



*Monitoring of Nickel content in foodstuffs on the
Luxembourgish market.*

Contributions to dietary intake.

Luc SCHULER, Ph.D.
Division of Food Safety
Ministry of Health

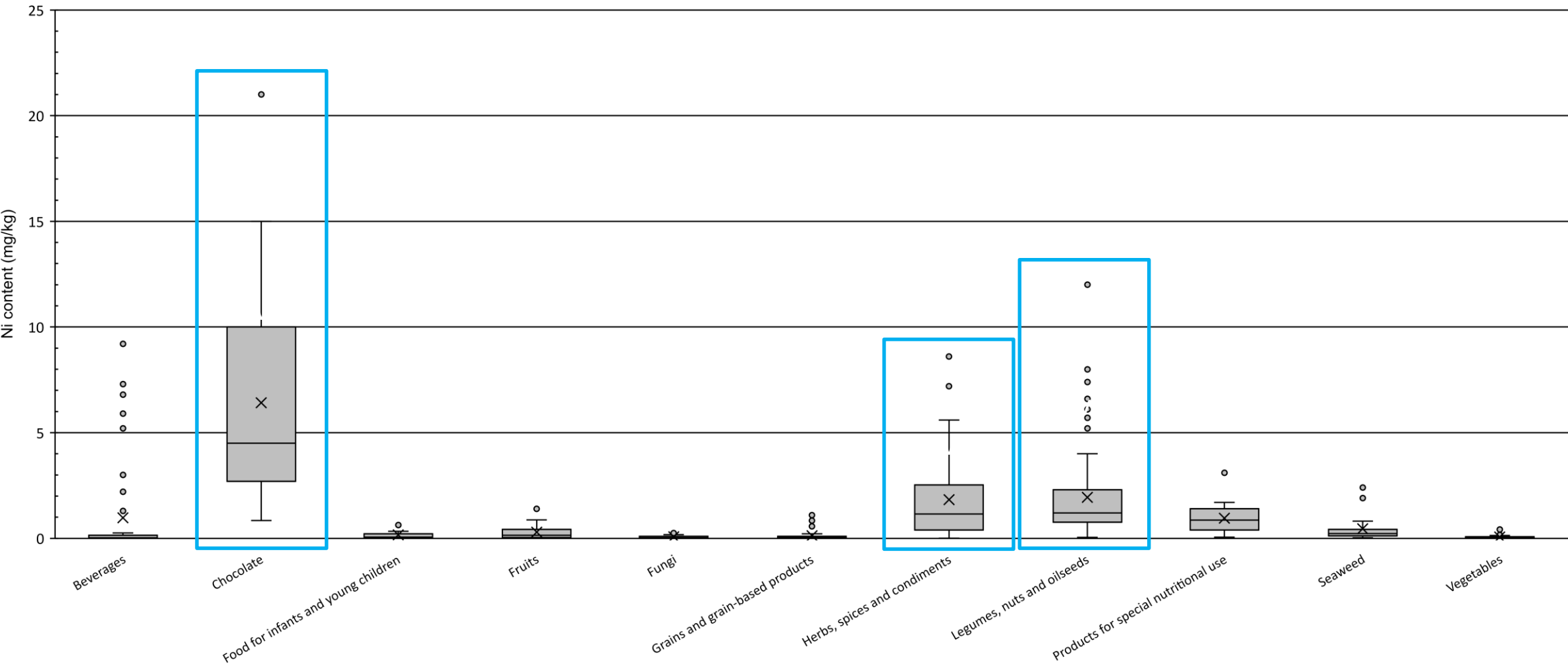


- Nickel (Ni) is quite common in the rocks of the earth's crust and can therefore be found in foodstuffs and drinking water.
- Ni intake in the EU Member States varies and depends on the natural occurrence in the environment, local industry and consumption habits.
- Exposure: food intake, leaching from stainless steel cooking ware, ...
- Ni toxicity relates in allergic skin reactions in people sensitised to this metal.
- Inhalation of Ni may increase the risk of lung fibrosis and cancer of the respiratory tract.
- It is estimated that up to 17% of women and 3% of men are allergic to nickel.
- In 2015, EFSA fixed the tolerable daily intake at 2.8 µg/kg body weight which was updated to 13 µg/kg body weight in 2020.
- No official limits have been set.

