



RUOKAVIRASTO
Livsmedelsverket • Finnish Food Authority

Publications

4/2024

Fineli analyses 2022–2023: Cheeses and cereals



Finnish Food Authority publications 4/2024

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Cheeses and cereals



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Description

Publisher	Finnish Food Authority
Authors	Finnish Food Authority, Chemistry Unit
Title of publication	Fineli analyses 2022–2023: Cheeses and cereals
Series and publication number	Finnish Food Authority publications 4/2024
Publications date	04/2024
ISBN PDF	978-952-358-062-6
ISSN PDF	2669-8307
Pages	38
Language	English
Keywords	Fineli, chemical composition of food
Publisher	Finnish Food Authority
Layout	Finnish Food Authority, In-house Services Unit
Distributed by	Online version: foodauthority.fi

Abstract

The purpose of this work/study was to update composition data in Fineli (Finnish Food Composition Database). The analysed food items are selected by Fineli monitoring group, which is led by the Finnish Institute for Health and Welfare (THL). The Finnish Food Authority is responsible for the sampling, analyses and reporting of the results. THL takes care of updating the data into the Fineli database.

In 2022-2023, the Fineli updating work concerned cheeses and cereal products. A total of 23 food items (13 cheeses and 10 cereal products) were analysed. Almost all were analysed for basic composition (protein, fat, water, ash), amino acids, fatty acids, vitamins B1 and B2, and chemical elements. Sugars, starch, and dietary fibre were analysed from only three cereal products. The analyses were performed by the Laboratory of Chemistry at the Finnish Food Authority, except for vitamins B1 and B2, which were analysed in a commercial laboratory.

This report presents all the obtained results. The new analytical results have been compared to previous Fineli values when applicable. It was noted that most of the new results differ from the previous values in Fineli. The differences were observed both as percentages and as absolute values, as even small changes in very small concentrations appeared to be large in percentage terms only.

Compared to previous data, there were many differences in fatty acid results, which may be due to deficiencies in previous results for some fatty acids. The analysis results for selenium and phosphorus were generally higher than the previous values in Fineli. On the other hand, the iron contents of cheeses were somewhat lower than Fineli results. For many cheeses, most of the chemical element results were clearly different from Fineli values. According to the new analyses, the majority of the vitamin B1 and B2 results were significantly lower than Fineli values.

Since there were significant differences between the new analytical results and the previous Fineli values, updating the compositional database is very necessary also in the future. Fineli has a wide range of users, the needs of the users are diverse, and updated values are crucial in many cases.

Kuvailulehti

Julkaisija	Ruokavirasto
Tekijät	Ruokavirasto, kemian yksikkö
Julkaisun nimi	Fineli-analyysit 2022–2023: Juustot ja viljat
Julkaisusarjan nimi ja numero	Ruokaviraston julkaisuja 4/2024
Julkaisuaika	04/2024
ISBN PDF	978-952-358-062-6
ISSN PDF	2669-8307
Sivuja	38
Kieli	English
Asiasanat	Fineli, elintarvikkeiden kemiallinen koostumus
Kustantaja	Ruokavirasto
Taitto	Ruokavirasto, käyttäjäpalvelujen yksikkö
Julkaisun jakaja	Sähköinen versio: ruokavirasto.fi

Tiivistelmä

Vuosina 2022–2023 toteutetun Finelin (kansallinen elintarvikkeiden koostumustietokanta) päivitystyön tarkoituksena oli saattaa juustojen ja viljatuotteiden tiedot ajan tasalle. Analysoitavat nimikkeet valittiin Finelin seurantaryhmässä, jonka koollekutsujana toimii THL. Näytteenotosta, analyysistä ja tulosten raportoinnista vastasi Ruokavirasto. THL huolehtii tietojen päivittämisestä Fineli-tietokantaan.

Työssä analysoitiin 23 nimikettä (13 juustoa ja 10 viljatuotetta), joista lähes kaikista analysoitiin peruskoostumus (proteiini, rasva, vesi, tuhka), aminohapot ja rasvahapot, B1- ja B2-vitamiinit sekä alkuaineet. Sokerit, tärkkelys ja ravintokuitu analysoitiin vain kolmesta viljatuotteesta. Analyysit tehtiin Ruokaviraston kemian laboratoriossa, lukuun ottamatta B-vitamiineja, jotka analysoitiin kaupallisessa laboratoriossa.

Tässä raportissa on esitetty kaikki päivitystyössä saadut tulokset. Analyysituloksia on verrattu Finelin aikaisempiin arvoihin soveltuvien osien. Vertailussa huomattiin, että suurin osa uusista tuloksista poikkeaa aikaisemmista arvoista. Eroja tarkasteltiin sekä prosentuaalisesti että absoluuttisina lukuina, sillä pienetkin muutokset hyvin pienissä pitoisuuksissa näyttivät prosentuaalisesti suurilta.

Erityisesti rasvahappotuloksissa oli paljon eroja aikaisempiin tietoihin verrattuna, mikä saattaa johtua aikaisempien tulosten puutteista joidenkin rasvahappojen osalta. Seleenin ja fosforin analyysitulokset olivat yleisesti suurempia kuin Finelissä. Juustojen rautapitoisuudet puolestaan olivat jonkin verran Finelin tuloksia pienempiä. Useiden juustojen kohdalla valtaosa alkuainetuloksista erosi selvästi Finelin arvoista. Suurin osa B1- ja B2-tuloksista oli uusien analyysien mukaan merkittävästi Finelin arvoja pienempiä.

Analyysitulokset ja aikaisempien Finelin arvojen välillä oli merkittävässä määrin eroja. Voidaan todeta koostumustietokannan päivittämisen olevan erittäin tarpeellista myös jatkossa, koska sen käyttäjäkunta on laaja ja käyttötarkoitukset moninaiset.

Beskrivning

Utgivare	Livsmedelsverket
Författare	Livsmedelsverket, enheten för kemi
Publikationens titel	Fineli-analyser 2022–2023: Ostar och spannmål
Publikationsseriens namn och nummer	Livsmedelsverkets publikationer 4/2024
Utgivningsdatum	04/2024
ISBN PDF	978-952-358-062-6
ISSN PDF	2669-8307
Sidantal	38
Språk	Engelska
Nyckelord	Fineli, livsmedlens kemiska sammansättning
Förläggare	Livsmedelsverket
Layout	Livsmedelsverket, enheten för interna stödtjänster
Distribution	Elektronisk version: livsmedelsverket.fi

Referat

Syftet med uppdateringen av Fineli (den nationella livsmedelsdatabasen) som genomfördes 2022–2023 var att uppdatera uppgifterna om ostar och spannmålsprodukter. De produkter som analyserades valdes ut av den av THL sammankallade uppföljningsgruppen för Fineli. Livsmedelsverket ansvarade för provtagning, analyser och rapportering av resultat. THL ansvarar för uppdateringen av uppgifterna i Fineli-databasen.

Tjugotre produkter (13 ostar och 10 spannmålsprodukter) analyserades. Det grundläggande innehållet (protein, fett, vatten, aska), amino- och fettsyror, vitamin B1 och B2 och grundämnen analyserades i nästan alla produkter. Sockerarter, stärkelse och kostfiber analyserades endast i tre spannmålsprodukter. Analyserna utfördes av Livsmedelsverkets kemiska laboratorium, med undantag för vitaminerna B1 och B2, som analyserades i ett kommersiellt laboratorium.

I denna rapport presenteras alla resultat från uppdateringen. Analysresultaten har i tillämpliga delar jämförts med tidigare värden i Fineli. Jämförelsen visade att de flesta av de nya resultaten skiljer sig från de tidigare värdena. Skillnaderna beaktades både som procentuella och absoluta tal, eftersom även små förändringar i mycket små koncentrationer verkade stora procentuellt sett.

Skillnaderna var särskilt stora i resultaten för fettsyror jämfört med tidigare data och detta kan bero på brister i tidigare resultat för vissa fettsyror. Analysresultaten för selen och fosfor var i allmänhet högre än i Fineli. Järnhalten i ostarna var något mindre än resultaten i Fineli. För flera ostar skiljde sig majoriteten av resultaten för grundämnen tydligt från värdena i Fineli. De flesta resultaten för vitaminerna B1- och B2 var betydligt lägre enligt de nya analyserna än värdena i Fineli.

Skillnaderna mellan analysresultaten och de tidigare värdena i Fineli var signifikanta. Man kan dra slutsatsen att det finns ett stort behov av att fortsätta uppdatera databasen över livsmedlens sammansättning, med tanke på att databasen har många olika användare och användningsområden.

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1 Background

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2 Sampling

The sampling plan was based on the market shares of the three largest trade groups. The aim was to collect 12 subsamples for every 23 food items, for a total of 276 subsamples. Due to the variation in the batches of cheeses and the assortment of stores, samples (food items 1-13) were collected from 12 different stores. At the stores, products were selected based on supply. Since flour and other cereal products (food items 14-23) were considered homogenous and industrially processed products, they were purchased from three shops based on market shares and supply.

Table 1. Number of subsamples taken in the sampling. The number of subsamples purchased is presented by Finnish trade groups and in total.

Nro	Food	FoodEx2	S-Group	K-Group	Lidl	Total
1	Cream cheese, c. 30% fat	A02VY	7	4	1	12
2	Edam, c. 25% fat	A02TV	7	4	1	12
3	Gouda, c. 30% fat	A02VA	7	4	1	12
4	Semi-hard light cheese, c. 17% fat	A02XY	7	4	1	12
5	Emmental, Red-Label, c. 30% fat	A02YM	7	4	1	12
6	Polar / (Emmental-type, light), 15-17% fat	A02YE	8	3	1	12
7	Cottage cheese, 2% fat	A02QG	7	4	1	12
8	Cottage cheese, fat-free	A02QG	7	4	1	12
9	Slices of processed cheese, c. 23% fat	A031B	7	4	1	12
10	Cheese spread, c. 12% fat	A031C	1	2	1	4
11	Processed cheese, unflavoured, 20-25% fat	A02QZ	7	4	1	12
12	Processed cheese, unflavoured, c. 15% fat	A02QZ	4	4	1	9
13	Finnish oven cheese*	A02QT	7	4	1	12
14	Rolled oats	A00DH	6	5	1	12
15	Wheat flour, semi-coarse	A003Y	4	4	1	9
16	Rye flour, wholemeal rye flour	A003M	6	5	1	12
17	Barley flour, wholemeal barley flour	A002L	2	2	-	4
18	Wholemeal wheat flour/graham flour	A003Z	3	2	-	5
19	Dark wheat flour	A004A	4	5	1	10
20	Semolina, wheat groats	A004F	4	4	1	9
21	Buckwheat flour	A002G	5	2	-	7
22	Rice, long grain	A003E	6	4	-	10
23	Barley groats	A002K	3	7	-	10

Although not all the planned subsamples were obtained (Table 1), the sampling was well proportional to the market situation and can be considered comprehensive for the 2022 trade situation.

