMRO (11 µg/kg).[1]

Only comparisons between forms in the same study are available, not before-and-after measurements of the same grapes.[17] peeled or flesh grapes (all samples) had lead higher at 370 µg/kg, against 240 µg/kg for the unprocessed form in the same group (grapes as sold).[17]

Inorganic arsenic, the more toxic form, was measured in 22 results from 5 sources, far fewer than total arsenic.[1,19,20,21,22] Across 2 other studies of ordinary farms and markets, reported inorganic arsenic means and medians with the basis not stated ranged from 3 µg/kg (Centre for Food Safety FEHD HKSAR 2012) to 4.5 µg/kg (U.S. Food and Drug Administration 2016).[21,22]

References

[1] GEMS/Food Contaminants database heavy-metal exports
World Health Organization · GEMS/Food Contamination Monitoring and Assessment Programme · 2026 · extranet.who.int
DATASET

[2] FY2018-FY2020 TDS Elements Analytical Results
U.S. Food and Drug Administration · FDA Total Diet Study · 2022 · www.fda.gov
DATASET

[3] Quantification and Reduction in Heavy Metal Residues in Some Fruits and Vegetables: A Case Study Galați County, Romania
Bora FD, Bunea A, Pop SR, Banita SI, Dusa DS, Chira A, et al. · Horticulturae · 2022 · doi.org/10.3390/horticulturae8111034
PEER-REVIEWED

[4] Heavy metals in vegetables and potential risk for human health
Guerra F, Trevizam AR, Muraoka T, Marcante NC, and Canniatti-Brazaca SG · Scientia Agricola 69(1):54-60 · 2012 · doi.org/10.1590/s0103-90162012000100008
PEER-REVIEWED

[5] Occurrence and health risk assessment of antimony, arsenic, barium, cadmium, chromium, nickel, and lead in fresh fruits consumed in South Korea
Lee J, Hwang I, Park YS, and Lee DY · Applied Biological Chemistry · 2023 · doi.org/10.1186/s13765-023-00799-x
PEER-REVIEWED

[6] The content of lead, cadmium, arsenic, mercury and tin in fruit and their products based on monitoring studies – exposure assessment
Mania M, Rebeniak M, Chabros E, Orshulyak O, and Postupolski J · Roczniki Państwowego Zakładu Higieny (Annals of the National Institute of Hygiene) · 2021 · doi.org/10.32394/rpzh.2021.0188
PEER-REVIEWED

[7] Concentration of cadmium and lead in vegetables and fruits
Rusin M, Domagalska J, Rogala D, Razzaghi M, and Szymala I · Scientific Reports · 2021 · doi.org/10.1038/s41598-021-91554-z
PEER-REVIEWED

[8] Determination, distribution, and health risk assessment of 12 heavy metals in various edible oils in Taiwan
Lin S-T, Liao K-W, Xuan T-C, Chiou T-Y, Lin Z-E, and Lee W-J · JSFA Reports · 2024 · doi.org/10.1002/jsf2.186
PEER-REVIEWED

[9] Contents of Nitrates (III) and (V), Lead and Cadmium in Select Domestic Fruits
Sembratowicz I, Rusinek E, and Ognik K · Polish Journal of Environmental Studies · 2010
PEER-REVIEWED

[10] Analysis of Toxic Heavy Metal Content of the Most Widely Consumed Fruits
Rahim M, Saqib NU, Wahid F, Khan N, and Alrawi LI · Journal of Physical Science · 2020 · doi.org/10.21315/jps2020.31.2.5
PEER-REVIEWED

[11] Metal Concentrations in Grape Spirits
van Wyk TN, van Jaarsveld F, and Caleb OJ · South African Journal of Enology and Viticulture 42(1): 36-43 · 2021 · doi.org/10.21548/42-1-4238
PEER-REVIEWED

[12] Determination and Risk Analysis of Heavy Metals in Different Fruits Collected from Different Shops of Dhaka City
Afrin S · M.S. Thesis, Sher-e-Bangla Agricultural University, Dhaka · 2020
PEER-REVIEWED

[13] Effect of thermal processing on toxic heavy metals in edible seaweeds of Gulf of Mannar and their health risk assessment
Sundhar S, Shakila RJ, Shalini R, Aanand S, and Jayakumar N · Regional Studies in Marine Science · 2023 · doi.org/10.1016/j.rsma.2023.102827
PEER-REVIEWED

[14] Essential elements in the different type of fruits, soil and water samples collected from Markazi province, Iran: a health risk assessment study
Mohammad Rezaei, Yousef Fakhri, Maryam Abtahi, Majid Keramati, Gholamreza Ghasemi, Mohammad H. Moradi, et al. · Quality Assurance and Safety of Crops & Foods · 2020 · doi.org/10.15586/qas.v12i3.777
PEER-REVIEWED

[15] Determination of heavy metals contamination in some vegetables and fruits samples from the market of Jagdalpur, Chhattisgarh State
Salhotra P and Verma R · IOSR Journal of Applied Chemistry · 2017 · doi.org/10.9790/5736-100502110113
PEER-REVIEWED

[16] Infants' and young children's dietary exposures to lead and cadmium: FDA total diet study 2018-2020
Spungen JH and et al. · Food Additives & Contaminants: Part A · 2024 · doi.org/10.1080/19440049.2024.2396910
PEER-REVIEWED

[17] Copper and other heavy metals in grapes: a pilot study tracing influential factors and evaluating potential risks in China
Li X, Dong S, and Su X · Scientific Reports (2018) 8:17407 · 2018 · doi.org/10.1038/s41598-018-34767-z
PEER-REVIEWED

[18] Assessing the concentration and potential health risk of heavy metals in China's main deciduous fruits
Nie JY, Kuang LX, Li ZX, Xu WH, Wang C, Chen QS, et al. · Journal of Integrative Agriculture 2016, 15(7): 1645-1655 · 2016 · doi.org/10.1016/S2095-3119(16)61342-461342-4)
PEER-REVIEWED

[19] Assessment of metal levels in foodstuffs from the Region of Valencia (Spain)
Marín S, Pardo O, Sánchez A, Sanchis Y, Vélez D, Devesa V, et al. · Toxicology Reports 5 (2018) 654-670 · 2018 · doi.org/10.1016/j.toxrep.2018.05.005
PEER-REVIEWED

[20] Total Diet Study of metals and other elements in food
Baxter M and Brereton N · Food and Environment Research Agency report for the UK Food Standards Agency, Fera report 15/06, project FS102081 · 2015 · www.food.gov.uk
GOVERNMENT

[21] The First Hong Kong Total Diet Study: Inorganic Arsenic
Centre for Food Safety FEHD HKSAR · Centre for Food Safety, Food and Environmental Hygiene Department, Government of the Hong Kong Special Administrative Region · 2012 · www.cfs.gov.hk
GOVERNMENT

[22] Analytical Results from Inorganic Arsenic in Rice Cereals for Infants, Non-Rice Infant Cereal and Other Foods Commonly Eaten by Infants and Toddlers
U.S. Food and Drug Administration · 2016 · www.fda.gov
DATASET

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.

DATA AVAILABILITY

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

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.

PUBLICATION HISTORY

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