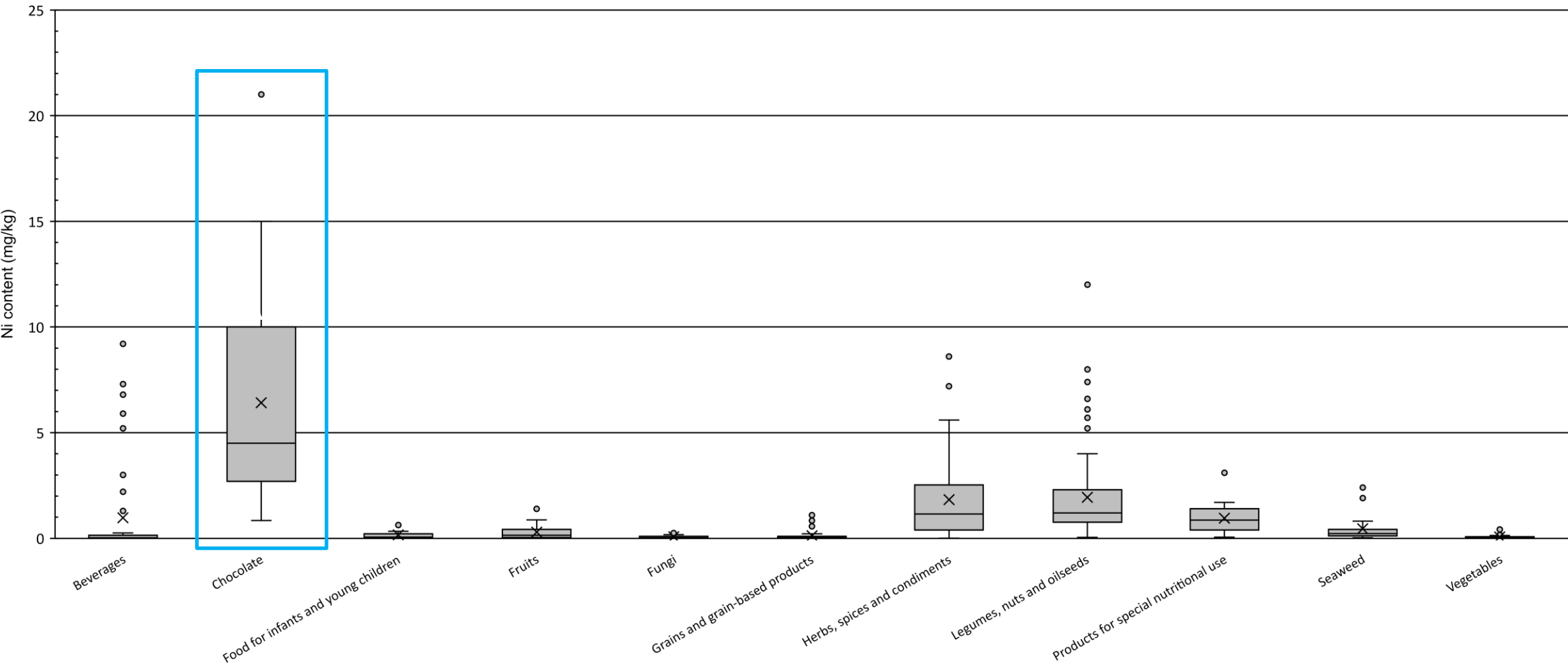


- Monitoring of contaminants in food allows:
 - obtaining representative data on the occurrence of substances in food and other commodities that are undesirable to health,
 - assess consumer exposure,
 - analysis of trends and recognition of potential health risks.
- The Luxembourgish market is unique in Europe; 625 000 residents, of which 47,4 % are of foreign background representing 170 nationalities.
- The aim of this study was to analyse nickel content in plant based foods and beverages most commonly consumed in Luxembourg.
- 580 analysed samples from 2017-2020.