2.1 Pre-treatment of samples

An equal amount of subsamples of each food item was weighed and pooled into one composite sample. The composite sample was then mixed and ground. About half of the composite sample of each cheese was freeze-dried and, after drying, ground again. All the cereal samples as well as the freeze-dried cheeses were ground through a 0.5 mm sieve. In all steps, care was taken to avoid metal contamination by using plastic bowls, ceramic knives, and metal-free mill blades. Moisture analyses were performed immediately after pooling. All cheese samples were stored in a freezer, while some grain samples were kept in a freezer and some at room temperature until analysis.

3 Analytical methods used

Laboratory analyses were mainly performed at the Finnish Food Authority. Vitamins B1 and B2 (thiamine and riboflavin) were subcontracted from a commercial laboratory (Eurofins Vitamin Testing Denmark). Analytical methods, compounds analysed, measurement uncertainties and limits of quantification used by the Finnish Food Authority are listed in Table 2, while the analyses per food item are given in Table 3.

The chemistry laboratory at the Finnish Food Authority is the testing laboratory T014 accredited by the FINAS Accreditation Service, accreditation requirement SFS-EN ISO/IEC 17025. All methods marked with an asterisk (*) in Table 2 are accredited. Results between the limit of quantification (LOQ) and the limit of detection (LOD) are reported as quantitative for usability but are not accredited results.

For validated and accredited methods, 2-3 replicate samples are typically used in the analyses. In this report, results are presented as means of parallel analyses without ranges, as in the Fineli database.

Table. Analytical methods used by the Food Authority, including their measurement uncertainties and limits of quantification.

Analysis (Method No)	Method type	Measurement uncertainty (MU)	Limit of detection (LOD)	Other information
Moisture (Evira 8280*)	Drying + gravimetric	8%	-	
Ash (Evira 8214)	Ashing + gravimetric	0.24% units	Suitable for contents >0.45 g/100 g ([□] >0.05 g/100 g)	
Protein (Evira 8282*)	Kjeldahl	8%, for contents ≤40%; 4%, for contents >40%	-	Nitrogen-to-protein factor 6.25
Starch (LM 8336*)	Enzymatic + HPLC-RI	6%	0.4 g/100 g ([□] >0.03 g/100 g)	
Sugars (Evira 8333*) (Evira 8334*)	Hot water extraction + HPLC-RI/HPAEC-PAD	16.5% 5.13%	0.2 g/100 g (HPLC) ([□] >0.03 g/100 g) 0.5 mg/100 g (HPAEC)	
Dietary fibre (LM 8337*)	Enzymatic-gravimetric + HPLC-RI	20%	0.2 g/100 g	
Fat (Evira 8206*)	Solvent extraction + gravimetric	14%, for contents <5%; 8%, for contents 5–10%; 4%, for contents >10%	0.1 g/100 g	

Analysis (Method No)	Method type	Measurement uncertainty (MU)	Limit of detection (LOD)	Other information
Fatty acids (Evira 8237*)	Fat extraction + esterification (FAME ¹) + GC-MS	36%, for contents <2%; 16%, for contents 2–15%; 6%, for contents >15%; 42% for short-chain fatty-acids (C4-C10)	0.8 g/kg of oil (0.08% of total fatty acids)	Fatty acid group totals calculated on the basis of individual analyses. The chromatographic response of FAME1 is corrected by a factor calculated from the response of the reference compounds and, if necessary, the sum of the fatty acids is normalised to 98–100%.
Amino acids (Evira 8263*)	Oxidation/no oxidation, acid hydrolysis, UPLC-UV	Cys 27%; His 26%; Met 24%; Ser, Ala, Lys 21%, Arg 12%; Gly, Asp 15%; Glu, Thr, Ile 18%; Pro 19%; Tyr 23%; Val, Phe 20%; Leu 16%	0.32–1.00 g/kg for individual amino acids	Accredited for feed only, food results not accredited
Tryptofan (Evira 8265*)	Basic hydrolysis, UPLC-FL	Trp 20%	1 g/kg	Accredited for feed only, food results not accredited
Chemical elements (Evira 8128*)	ICP-MS (As, Cd, Cr, Cu, Mn, Ni, Pb, Se, Zn)	As, Mn, Pb: 0.010– 0.015: 0.0030 mg/kg, >0.015: 20% Cd: 0.0010–0.0015: 0.00030 mg/kg, >0.0015: 20% Cr: 0.10–0.13: 0.070 mg/kg; >0.13: 55% Cu: 0.20–0.40: 0.080 mg/kg; >0.40: 20% Ni: 0.10–0.15: 0.030 mg/kg; >0.15: 20% Se: 0.020–0.033: 0.010 mg/kg; >0.033: 30% Zn: 0.20–0.40: 0.060 mg/kg; >0.40: 15%	As: 0.010 mg/kg Cd: 0.0010 mg/kg Cr: 0.10 mg/kg Cu: 0.20 mg/kg Mn: 0.010 mg/kg Ni: 0.10 mg/kg Pb: 0.010 mg/kg Se: 0.020 mg/kg Zn: 0.20 mg/kg	Cn and Ni results are not accredited
Chemical elements (Evira 8145*)	ICP-OES (Ca, Fe, K, Mg, Na, P)	Ca, P: 25% Fe, Mg, Na: 30% K: 20%	Ca, Na: 2.5 mg/kg Fe: 0.25 mg/kg K: 25 mg/kg Mg: 1.3 mg/kg P: 5 mg/kg	
Chemical elements (Evira 8138)	ICP-MS (I)	egg and milk 18%, cheese 24%, meat 29%, seaweed 10%	0,060 mg/kg	

*Accredited method; ⚠LOD for dried samples; ¹FAME = fatty acid methyl esters

Table 3. Analysis by food item.

Nro	Nimi	Vesi	Rasva	Rasva- hapot	Typpi	Amino- hapot	Tuhka	Alku- aineet	Jodi	Sokerit	Tärkkelys	Kuitu	B1-vit.	B2-vit.
1	Kermajuusto, n. 30 % rasvaa	x	x	x	x	x	x	x					x	x
2	Edam, n. 25 % rasvaa	x	x	x	x	x	x	x					x	x
3	Gouda, n. 30 % rasvaa	x	x	x	x	x	x	x	x				x	x
4	Puolikova kevyt juusto, n. 17 % rasvaa	x	x	x	x	x	x	x	x				x	x
5	Emmental punaleima, n. 30 % rasvaa	x	x	x	x	x	x	x					x	x
6	Polar/kevyt Emmental, 15–17 % rasvaa	x	x	x	x	x	x	x	x				x	x
7	Raejuusto, 2 % rasvaa	x	x	x	x	x	x	x	x				x	x
8	Raejuusto, rasvaton	x	x		x	x	x	x	x				x	x
9	Sulatejuustoviipale, n. 23 % rasvaa	x	x	x	x	x	x	x	x				x	x
10	Sulatejuusto, n. 12 % rasvaa	x	x	x	x	x	x	x	x				x	x
11	Tuorejuusto, maustamaton, 20–25 % rasvaa	x	x	x	x	x	x	x	x				x	x
12	Tuorejuusto, maustamaton, n. 15 % rasvaa	x	x	x	x	x	x	x	x				x	x
13	Leipäjuusto	x	x	x	x	x	x	x	x				x	x
14	Kaurahiutale	x	x	x	x	x	x	x					x	x
15	Vehnäjauho, puolikarkea	x	x	x	x	x	x	x					x	x
16	Ruisjauho, täysjyväruisjauho	x	x	x	x	x	x	x					x	x
17	Ohrajauho, täysjyväohrajauho	x	x	x	x	x	x	x					x	x
18	Täysjyvävehnäjauho/grahamjauho	x	x	x	x	x	x	x					x	x
19	Hiivaleipävehnäjauho	x	x	x	x	x	x	x					x	x
20	Mannasuurimo, vehnäsuurimo	x	x	x	x	x	x	x		x	x	x	x	x
21	Tattarijauho	x	x	x	x	x	x						x	x
22	Riisi, pitkäjyväinen	x	x	x	x	x	x	x		x	x	x	x	x
23	Ohrasuurimo	x	x	x	x	x	x	x		x	x	x	x	x
	YHTEENSÄ	23	23	22	23	23	23	22	10	3	3	3	23	23

4 Results

The samples were analysed as planned, with the analytical results presented in tables as follows:

Table 4:	Moisture, ash, protein, carbohydrates (sugars + starch), fat and dietary fibre
Table 5:	Comparison of fat and protein results with Fineli values
Table 6:	Individual sugars
Table 7:	Dietary fibre fractions
Table 8:	Total fat and fatty acids (Figure 2)
Table 9:	Ratio of total amino acids to protein content
Table 10:	Amino acids
Table 11:	Chemical elements
Table 12:	Comparison of chemical elemental results with Fineli values
Table 13:	Vitamins B1 and B2
Table 14:	Comparison of vitamin B1 and B2 results with Fineli values
Table 15:	Individual fatty acids (Annex 1)

Comparison of the analytical results with Fineli values is presented in the following figures: fat and protein (Figure 1; Figure 7 in Annex 2), fatty acids (Figure 3; Figure 8 in Annex 2), elements (Figures 4 and 5; Figures 9 and 10 in Annex 2) and vitamins B1 and B2 (Figure 6; Figure 11 in Annex 2).

4.1 Moisture, ash, protein, carbohydrates, fat, and dietary fibre

The results for moisture, ash, protein, carbohydrates (sugars and starch), fat, and dietary fibre are given in Table 4. When the above concentrations are added together (checksum), the result should be 100 g. Due to the measurement uncertainties of the methods, a deviation of about ± 5 g can be considered acceptable.

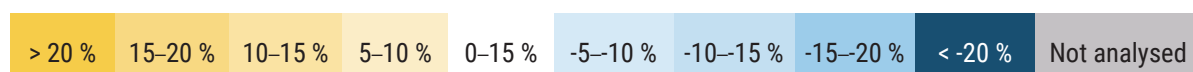
Table 4. Moisture, ash, protein, sugars, starch, fat, and dietary fibre results (g/100 g, as fresh weights).

