Clementines and tangerines

Karen Pendergrass · Heavy Metal Index, Institute of Contaminant Standards

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Abstract

Clementines and tangerines in the HMI library has 101 reported results for lead, cadmium, total arsenic, inorganic arsenic, total mercury, methylmercury, nickel, chromium, aluminum, tin, antimony, Zn, V, Ba, DBT, DOT, OTC_sum_as_Sn, sumOTC, TBT, TPhT and TPT from 11 sources. WHO GEMS/Food submissions reported lead in clementines and tangerines as sold from 525 results in 4 reporting regions, with subgroup medians from 6.4 to 30 µg/kg. For cadmium, GEMS/Food gave subgroup medians below 5.5 µg/kg, mostly non-detects from 473 results.

1 | Clementines and tangerines overview

Across 2 other studies of ordinary farms and markets, reported lead means and medians on an as-sold or fresh-weight basis ranged from 14.9 µg/kg (Lee et al. 2011) to 22.1 µg/kg (Lee et al. 2023).[2,3] For cadmium, 3 studies with the basis not stated reported means and medians from 0.17 µg/kg (Czech et al. 2021) to 60 µg/kg (authors 2017).[6,7]

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

2 | What counts as clementines and tangerines

This page covers clementines and tangerines as sold (101 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 clementines and tangerines

No study in the library compared clementines and tangerines from contaminated and ordinary settings, so the routes by which metals reach it are not measured here.

4 | Which forms and regions measured lower

The HMI reference for lead in clementines and tangerines as sold pools 58 subgroup units from 1 sampling family, with a median of between 5.2 and 13 µg/kg and a middle half spanning below 8 (lower quartile) and between 16 and 23 µg/kg (upper quartile).[1] for cadmium in clementines and tangerines as sold, the reference median was below 2 µg/kg, with a middle half from below 1.1 to below 3 µg/kg across 41 units.[1] For total arsenic in clementines and tangerines as sold, the reference median was below 10 µg/kg, with a middle half from below 5.35 to below 20 µg/kg across 31 units.[1]

Among GEMS/Food reporting regions, clementines and tangerines as sold had the lowest lead subgroup median in PAHO (6.4 µg/kg) and the highest in EURO (24 µg/kg); reporting regions are markets, not growing areas.[1]

Targeted clementines and tangerines as sold samples in WPRO had lead higher at 30 µg/kg, against 10 µg/kg for WPRO in the same study.[1]

In one study, lead across 6 groups of clementines and tangerines ranged from 6.4 µg/kg (PAHO) to 24 µg/kg (EURO); the lowest is the lowest observed in that study, not an established sourcing preference.[1]

5 | Processing, cooking and preparation

No processing study for metals in this food is in the library yet.

6 | Mitigation for clementines and tangerines

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

7 | Trade-offs and limits of controls

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 clementines and tangerines for metals

Results depend on the method and its reporting limit. Reporting limits for lead ranged from 1 µg/kg (WHO GEMS/Food) to 50 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1] Reporting limits for cadmium ranged from 0.001 µg/kg (Lee et al. 2011) to 50 µg/kg (WHO GEMS/Food), so a non-detect from a less sensitive method says much less.[1,2] Reporting limits for total arsenic ranged from 2.14 µg/kg (Lee et al. 2023) to 125 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 clementines and tangerines

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

10 | Exposure from clementines and tangerines

No source in the library converted clementines and tangerines 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 clementines and tangerines was decided on its content: 11 occurrence extracted, 11 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 | Clementines and tangerines FAQs

The library reports lead, cadmium, total arsenic, inorganic arsenic, total mercury, methylmercury, nickel, chromium, aluminum, tin, antimony, Zn, V, Ba, DBT, DOT, OTC_sum_as_Sn, sumOTC, TBT, TPhT and TPT in clementines and tangerines, most often lead, cadmium and total arsenic.[1,2,3,4] WHO GEMS/Food submissions reported lead in clementines and tangerines as sold from 525 results in 4 reporting regions, with subgroup medians from 6.4 to 30 µg/kg.[1]

Among GEMS/Food reporting regions, clementines and tangerines as sold had the lowest lead subgroup median in PAHO (6.4 µg/kg) and the highest in EURO (24 µg/kg); reporting regions are markets, not growing areas.[1]

Inorganic arsenic, the more toxic form, was measured in 4 results from 2 sources, far fewer than total arsenic.[1,8] WHO GEMS/Food submissions reported inorganic arsenic in clementines and tangerines as sold from 6 results in 1 reporting region, with a subgroup median of 8.65 µg/kg.[1]

References

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DATASET

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GOVERNMENT

STATUS AND LICENCE

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COMPETING INTERESTS

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DATA AVAILABILITY

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

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