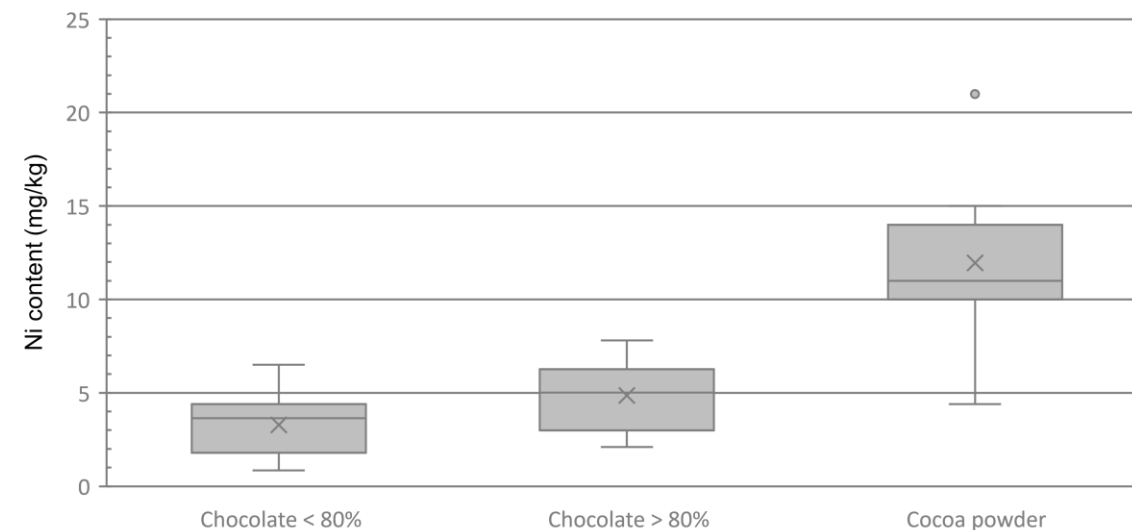
Ni content in analyzed food categories



Ni content in analyzed food categories



Product		Ni content (mg/kg)		
		Minimum	Maximum	Mean
Chocolate < 80%	17	0.844	6.500	3.281
Chocolate > 80%	8	2.100	7.800	4.851
Cocoa powder	15	4.400	21.000	11.960