No	Food item	Moisture	Ash	Protein*	Fat	Sugars	Starch	Dietary fibre	Sum
1	Cream cheese, c. 30% fat	40.8	3.5	24.5	29.8	n.a.	n.a.	n.a.	98.6
2	Edam, c. 25% fat	44.4	3.7	27.1	23.7	n.a.	n.a.	n.a.	98.9
3	Gouda, c. 30% fat	41.2	4.1	24.5	29.3	n.a.	n.a.	n.a.	99.1
4	Semi-hard light cheese, c. 17% fat	48.3	3.9	29.5	16.9	n.a.	n.a.	n.a.	98.6
5	Emmental, Red-Label, c. 30% fat	36.6	3.3	29.6	30.2	n.a.	n.a.	n.a.	99.7
6	Polar / (Emmental-type, light), 15-17% fat	47.0	4.0	31.7	16.2	n.a.	n.a.	n.a.	98.8
7	Cottage cheese, 2% fat	81.7	0.8	14.0	1.8	n.a.	n.a.	n.a.	98.4
8	Cottage cheese, fat-free	83.0	0.9	14.6	0.2	n.a.	n.a.	n.a.	98.6
9	Slices of processed cheese, c. 23% fat	50.3	4.8	18.1	23.4	n.a.	n.a.	n.a.	96.7
10	Cheese spread, c. 12% fat	67.8	4.2	17.1	8.3	n.a.	n.a.	n.a.	97.4
11	Processed cheese, unflavoured, 20-25% fat	67.2	1.4	5.2	22.3	n.a.	n.a.	n.a.	96.2
12	Processed cheese, unflavoured, c. 15% fat	72.8	1.5	7.1	12.9	n.a.	n.a.	n.a.	94.3
13	Finnish oven cheese	52.9	2.4	17.6	24.7	n.a.	n.a.	n.a.	97.6
14	Rolled oats	9.5	1.9	14.7	6.8	n.a.	n.a.	n.a.	n.a.
15	Wheat flour, semi-coarse	12.2	0.5	12.2	1.4	n.a.	n.a.	n.a.	n.a.
16	Rye flour, wholemeal rye flour	10.1	1.5	10.0	1.7	n.a.	n.a.	n.a.	n.a.
17	Barley flour, wholemeal barley flour	10.6	1.5	10.7	2.1	n.a.	n.a.	n.a.	n.a.
18	Wholemeal wheat flour/ graham flour	10.6	1.6	12.0	2.1	n.a.	n.a.	n.a.	n.a.
19	Dark wheat flour	10.4	1.4	14.8	2.7	n.a.	n.a.	n.a.	n.a.
20	Semolina, wheat groats	10.9	0.4	11.1	1.1	10.0 ☒	65.0	14.7	113.3
21	Buckwheat flour	11.5	1.6	11.8	2.7	n.a.	n.a.	n.a.	n.a.
22	Rice, long grain	9.1	0.7	7.7	0.9	0.4	74.3	2.15	95.3
23	Barley groats	8.2	1.3	11.2	1.9	7.0 ☒	59.7	15.7	104.9

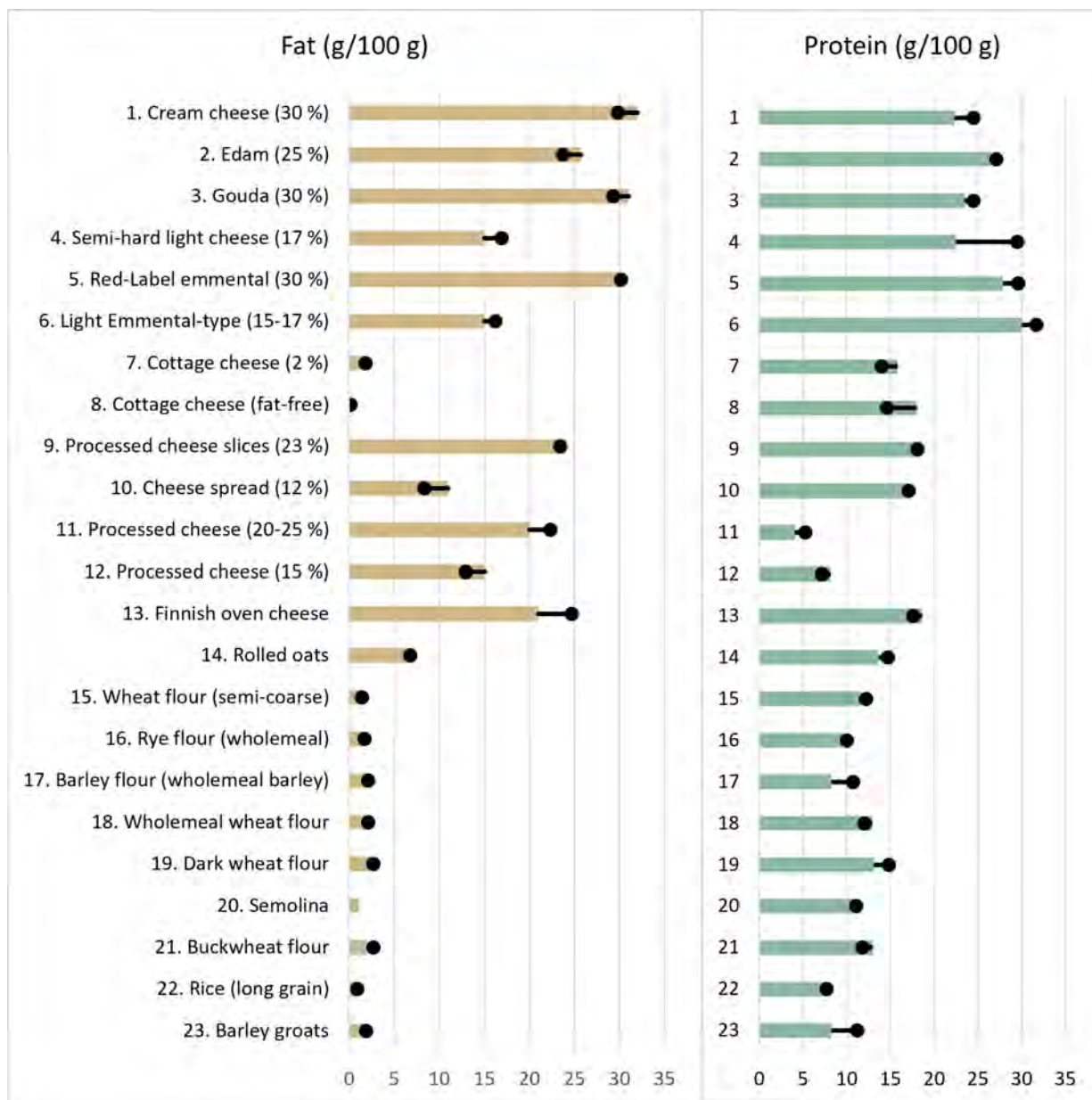
n.a. = not analysed; *Protein = nitrogen x 6.25; ☒not accredited result; 13 Finnish oven cheese a.k.a. bread cheese

Table 5. Comparison of the analytical results with Fineli data. The numbers indicate the percentage (%) by which the Fineli results are higher (positive numbers; yellow colour when the difference is greater than 5%) or lower (negative numbers; blue colour when the difference is greater than -5%) than the new analytical results. The analytical result is compared to the corresponding value in Fineli, without taking into account the measurement uncertainties of the analyses..

No	Cream cheese, c. 30% fat	Fat	Protein
1	Cream cheese, c. 30% fat	7	-10
2	Edam, c. 25% fat	8	-2
3	Gouda, c. 30% fat	6	-4
4	Semi-hard light cheese, c. 17% fat	-13	-31
5	Emmental, Red-Label, c. 30% fat	-1	-6
6	Polar / (Emmental-type, light), 15-17% fat	-8	-6
7	Cottage cheese, 2% fat	10	11
8	Cottage cheese, fat-free	15	19
9	Slices of processed cheese, c. 23% fat	2	2
10	Cheese spread, c. 12% fat	24	-1
11	Processed cheese, unflavoured, 20-25% fat	-12	-28
12	Processed cheese, unflavoured, c. 15% fat	14	12
13	Finnish oven cheese (a.k.a. bread cheese)	-18	5
14	Rolled oats	6	-8
15	Wheat flour, semi-coarse	10	-5
16	Rye flour, wholemeal rye flour	12	-5
17	Barley flour, wholemeal barley flour	-5	-30
18	Wholemeal wheat flour/graham flour	15	7
19	Dark wheat flour	-14	-13
20	Semolina, wheat groats	0	3
21	Buckwheat flour	-35	9
22	Rice, long grain	13	5
23	Barley groats	5	-36



In percentage terms, some of the new analytical results differed significantly from the Fineli values. The comparisons were also made using absolute values (Figure 1), in which case the differences were mainly quite small. However, some clear changes were observed.



13 Finnish oven cheese a.k.a. bread cheese

Figure 1. Comparison of previous Fineli values (g/100 g) for fat (brown, left) and protein (green, right) with the new analytical results. The coloured bars represent Fineli values (g/100 g). The black ball indicates the new analytical result and shows whether it is higher or lower than the Fineli value. The differences are also described in Annex 2, Figure 7.

4.2 Individual sugars

The analysed fructose and sucrose concentrations were similar to the previous levels. Unlike before, high levels of maltose were found in the semolina (wheat groats) and barley groats. This finding is an anomaly compared to the results of Fineli (contents <0.1 g/100 g) and other countries' food composition databases. The analytical results were confirmed by several repetitions and using another method. Due to these unusual findings, a mill producing semolina was contacted. In the company's own-checks, all the detected sugar contents had

been as usual. Maltose may be formed in certain products during production or storage, but in this case the origin of the maltose remains unclear. The unusual analytical results require further investigation.

Table 6. Individual sugars; fructose (*fru*), galactose (*gal*), glucose (*glc*), lactose (*lac*), maltose (*mal*) and sucrose (*suc*) and their sum.

No	Food item	Fru	Gal	Glc	Lac	Mal	Suc	Total
20	Semolina, wheat groats	n.d.	n.d.	n.d.	n.d.	9.85	0.14	10.0
22	Rice, long grain	n.d.	n.d.	n.d.	n.d.	n.d.	0.44	0.44
23	Barley groats	0.30	n.d.	n.d.	n.d.	5.85	0.85	7.8

n.d. = not detected

4.3 Dietary fibre fraction

The dietary fibre analyses were performed using a method (AOAC 2017.16/2022.01) capable of analysing all the components according to the Codex Alimentarius definition (2009) of dietary fibre.

The total dietary fibre content of semolina and barley groats was found to be significantly higher than the results reported in the food composition databases (Fineli: semolina 3.5 g/100 g; barley groats 7.6 g/100 g). Results analysed with a new method (same as the one used now), e.g. for some flours, had been published in Fineli a number of years ago. They show a dietary fibre content of 9.9 g/100 g for graham flours, which is significantly lower than the result analysed for semolina (wheat groats) now, and 11 g/100 g for barley groats, which is closer to the new result obtained for barley groats. The method has been used for several consecutive years in international proficiency testing rounds, giving correct results. The reason for the high dietary fibre results remained unclear.

Table 7. Concentrations of dietary fibre fractions in g/100 g fresh weight.

No	Food item	IDF (g/100 g)	SDFP (g/100 g)	SDFS (g/100 g)	Total
20	Semolina, wheat groats	2.8	8.5	3.3	14.7
22	Rice, long grain	0.6	1.4	0.2	2.15
23	Barley groats	6.1	8.6	1.0	15.7

IDF = insoluble dietary fibre

SDFP = soluble dietary fibre that precipitates in the presence of 78% aqueous ethanol

SDFS = soluble dietary fibre that remains soluble in 78% aqueous ethanol

Total = IDF + SDFP + SDFS

4.4 Total fat and fatty acids

Fatty acid concentrations are given in Table 8 in units of "g/100 g, fresh weight", as in Fineli. The group results (PUFA, MUFA, SFA and TFA) presented in the table are calculated from the analytical results of the individual fatty acids. In Figure 2, the fatty acid profiles are presented in relation to the total fat content, which makes it easier to visualise the relative concentrations of the different fatty acid groups. In fat-free cottage cheese (no 8), the amount of fat was too low for fatty acid analysis.