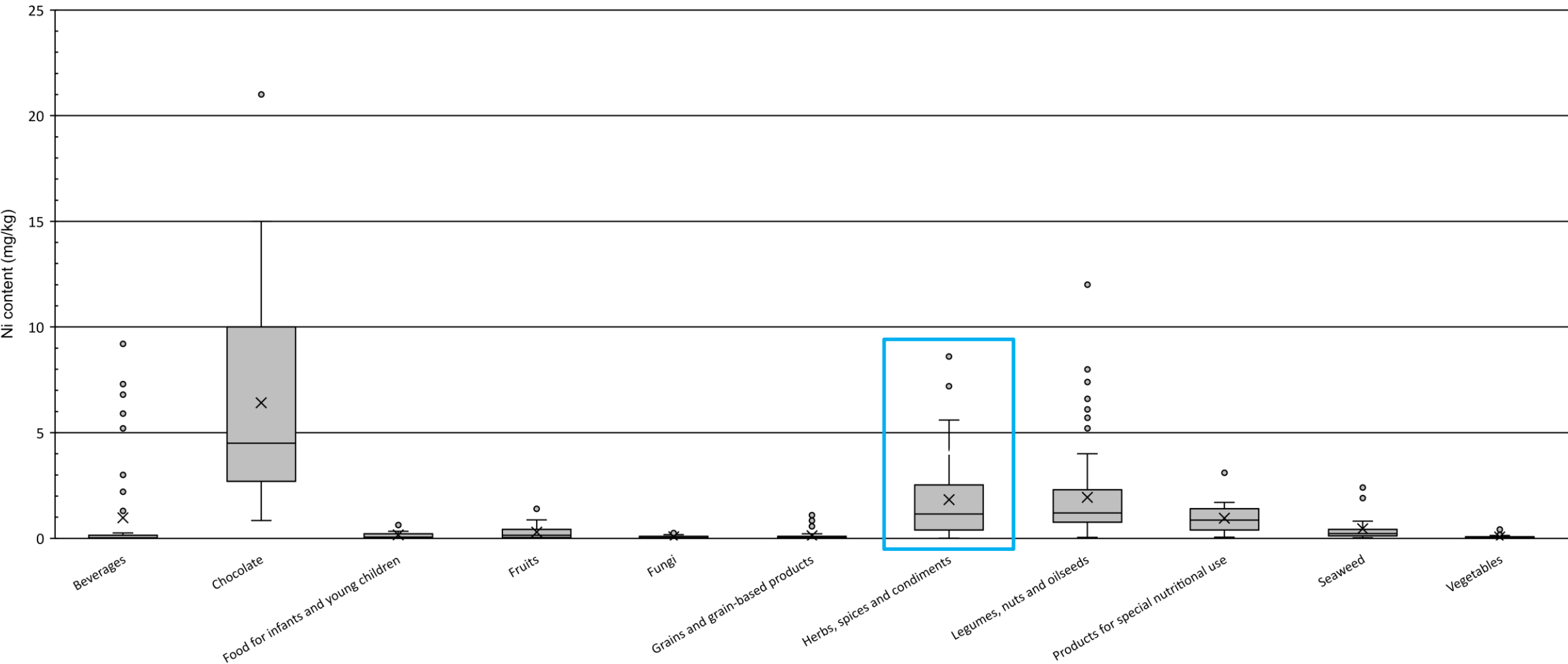


Kruszewski *et al.* reported a maximum Ni content of 12.1 mg/kg in raw cocoa and 4.5 mg/kg in chocolate.

Babaahmadifooladi *et al.* reported a nickel concentration varying from 0.883 to 8.457 mg/kg for chocolate and derived products.

EFSA reported high mean values for certain types of chocolate products (3.8 mg/kg) and cocoa products (9.5 mg/kg)

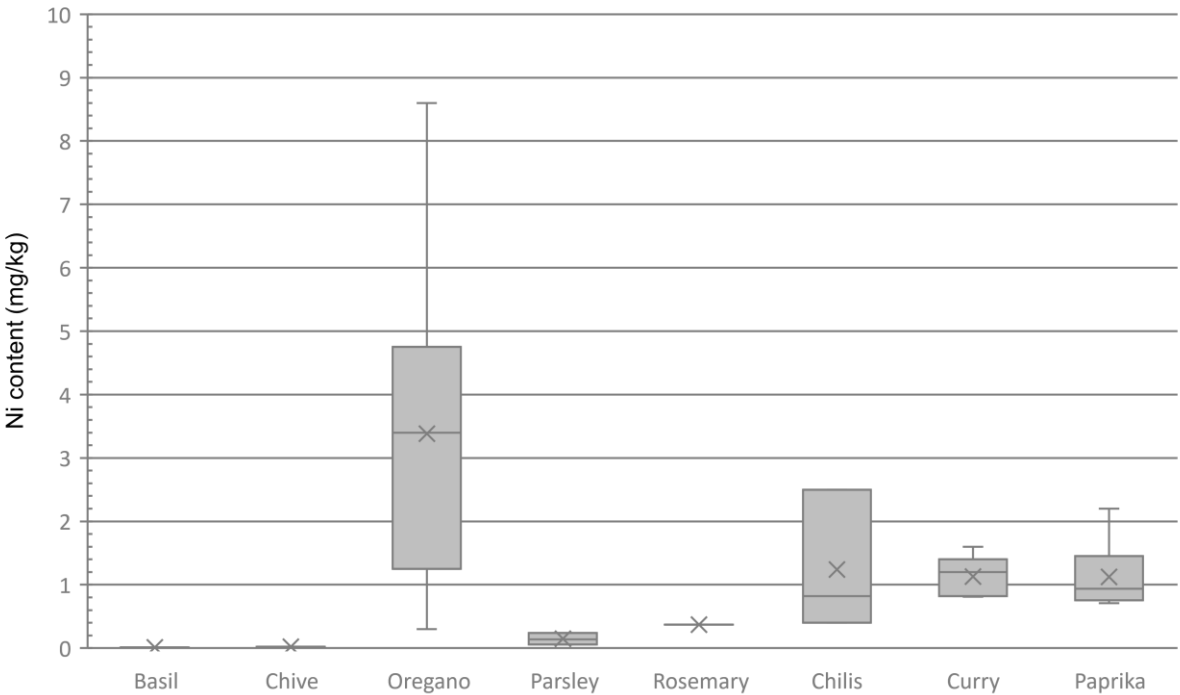
Ni content in analyzed food categories



Aromatic herbs and spices



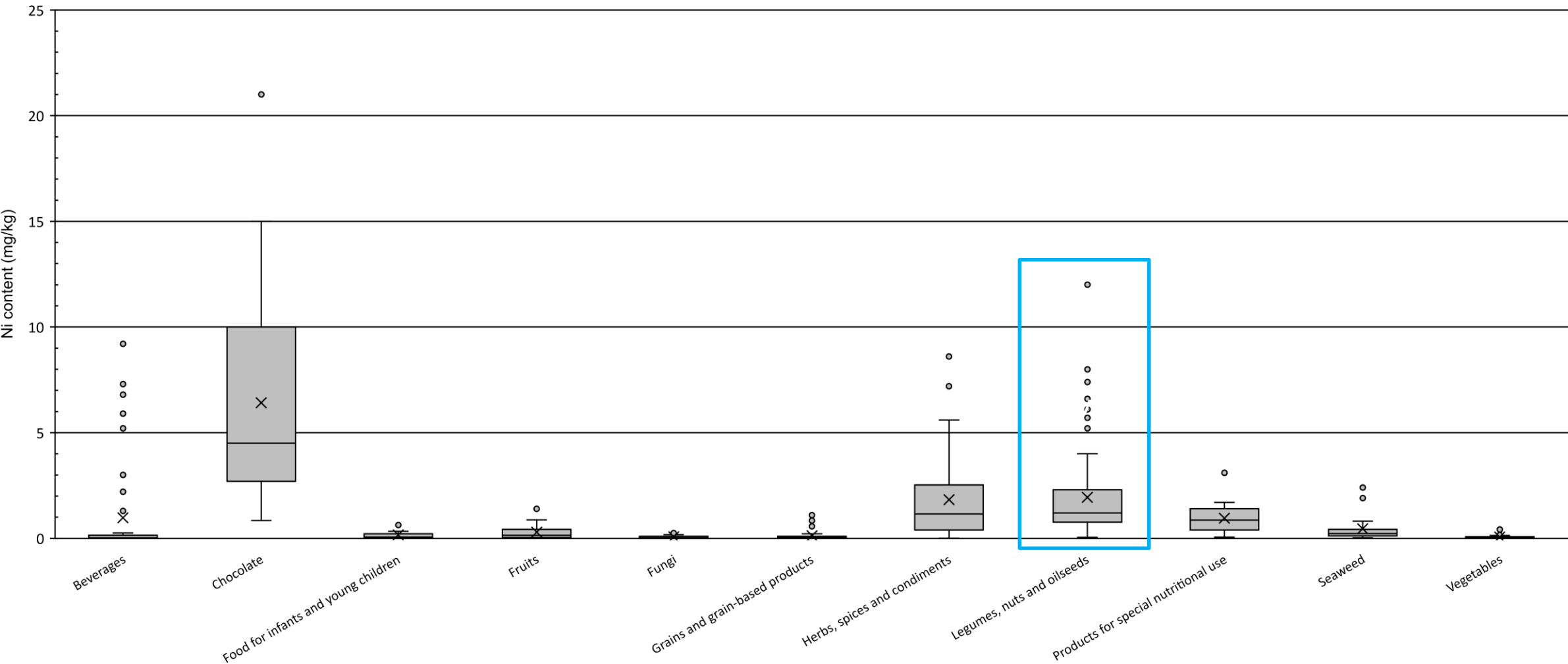
Product	N	Ni content (mg/kg)		
		Minimum	Maximum	Mean
Basil	1	0.010	0.010	0.010
Chive	1	0.020	0.020	0.020
Oregano	13	0.300	8.600	3.383
Parsley	3	0.058	0.240	0.146
Rosemary	1	0.370	0.370	0.370
Chilis	3	0.400	2.500	1.240
Curry	5	0.810	1.600	1.128
Paprika	6	0.710	2.200	1.125



A study of the polish market revealed a Ni content in oregano of 10.6 mg/kg.

Oregano seems to accumulate more Ni than other aromatic herbs.