Table 8. Fatty acid concentrations (g/100 g) as group results per fresh weight. The concentrations are calculated from total fat.

No	Food item	PUFA g/100 g	MUFA g/100 g	SFA g/100 g	TFA g/100 g	Total fat g/100 g
1	Cream cheese, c. 30% fat	0.5	6.6	21	0.9	29.8
2	Edam, c. 25% fat	0.5	5.5	17	0.8	23.7
3	Gouda, c. 30% fat	0.6	6.7	20	0.9	29.3
4	Semi-hard light cheese, c. 17% fat	0.3	3.7	12	0.5	16.9
5	Emmental, Red-Label, c. 30% fat	0.5	6.6	22	0.8	30.2
6	Polar / (Emmental-type, light), 15-17% fat	0.3	3.7	12	0.5	16.2
7	Cottage cheese, 2% fat	0.0	0.4	1.4	0.0	1.8
8	Cottage cheese, fat-free	*	*	*	*	0.2
9	Slices of processed cheese, c. 23% fat	0.5	5.4	17	0.5	23.4
10	Cheese spread, c. 12% fat	0.1	1.7	6.2	0.2	8.3
11	Processed cheese, unflavoured, 20-25% fat	0.4	4.9	16	0.5	22.3
12	Processed cheese, unflavoured, c. 15% fat	0.2	2.7	9.6	0.3	12.9
13	Finnish oven cheese (a.k.a. bread cheese)	0.3	5.2	18	0.6	24.7
14	Rolled oats	2.7	2.9	1.2	n.d.	6.8
15	Wheat flour, semi-coarse	1.0	0.2	0.2	n.d.	1.4
16	Rye flour, wholemeal rye flour	1.1	0.3	0.3	n.d.	1.7
17	Barley flour, wholemeal barley flour	1.3	0.3	0.4	n.d.	2.1
18	Wholemeal wheat flour/graham flour	1.4	0.4	0.3	n.d.	2.1
19	Dark wheat flour	1.8	0.5	0.4	n.d.	2.7
20	Semolina, wheat groats	0.8	0.1	0.2	n.d.	1.1
21	Buckwheat flour	1.0	1.1	0.5	n.d.	2.7
22	Rice, long grain	0.3	0.4	0.2	n.d.	0.9
23	Barley groats	1.1	0.3	0.4	n.d.	1.9

*Amount of fat was inadequate for fatty acid analysis.

n.d. = not detected; 0 = Low concentration, rounded to 0 g/100 g

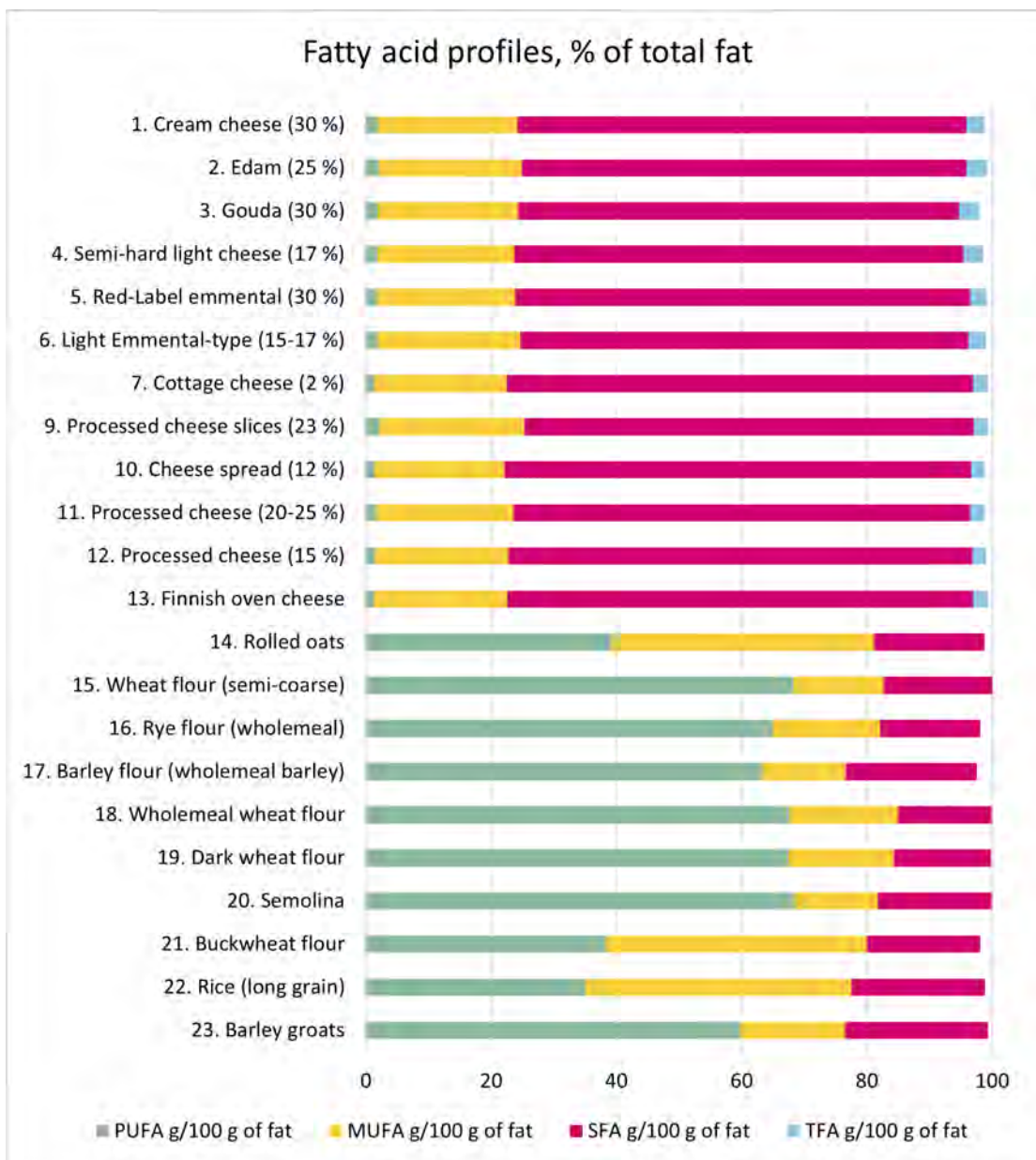


Figure 2. Fatty acid profiles of cheeses and flours according to the analytical results calculated per g/100 g fat.

Figure 3 shows Fineli values and the new analysis results on the same horizontal bar chart. The differences between the Fineli values and the analytical results are shown in Appendix 2, Figure 8. The results for individual fatty acids are shown in Appendix 1, Table 15.

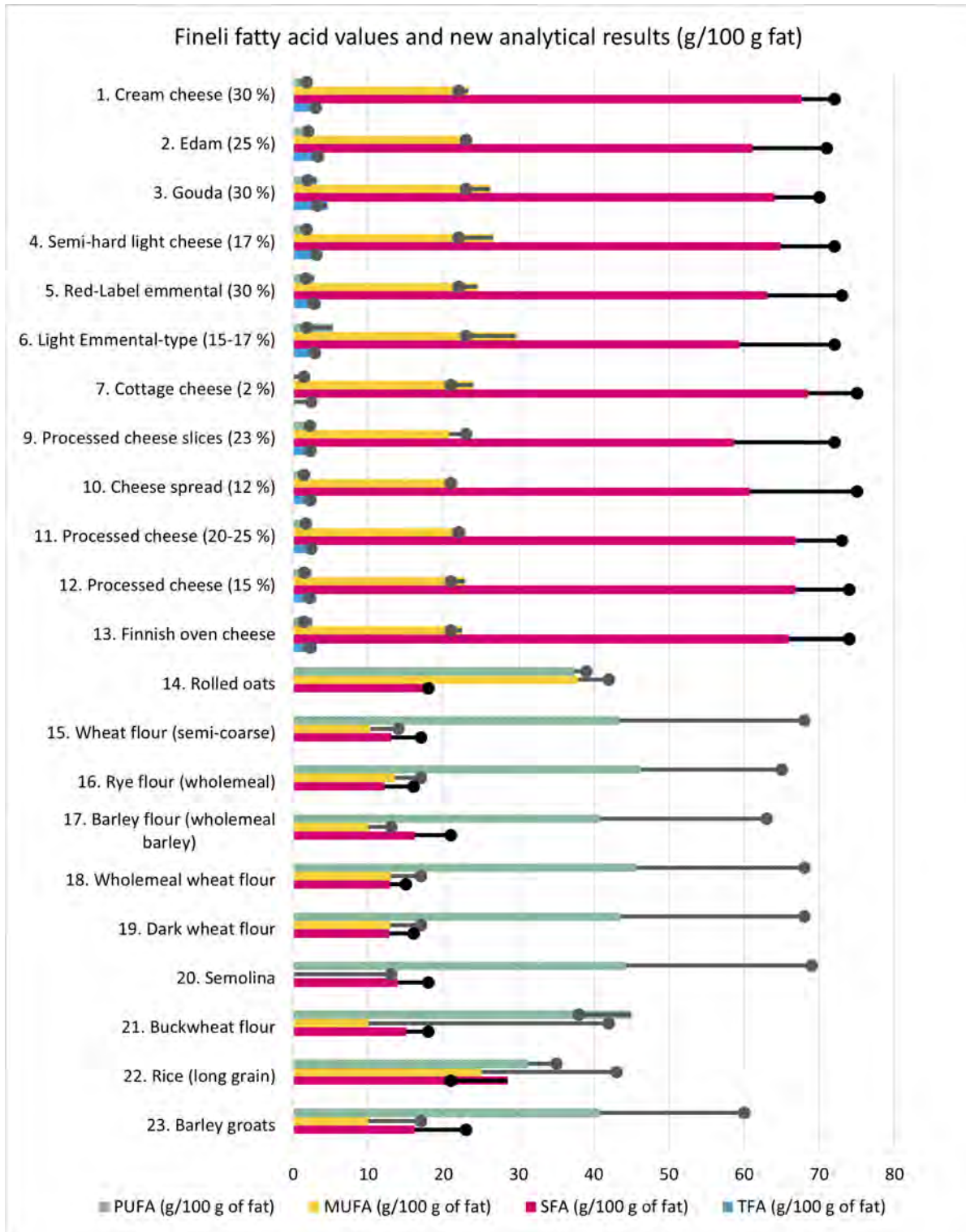


Figure 3. Coloured bars represent the content of polyunsaturated (PUFA = green), monounsaturated (MUFA = yellow), saturated (SFA = pink) and trans fatty acids (TFA = blue) in Fineli (g/100 g fat). The black ball indicates the new analytical result and shows whether the result is higher or lower compared to the Fineli value.