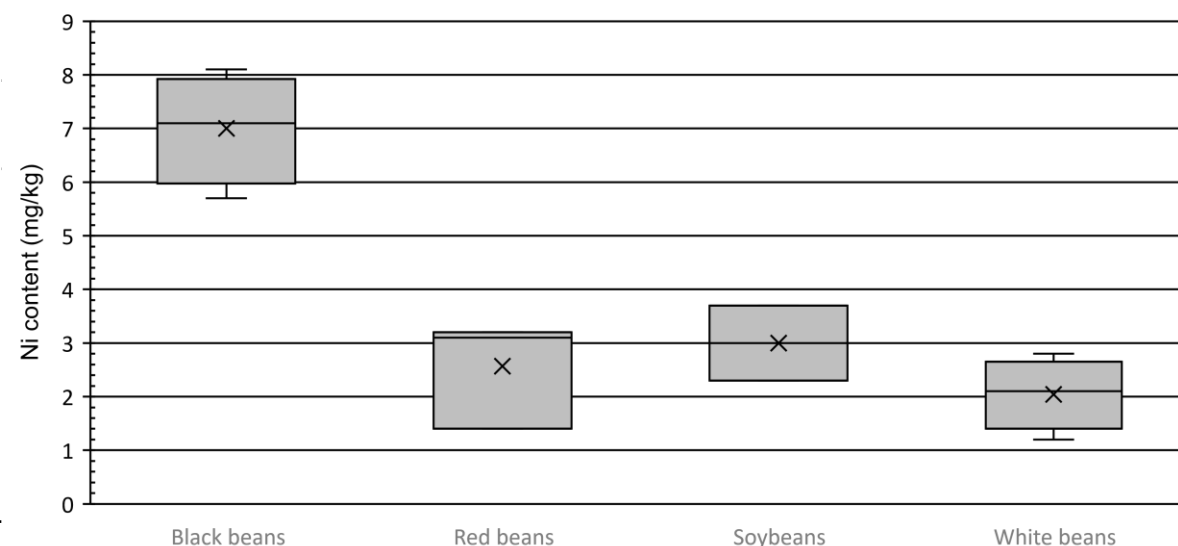
Ni content in analyzed food categories



Legumes



Product	N	Ni content (mg/kg)		
		Minimum	Maximum	Mean
Black beans	4	5.700	8.100	7.000
Red beans	3	1.400	3.200	2.567
Soybeans	2	2.300	3.700	3.000
White beans	5	1.200	2.800	2.040



According to EFSA, dried beans contain mean levels of Ni ranging from 3.055 to 3.077 mg/kg.

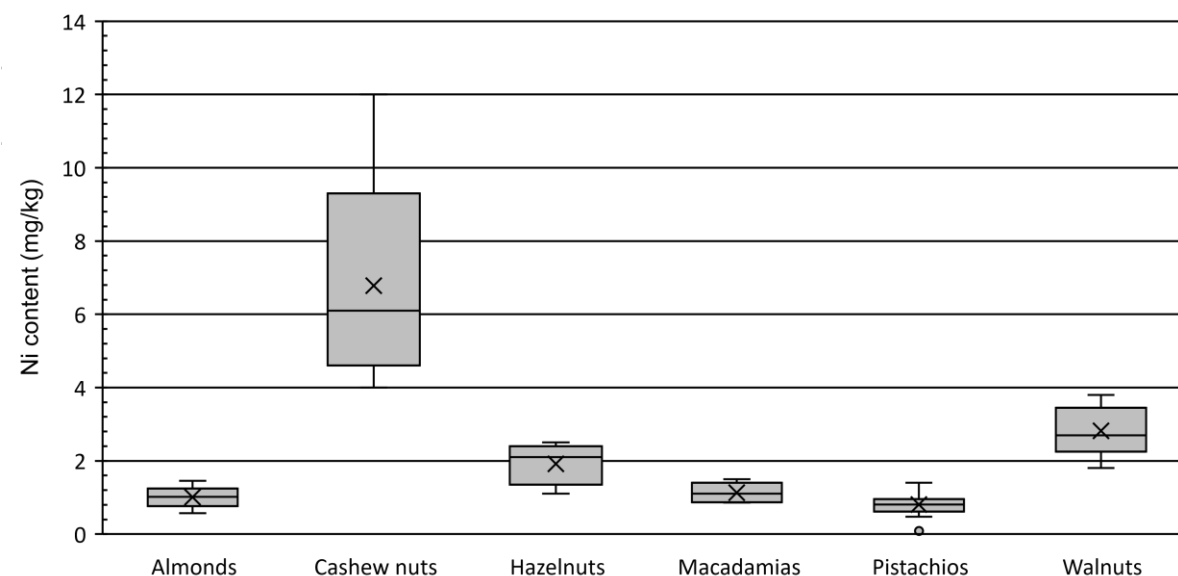
A recent study from the Belgian market reported a nickel concentration of 2.892 mg/kg in different types of beans including white red and black beans.

Black beans seem to contain more than twice as much Ni than any other analysed sample of this category.