4.5 Amino acids

The amino acid results for each sample were summed and the result was compared with total protein (Table 9). These should agree and usually did. In some cases, a protein result significantly higher than the sum of amino acids could be explained by possible non-amino acid nitrogen, as all detected nitrogen is included in the protein analysis. The differences observed may also be partly explained by measurement uncertainty. All amino acid concentrations analysed are presented in Table 10.

Table 9. Ratio of total amino acids to protein content (%).

No	Food item	Amino acid in total (g/100 g)	Protein (g/100 g)	Ratio%
1	Cream cheese, c. 30% fat	25.8	24.5	105
2	Edam, c. 25% fat	28.8	27.1	106
3	Gouda, c. 30% fat	25.5	24.5	104
4	Semi-hard light cheese, c. 17% fat	31.8	29.5	108
5	Emmental, Red-Label, c. 30% fat	30.7	29.6	104
6	Polar / (Emmental-type, light), 15-17% fat	33.1	31.7	104
7	Cottage cheese, 2% fat	14.5	14.0	103
8	Cottage cheese, fat-free	14.1	14.6	97
9	Slices of processed cheese, c. 23% fat	18.3	18.1	101
10	Cheese spread, c. 12% fat	16.2	17.1	94
11	Processed cheese, unflavoured, 20-25% fat	5.3	5.23	101
12	Processed cheese, unflavoured, c. 15% fat	6.9	7.14	97
13	Finnish oven cheese (a.k.a. bread cheese)	18.7	17.6	106
14	Rolled oats	14.1	14.7	96
15	Wheat flour, semi-coarse	11.6	12.2	95
16	Rye flour, wholemeal rye flour	9.1	10.0	91
17	Barley flour, wholemeal barley flour	9.9	10.7	93
18	Wholemeal wheat flour/graham flour	11.7	12.0	98
19	Dark wheat flour	14.6	14.8	99
20	Semolina, wheat groats	11.2	11.1	101
21	Buckwheat flour	11.5	11.8	98
22	Rice, long grain	7.6	7.7	99
23	Barley groats	11.4	11.2	102

Table 10. Amino acid concentrations. Results expressed as mg/100 g fresh weight.

No	Food item	Ala	Arg	Asp	Fen	Glu	Gly	His	Iso	Kys	Leu	Lys	Met	Pro	Ser	Tre	Trp	Tyr	Val
1	Cream cheese, c. 30% fat	690	880	1 700	1 300	5 400	450	810	1 200	97	2 300	2 000	590	2 600	1 400	900	360	1 400	1 600
2	Edam, c. 25% fat	760	960	1 900	1 500	6 100	500	870	1 400	120	2 600	2 200	670	3 000	1 600	1 000	420	1 500	1 800
3	Gouda, c. 30% fat	690	790	1 700	1 300	5 400	440	720	1 300	100	2 300	2 000	590	2 600	1 400	890	360	1 300	1 600
4	Semi-hard light cheese, c. 17% fat	850	1 000	2 200	1 600	6 700	550	940	1 500	120	2 900	2 400	740	3 300	1 700	1 100	470	1 700	2 000
5	Emmental, Red-Label, c. 30% fat	830	1 100	2 000	1 600	6 600	540	850	1 500	120	2 800	2 400	770	3 200	1 700	1 100	440	1 400	1 900
6	Polar / (Emmental-type, light), 15–17% fat	910	1 000	2 200	1 700	7 000	580	1 100	1 600	120	3 100	2 600	790	3 400	1 800	1 200	480	1 500	2 100
7	Cottage cheese, 2% fat	400	490	1 000	710	3 100	250	380	710	60	1 300	1 100	340	1 500	790	560	230	720	880
8	Cottage cheese, fat-free	390	490	880	710	2 800	260	480	710	46	1 300	1 100	340	1 500	810	580	230	710	870
9	Slices of processed cheese, c. 23% fat	500	600	1 200	920	3 900	330	500	880	69	1 700	1 400	440	1 900	1 000	650	240	880	1 100
10	Cheese spread, c. 12% fat	450	530	1 100	830	3 500	290	440	780	66	1 500	1 200	390	1 700	910	590	240	670	990
11	Processed cheese, unflavoured, 20–25% fat	170	170	410	240	1 100	97	130	270	40	500	410	120	480	330	220	76	220	310
12	Processed cheese, unflavoured, c. 15% fat	220	220	550	320	1 400	120	170	360	53	660	550	160	640	400	300	110	270	420
13	Finnish oven cheese	490	640	1 300	950	4 000	320	500	900	74	1 700	1 400	450	1 900	1 100	660	270	940	1 100
14	Rolled oats	690	970	1 300	730	3 200	710	390	600	36	1 100	610	270	810	700	520	210	500	820
15	Wheat flour, semi-coarse	340	460	480	530	4 000	440	280	430	240	800	260	200	1 300	560	310	140	350	490
16	Rye flour, wholemeal rye flour	390	490	750	440	2 200	420	270	340	190	590	370	170	930	400	320	110	230	480
17	Barley flour, wholemeal barley flour	370	470	610	530	2 500	390	270	380	220	710	350	190	1 200	420	340	140	290	540
18	Wholemeal wheat flour/graham flour	420	550	650	550	3 600	490	320	440	230	810	350	200	1 200	540	350	160	330	560
19	Dark wheat flour	500	650	750	720	4 700	560	380	540	270	1 000	400	250	1 600	650	440	170	390	690
20	Semolina, wheat groats	330	380	480	530	3 900	410	270	420	220	770	270	180	1 300	490	310	120	320	470
21	Buckwheat flour	510	1 100	1 200	490	2 100	730	310	460	240	780	750	240	450	560	460	200	330	600
22	Rice, long grain	430	610	730	340	1 400	360	210	340	160	640	300	220	360	370	280	110	290	470
23	Barley groats	410	510	660	600	3 100	430	290	450	220	820	390	190	1 400	470	380	150	350	580

4.6 Chemical elements

The analytical results for the elements (minerals, trace elements and heavy metals) are presented in Table 11. The new analytical results were compared with the Fineli values where appropriate (Table 12, Figures 4 and 5). The following elements are freely available for all users in Fineli: calcium (Ca), iron (Fe), iodide (iodine; I), potassium (K), magnesium (Mg), sodium (Na), salt (NaCl), phosphorus (P), selenium (Se), zinc (Zn).

In percentage terms, most of the new analytical results were different than those in Fineli. Of the analytical results, just under a third differed by less than 10% from previous Fineli values. One fifth of the analytical results differed by 10-20% from the data published in Fineli. Eight results were below the limit of quantification and could not be compared. The remaining, nearly half of the results (92/208), differed by more than 20% from the previous results.

A comparison of the percentage differences between the analytical results and the Fineli values (Table 12) gives a slightly misleading impression as some of the results are very small in number, making a marginal shift appear large in percentage terms. In these cases, the difference may be due to a change in composition, could be influenced by the analytical method used or can be explained by the method's measurement uncertainty. The absolute differences between the analytical results and the Fineli values are shown in Figures 4 and 5, where the Fineli values are represented by coloured bars with black bars at the ends to indicate the difference with the new analytical results. No 21 (buckwheat flour) is missing because its elemental analyses have already been performed in the past and have been updated in the Fineli database.

Table II. Analytical results for the chemical elements. The amount of salt is obtained by multiplying the amount of sodium (Na) by 2.548.

No	Food item	As µg/ 100 g	Ca mg/ 100 g	Cd µg/ 100 g	Cr µg/ 100 g	Cu µg/ 100 g	Fe mg/ 100 g	I µg/ 100 g	K mg/ 100 g	Mg mg/ 100 g	Mn µg/ 100 g	Na mg/ 100 g	Salt mg/ 100 g	Ni µg/ 100 g	Pb µg/ 100 g	P mg/ 100 g	Se µg/ 100 g	Zn mg/ 100 g
1	Cream cheese, c. 30% fat	<1	770	<0.1	<10	35	0.13	n.a.	74	29	18	570	1 450	<10	<1	480	40	3.9
2	Edam, c. 25% fat	<1	870	<0.1	<10	40	0.12	n.a.	78	31	19	500	1 270	<10	<1	540	33	4
3	Gouda, c. 30% fat	<1	810	<0.1	<10	35	0.12	20	73	29	18	730	1 860	<10	<1	490	30	3.5
4	Semi-hard light cheese, c. 17% fat	<1	910	<0.1	<10	42	0.12	17	85	35	22	540	1 380	<10	<1	570	37	4.2
5	Emmental, Red-Label, c. 30% fat	<1	990	<0.1	<10	810	0.13	n.a.	75	36	24	220	561	<10	<1	610	52	4.6
6	Polar / (Emmental-type, light), 15–17% fat	<1	1 000	<0.1	<10	48	0.12	21	85	38	25	450	1 150	<10	<1	640	46	4.7
7	Cottage cheese, 2% fat	<1	42	<0.1	<10	22	0.033	14	62	4.1	2.6	240	612	<10	<1	140	16	0.32
8	Cottage cheese, fat-free	<1	47	<0.1	<10	24	0.03	14	69	4.6	3.2	250	637	<10	<1	150	14	0.34
9	Slices of processed cheese, c. 23% fat	<1	620	<0.1	13	160	0.17	26	130	23	19	1 200	3 060	<10	<1	860	22	2.6
10	Cheese spread, c. 12% fat	<1	540	<0.1	<10	48	0.11	17	190	22	12	910	2 320	<10	<1	810	18	2.3
11	Processed cheese, unflavoured, 20–25% fat	<1	87	<0.1	<10	<20	0.063	14	120	8.2	3.8	280	713	<10	<1	91	6.1	0.46
12	Processed cheese, unflavoured, c. 15% fat	<1	120	<0.1	<10	<20	0.06	17	160	11	5.9	280	713	<10	<1	120	8.6	0.56
13	Finnish oven cheese	<1	570	<0.1	13	32	0.084	19	120	25	15	280	713	<10	<1	370	25	2.6
14	Rolled oats	<1	46	2.2	29	480	5.2	n.a.	410	150	4 100	2	5.1	230	<1	460	12	3.9
15	Wheat flour, semi-coarse	<1	18	2.9	19	220	1.3	n.a.	170	33	660	<2	<5.1	14	<1	130	5.5	1.1
16	Rye flour, wholemeal rye flour	<1	34	1.5	21	380	3.1	n.a.	460	100	2 200	<2	<5.1	22	<1	300	4.6	2.8
17	Barley flour, wholemeal barley flour	<1	24	0.84	13	420	2.8	n.a.	370	98	900	2	5.1	<10	<1	300	9.6	2.5
18	Wholemeal wheat flour/graham flour	<1	29	3.4	<10	490	3.8	n.a.	440	120	2 800	2	5.1	23	<1	350	6.6	3.1
19	Dark wheat flour	<1	29	4	<10	460	3.6	n.a.	350	100	2 600	2	5.1	25	<1	300	9.4	3.1
20	Semolina, wheat groats	<1	14	2.6	<10	170	0.79	n.a.	130	18	360	<2	<5.1	<10	<1	89	4.3	0.66
22	Rice, long grain	16	20	1.7	17	210	0.54	n.a.	170	30	600	2	5.1	43	<1	150	4.5	0.75
23	Barley groats	<1	23	1.5	59	380	3.2	n.a.	330	79	730	2	5.1	31	<1	260	15	2.2

n.a. = not analysed

Table 12. Comparing the analytical results of chemical elements with Fineli data. The figures show the percentage (%) by which the Fineli results are higher (positive figures; yellow colour when the difference is greater than 5%) or lower (negative figures; blue colour when the difference is greater than -5%) than the new analytical results. The analytical result is compared to the corresponding value in Fineli, without taking into account the measurement uncertainties of the analyses.

No	Food item	Ca (Calcium)	Fe (Iron)	I (Iodine)	K (Potassium)	Mg (Magnesium)	Na (Sodium)	Salt	P (Phosphorus)	Se (Selenium)	Zn (Zinc)
1	Cream cheese, c. 30% fat	1	59		18	0	5	5	-7	-113	-25
2	Edam, c. 25% fat	3	43		3	-3	2	2	-6	-61	5
3	Gouda, c. 30% fat	8	68	0	19	9	-1	-1	6	-58	13
4	Semi-hard light cheese, c. 17% fat	13	43	19	-6	-17	-1	-1	-12	-81	1
5	Emmental, Red-Label, c. 30% fat	-5	43		-7	-6	27	27	-11	-170	-12
6	Polar / (Emmental-type, light), 15–17% fat	-8	35	46	-21	-44	12	12	-43	-155	-26
7	Cottage cheese, 2% fat	40	72	18	38	54	20	20	30	-31	76
8	Cottage cheese, fat-free	61	75	18	31	49	17	17	25	-15	75
9	Slices of processed cheese, c. 23% fat	-6	50	-24	-8	12	-20	-20	-41	-5	-1
10	Cheese spread, c. 12% fat	10	63	19	-73	4	9	9	-33	27	0
11	Processed cheese, unflavoured, 20–25% fat	32		-5	29	20	13	13	-24	-179	-30
12	Processed cheese, unflavoured, c. 15% fat	44		-47	42	-1	29	29	-66	-304	-64
13	Finnish oven cheese	33	65	-73	-140	17	-17	-17	24	-15	35
14	Rolled oats	2	-11		1	-6	-100	-100	2	0	-8
15	Wheat flour, semi-coarse	5	-44		-10	-14			-12	45	-37
16	Rye flour, wholemeal rye flour	-3	6		-3	-3			4	8	3
17	Barley flour, wholemeal barley flour	-4	38		-3	-10	-100	-100	0	-12	11
18	Wholemeal wheat flour/graham flour	9	3		-6	1	-100	-100	-1	13	-3
19	Dark wheat flour	-12	-44		-27	-32	-100	-100	-21	18	-48
20	Semolina, wheat groats	-8	34		13	14			6	44	18
21	Buckwheat flour										
22	Rice, long grain	-100	55		26	67	60	60	42	-125	63
23	Barley groats	-15	-7		-22	-22	17	17	-24	-74	-5

> 20 %	15–20 %	10–15 %	5–10 %	0 – ±5 %	-5 – -10 %	-10 – -15 %	-15 – -20 %	-20 %	Not comparable	Not analysed
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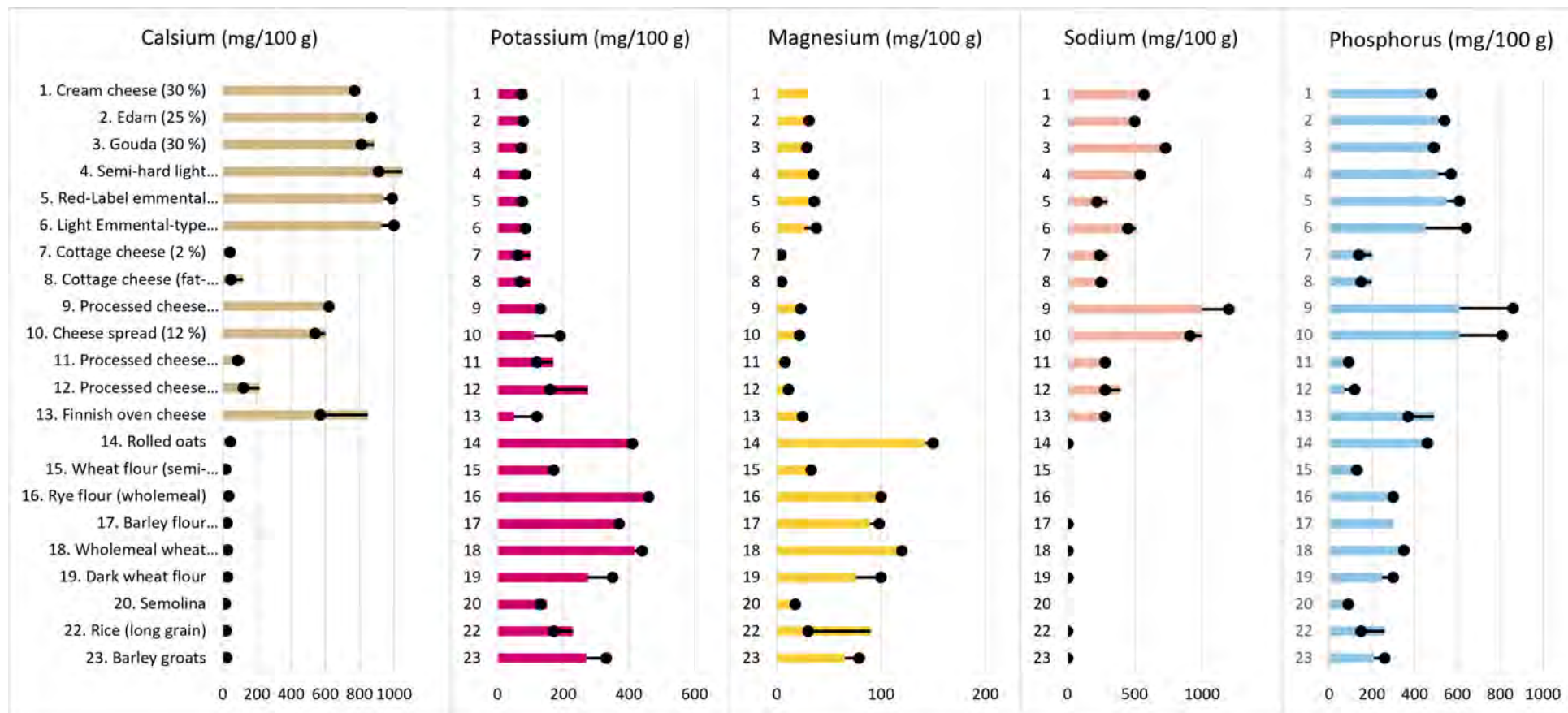


Figure 4. Comparison of the Fineli values and new analytical results. The coloured bars represent the Fineli values (calcium (Ca) = brown; potassium (K) = pink; magnesium (Mg) = yellow; sodium (Na) = pink; phosphorus (P) = light blue). New analytical results are indicated by black balls showing whether the new analytical result is higher or lower than the Fineli value. Measurement uncertainties are not taken into account in the comparison. The results are presented as mg/100 g.

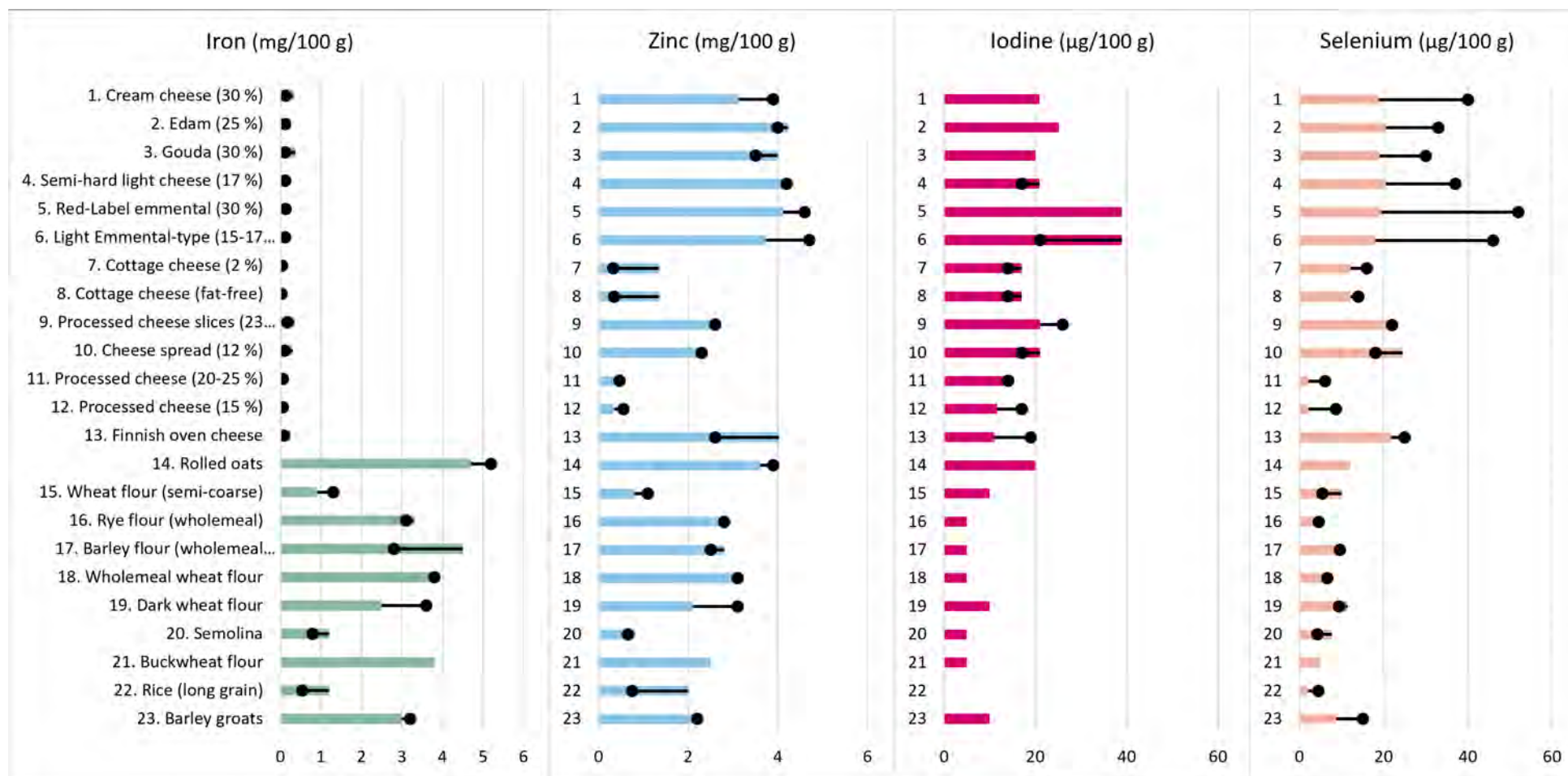


Figure 5. Comparison of the Fineli values and new analytical results. The coloured bars represent the Fineli values (iron (Fe) = green; zinc (Zn) = light blue; iodine (I) = bright pink; selenium (Se) = light pink). New analytical results are indicated by black balls showing whether the new analytical result is higher or lower than the Fineli value. Measurement uncertainties have not been taken into account in the comparison. The results are presented as mg/100 g or µg/100 g.