Nuts



Product	N	Ni content (mg/kg)		
		Minimum	Maximum	Mean
Almonds	10	0.571	1.450	1.007
Cashew nuts	5	4.000	12.000	6.780
Hazelnuts	5	1.100	2.500	1.920
Macadamias	5	0.860	1.500	1.128
Pistachios	30	0.086	1.400	0.804
Walnuts	5	1.800	3.800	2.820

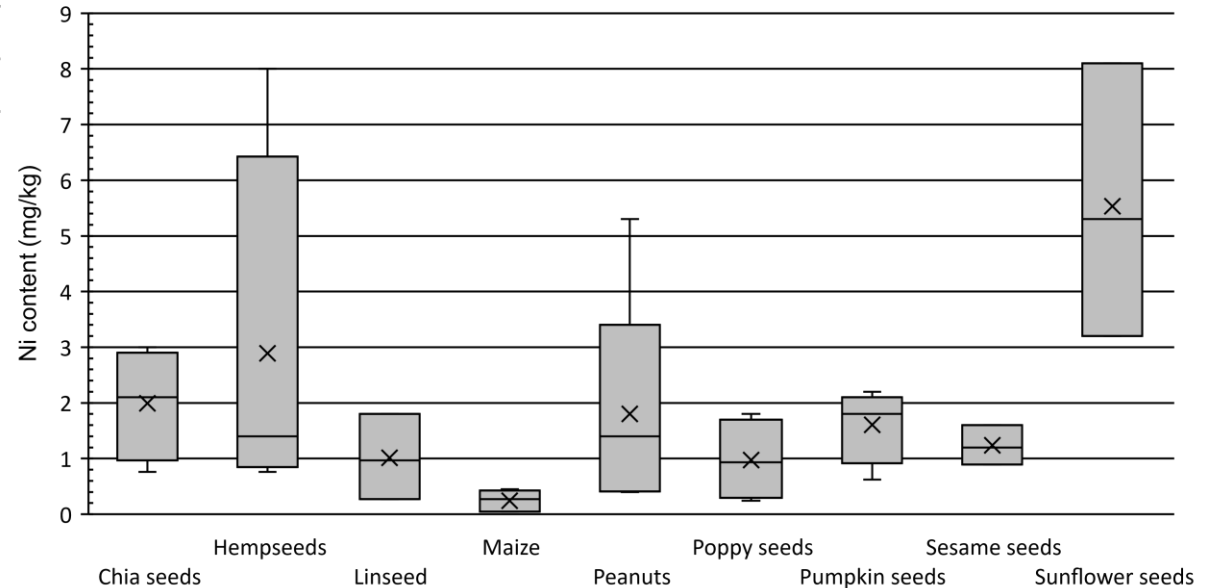


Soares *et al.* reported a Ni content in cashews ranging from 3.6 to 6.8 mg/kg (mean 6 mg/kg).

Babaahmadifooladi *et al.* reported Ni content for almonds (0.577 to 1,092 mg/kg), hazelnuts (1.196 to 3.846 mg/kg), pistachio (0.406 to 1.740 mg/kg) and walnuts (0.721 to 4.624 mg/kg).

The setting of a potential maximum limit for Ni in nuts should be considered.

Product	N	Ni content (mg/kg)		
		Minimum	Maximum	Mean
Chia seeds	4	0.760	3.000	1.990
Hempseeds	4	0.760	8.000	2.890
Linseed	3	0.270	1.800	1.013
Maize	5	0.044	0.450	0.243
Peanuts	5	0.400	5.300	1.804
Poppy seeds	4	0.240	1.800	0.975
Pumpkin seeds	4	0.620	2.200	1.605
Sesame seeds	5	0.890	1.600	1.238
Sunflower seeds	3	3.200	8.100	5.533



Mihoc *et al.* reported a Ni content of up to 6 mg/kg in hems seeds depending on the variety.

Andersen *et al.* reported nickel contents of 25 samples of sunflower kernels ranging from 2.3 to 5.3 mg/kg.

Hemp (*Cannabis sativa* L.) and sunflower (*Helianthus annuus*) are known for their tolerance to elevated heavy metals in soils and their ability to bioaccumulate these pollutants.

Therefore, the use of hemp seeds, sunflower kernels, peanuts and their derived products in food for human consumption raises concerns about elevated Ni content.



- Soil contamination and geographical origin has a strong influence on contaminants level in the raw material.
- Ni is one of the substances for which the toxicological reference values are easily exceeded taking into account average exposure data for children.
- Increased nickel contents were found in nuts, oilseeds, legumes and chocolate/chocolate derived products.
- The careful selection of food with relatively low nickel concentration can result in the reduction in the total dietary intake of nickel per day.



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