4.7 B vitamins

Thiamine (vitamin B1) and riboflavin (vitamin B2) were analysed in a commercial laboratory, as the Food Authority's laboratory does not have a suitable method for cheese and cereal matrices. The results are presented in Table 13.

Table 13. Results of the analysis of thiamine (B1; expressed as thiamine) and riboflavin (B2).

No	Food item	Thiamin B1; mg/100 g	MU	Riboflavin B2; mg/100 g	MU mg/100 g
1	Cream cheese, c. 30% fat	<0.015*		0.262	± 0.042
2	Edam, c. 25% fat	<0.015*		0.26	± 0.042
3	Gouda, c. 30% fat	<0.015*		0.275	± 0.044
4	Semi-hard light cheese, c. 17% fat	<0.015*		0.253	± 0.040
5	Emmental, Red-Label, c. 30% fat	<0.015*		0.176	± 0.028
6	Polar / (Emmental-type, light), 15–17% fat	<0.015*		0.219	± 0.035
7	Cottage cheese, 2% fat	<0.015*		0.128	± 0.020
8	Cottage cheese, fat-free	<0.015*		0.128	± 0.020
9	Slices of processed cheese, c. 23% fat	0.015	± 0.002	0.229	± 0.037
10	Cheese spread, c. 12% fat	<0.015*		0.273	± 0.044
11	Processed cheese, unflavoured, 20–25% fat	<0.015*		0.133	± 0.021
12	Processed cheese, unflavoured, c. 15% fat	<0.015*		0.156	± 0.025
13	Finnish oven cheese (a.k.a. bread cheese)	<0.015*		0.229	± 0.037
14	Rolled oats	0.351	± 0.056	0.0139	± 0.002
15	Wheat flour, semi-coarse	0.136	± 0.022	<0.01*	
16	Rye flour, wholemeal rye flour	0.234	± 0.037	0.0152	± 0.002
17	Barley flour, wholemeal barley flour	0.183	± 0.029	0.0176	± 0.003
18	Wholemeal wheat flour/graham flour	0.275	± 0.044	0.0115	± 0.002
19	Dark wheat flour	0.479	± 0.077	0.013	± 0.002
20	Semolina, wheat groats	0.041	± 0.007	<0.01*	
21	Buckwheat flour	0.402	± 0.064	0.0331	± 0.005
22	Rice, long grain	0.142	± 0.023	0.0134	± 0.002
23	Barley groats	0.09	± 0.014	0.0145	± 0.002

*LOQ: Thiamine (B1) < 0.015; Riboflavin (B2) < 0.01

MU: Expanded measurement uncertainty, k=2

Table 14. Comparison of thiamine and riboflavin analytical results with Fineli data. The numbers indicate the percentage (%) by which the Fineli results are higher (positive numbers; yellow colour when the difference is greater than 5%) or lower (negative numbers; blue colour when the difference is greater than -5%) than the new analytical results. The analytical result is compared to the corresponding value in Fineli, without taking into account the measurement uncertainties of the analyses.

No	Food item	Thiamine (B1; mg/100 g)	Riboflavin (B2; mg/100 g)
1	Cream cheese, c. 30% fat		19
2	Edam, c. 25% fat		28
3	Gouda, c. 30% fat		10
4	Semi-hard light cheese, c. 17% fat		30
5	Emmental, Red-Label, c. 30% fat		41
6	Polar / (Emmental-type, light), 15–17% fat		31
7	Cottage cheese, 2% fat		43
8	Cottage cheese, fat-free		43
9	Slices of processed cheese, c. 23% fat	50	54
10	Cheese spread, c. 12% fat		-8
11	Processed cheese, unflavoured, 20–25% fat		21
12	Processed cheese, unflavoured, c. 15% fat		2
13	Finnish oven cheese (a.k.a. bread cheese)		12
14	Rolled oats	-6	85
15	Wheat flour, semi-coarse	-70	
16	Rye flour, wholemeal rye flour	25	90
17	Barley flour, wholemeal barley flour	54	85
18	Wholemeal wheat flour/graham flour	21	92
19	Dark wheat flour	-6	89
20	Semolina, wheat groats	49	
21	Buckwheat flour	33	79
22	Rice, long grain	65	81
23	Barley groats	55	82

> 20 %	15–20 %	10–15 %	5–10 %	0 – ±5 %	-5 – -10 %	-10 – -15 %	-15 – -20 %	-20 %	Not comparable
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With a few exceptions, the new analyses show lower levels of vitamins B1 and B2 than the previous values in Fineli. The absolute differences are shown in Figure 6 and Annex 2 (Figure 11).

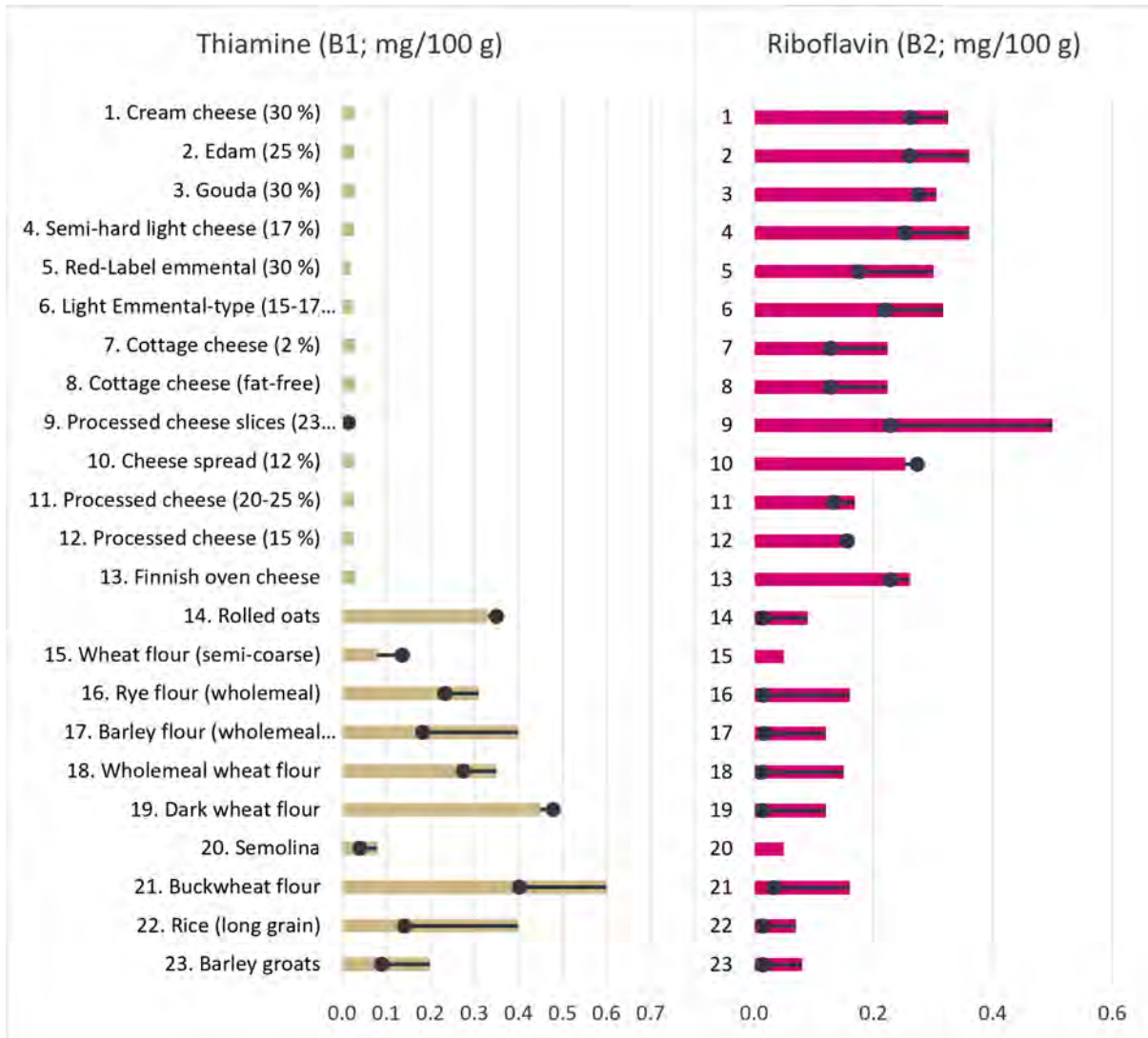


Figure 6. Comparison of thiamine and riboflavin analytical results (mg/100 g) with previous Fineli values. The coloured bars represent the Fineli values for thiamine (= brown) and riboflavin (= pink). The new analytical results are indicated by black balls showing whether the new analytical result is higher or lower compared to the Fineli value. Measurement uncertainties have not been taken into account in the comparison. The results are presented as mg/100 g.

Annex I. Results of fatty acids analysis

Table 15. Analytical results for individual fatty acids; n.d. = not detected.

No	Food item	C4:0	C6:0	C8:0	C10:0	C12:0	C14:0	C14:1 n-5	C15:0 iso	C15:0	C16:0 iso	C16:0	C16:1 n-7 trans	C16:1 n-?	C16:1 n-7
1	Cream cheese, c. 30% fat	6.8	2.5	1.2	2.8	3.3	11	1.0	0.5	1.0	0.2	31	0.1	0.2	2.0
2	Edam, c. 25% fat	7.9	2.8	1.3	2.8	3.1	10	0.9	0.5	0.9	0.2	29	0.1	0.2	1.9
3	Gouda, c. 30% fat	6.0	2.4	1.2	2.7	3.3	11	0.9	0.5	0.9	0.2	31	0.1	0.2	2.0
4	Semi-hard light cheese, c. 17% fat	7.5	2.8	1.3	2.9	3.4	11	1.0	0.5	0.9	0.2	30	0.1	0.2	1.9
5	Emmental, Red-Label, c. 30% fat	8.5	2.9	1.3	2.7	3.1	11	0.9	0.5	0.8	0.2	30	0.1	0.2	1.9
6	Polar / (Emmental-type, light), 15–17% fat	7.6	2.7	1.3	2.6	2.9	10	0.9	0.5	0.8	0.2	31	0.1	0.1	1.9
7	Cottage cheese, 2% fat	6.8	2.7	1.3	2.9	3.4	12	1.0	0.5	0.9	0.2	33	0.1	0.2	1.9
9	Slices of processed cheese, c. 23% fat	6.9	2.8	1.3	2.8	3.2	10	0.9	0.5	0.8	0.2	33	0.1	0.1	1.7
10	Cheese spread, c. 12% fat	8.3	3.2	1.5	3.1	3.6	11	1.0	0.5	0.9	0.2	31	0.1	0.1	1.9
11	Processed cheese, unflavoured, 20–25% fat	7.1	2.8	1.3	2.9	3.6	12	1.1	0.5	1.0	0.2	32	0.1	0.2	2.0
12	Processed cheese, unflavoured, c. 15% fat	7.1	2.9	1.4	3.1	3.7	12	1.1	0.5	1.0	0.2	33	0.1	0.1	2.0
13	Finnish oven cheese (a.k.a. bread cheese)	7.8	3.2	1.5	3.3	3.6	11	1.0	0.5	0.9	0.2	31	0.1	0.1	1.8
14	Rolled oats	n.d.	n.d.	n.d.	n.d.	n.d.	0.2	n.d.	n.d.	n.d.	n.d.	16	n.d.	n.d.	0.2
15	Wheat flour, semi-coarse	n.d.	n.d.	n.d.	n.d.	n.d.	0.5	n.d.	n.d.	n.d.	n.d.	16	n.d.	n.d.	0.1
16	Rye flour, wholemeal rye flour	n.d.	n.d.	n.d.	n.d.	n.d.	1.5	n.d.	n.d.	n.d.	n.d.	14	n.d.	n.d.	n.d.
17	Barley flour, wholemeal barley flour	n.d.	n.d.	n.d.	n.d.	n.d.	0.2	n.d.	n.d.	n.d.	n.d.	20	n.d.	n.d.	0.1
18	Wholemeal wheat flour/graham flour	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	14	n.d.	n.d.	n.d.
19	Dark wheat flour	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	15	n.d.	n.d.	n.d.
20	Semolina, wheat groats	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.1	n.d.	17	n.d.	n.d.	0.1
21	Buckwheat flour	n.d.	n.d.	n.d.	n.d.	n.d.	0.1	n.d.	n.d.	n.d.	n.d.	12	n.d.	n.d.	0.2
22	Rice, long grain	n.d.	n.d.	n.d.	n.d.	n.d.	0.4	n.d.	n.d.	n.d.	n.d.	18	n.d.	n.d.	0.2
23	Barley groats	n.d.	n.d.	n.d.	n.d.	n.d.	0.2	n.d.	n.d.	n.d.	n.d.	20	n.d.	n.d.	0.1

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No	Food item	C17:0 iso	C17:0	C17:1 trans-7	C17:1 n-7	C18:0	C18:1 n-9 trans	C18:1 n-7 trans	other C18:1 trans, sum	other C18:1 cis, sum	C18:1 n-9	C18:1 n-7	C18:2 n-6	C18:2 trans	C18:2 CLA
1	Cream cheese, c. 30% fat	0.3	0.4	0.2	n.d.	9.5	0.2	1.2	1.0	0.6	18	0.6	1.3	0.1	0.5
2	Edam, c. 25% fat	0.3	0.5	0.2	n.d.	10	0.3	1.3	1.1	0.5	19	0.6	1.4	0.1	0.5
3	Gouda, c. 30% fat	0.3	0.4	0.2	n.d.	10	0.2	1.3	1.1	0.5	18	0.6	1.3	0.1	0.5
4	Semi-hard light cheese, c. 17% fat	0.3	0.4	0.2	n.d.	9.6	0.2	1.2	1.1	0.6	17	0.6	1.3	0.1	0.5
5	Emmental, Red-Label, c. 30% fat	0.3	0.4	0.2	n.d.	10	0.2	1.1	0.9	0.6	18	0.5	1.2	0.1	0.5
6	Polar / (Emmental-type, light), 15–17% fat	0.3	0.4	0.2	n.d.	10	0.2	1.1	1.0	0.5	19	0.5	1.3	0.1	0.5
7	Cottage cheese, 2% fat	0.3	0.4	0.2	n.d.	9.2	0.2	0.9	0.9	0.3	17	0.5	1.1	0.1	0.3
9	Slices of processed cheese, c. 23% fat	0.2	0.4	0.2	n.d.	8.0	0.2	1.0	0.8	0.2	19	0.5	2.0	0.1	0.3
10	Cheese spread, c. 12% fat	0.3	0.4	0.2	n.d.	8.7	0.1	0.9	0.9	0.4	16	0.5	1.1	0.1	0.3
11	Processed cheese, unflavoured, 20–25% fat	0.2	0.4	0.2	n.d.	8.4	0.2	0.8	1.0	0.4	17	0.5	1.3	0.1	0.3
12	Processed cheese, unflavoured, c. 15% fat	0.3	0.4	0.2	n.d.	8.3	0.2	0.8	0.9	0.3	17	0.5	1.2	0.1	0.3
13	Finnish oven cheese (a.k.a. bread cheese)	0.3	0.4	0.2	n.d.	9.4	0.2	0.9	0.9	0.4	17	0.5	1.1	0.1	0.3
14	Rolled oats	n.d.	n.d.	n.d.	n.d.	1.4	n.d.	n.d.	n.d.	n.d.	40	0.9	38	n.d.	n.d.
15	Wheat flour, semi-coarse	n.d.	0.1	n.d.	n.d.	0.8	n.d.	n.d.	n.d.	n.d.	13	0.9	65	n.d.	n.d.
16	Rye flour, wholemeal rye flour	n.d.	n.d.	n.d.	n.d.	0.7	n.d.	n.d.	n.d.	n.d.	14	1.4	58	n.d.	n.d.
17	Barley flour, wholemeal barley flour	n.d.	n.d.	n.d.	n.d.	1.1	n.d.	n.d.	n.d.	n.d.	12	0.7	58	n.d.	n.d.
18	Wholemeal wheat flour/graham flour	n.d.	n.d.	n.d.	n.d.	0.8	n.d.	n.d.	n.d.	n.d.	16	1.0	64	n.d.	n.d.
19	Dark wheat flour	n.d.	n.d.	n.d.	n.d.	0.9	n.d.	n.d.	n.d.	n.d.	15	1.0	63	n.d.	n.d.
20	Semolina, wheat groats	n.d.	0.1	n.d.	n.d.	0.9	n.d.	n.d.	n.d.	n.d.	12	0.8	65	n.d.	n.d.
21	Buckwheat flour	n.d.	n.d.	n.d.	n.d.	1.7	n.d.	n.d.	n.d.	n.d.	37	1.4	36	n.d.	n.d.
22	Rice, long grain	n.d.	n.d.	n.d.	n.d.	1.7	n.d.	n.d.	n.d.	n.d.	41	0.9	34	n.d.	n.d.
23	Barley groats	n.d.	n.d.	n.d.	n.d.	1.7	n.d.	n.d.	n.d.	n.d.	15	0.7	57	n.d.	n.d.

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No	Food item	C18:3 n-6 gamma	C18:3 n-3	C19:0	C20:0	C20:1 n-9	C20:1 n-?	C20:3 n-6 gamma	C20:4 n-6	C22:0	C22:1 n-9	C22:1 n-7	C24:0	C24:1 n-9
1	Cream cheese, c. 30% fat	n.d.	0.4	0.1	0.1	<0.08	0.1	<0.08	<0.08	<0.08	n.d.	n.d.	n.d.	n.d.
2	Edam, c. 25% fat	n.d.	0.4	0.1	0.2	<0.08	0.1	<0.08	0.09	<0.08	n.d.	n.d.	n.d.	n.d.
3	Gouda, c. 30% fat	n.d.	0.4	0.1	0.1	<0.08	0.1	<0.08	<0.08	<0.08	n.d.	n.d.	<0.08	n.d.
4	Semi-hard light cheese, c. 17% fat	n.d.	0.4	0.1	0.1	<0.08	0.1	<0.08	<0.08	<0.08	n.d.	n.d.	n.d.	n.d.
5	Emmental, Red-Label, c. 30% fat	n.d.	0.4	0.1	0.2	<0.08	0.1	<0.08	n.d.	<0.08	n.d.	n.d.	n.d.	n.d.
6	Polar / (Emmental-type, light), 15–17% fat	n.d.	0.4	0.1	0.1	<0.08	0.2	<0.08	<0.08	<0.08	n.d.	n.d.	n.d.	n.d.
7	Cottage cheese, 2% fat	n.d.	0.3	0.1	0.2	<0.08	0.1	<0.08	n.d.	<0.08	n.d.	n.d.	n.d.	n.d.
9	Slices of processed cheese, c. 23% fat	n.d.	0.2	0.0	0.2	n.d.	0.1	n.d.	n.d.	<0.08	n.d.	n.d.	n.d.	n.d.
10	Cheese spread, c. 12% fat	n.d.	0.3	0.1	0.1	n.d.	0.1	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
11	Processed cheese, unflavoured, 20–25% fat	n.d.	0.3	0.1	0.1	n.d.	0.1	<0.08	0.09	<0.08	n.d.	n.d.	n.d.	n.d.
12	Processed cheese, unflavoured, c. 15% fat	n.d.	0.3	n.d.	0.1	n.d.	0.1	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
13	Finnish oven cheese (a.k.a. bread cheese)	n.d.	0.3	0.1	0.2	n.d.	0.1	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
14	Rolled oats	n.d.	1.3	n.d.	n.d.	0.7	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
15	Wheat flour, semi-coarse	n.d.	3.4	n.d.	0.1	0.6	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
16	Rye flour, wholemeal rye flour	n.d.	7.4	n.d.	n.d.	1.2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
17	Barley flour, wholemeal barley flour	n.d.	4.8	n.d.	0.2	0.7	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
18	Wholemeal wheat flour/graham flour	n.d.	4.0	n.d.	n.d.	0.7	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
19	Dark wheat flour	n.d.	4.0	n.d.	n.d.	0.8	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
20	Semolina, wheat groats	n.d.	3.2	n.d.	0.1	0.5	n.d.	n.d.	n.d.	0.1	n.d.	n.d.	0.2	n.d.
21	Buckwheat flour	n.d.	2.0	n.d.	1.3	3.4	n.d.	n.d.	n.d.	1.7	0.2	n.d.	1.5	n.d.
22	Rice, long grain	n.d.	1.1	n.d.	0.7	0.5	n.d.	n.d.	n.d.	0.3	n.d.	n.d.	0.6	n.d.
23	Barley groats	n.d.	3.1	n.d.	0.3	0.7	n.d.	n.d.	n.d.	0.2	n.d.	n.d.	n.d.	n.d.

Annex 2. Absolute differences between Fineli values and new analysis results as graphs

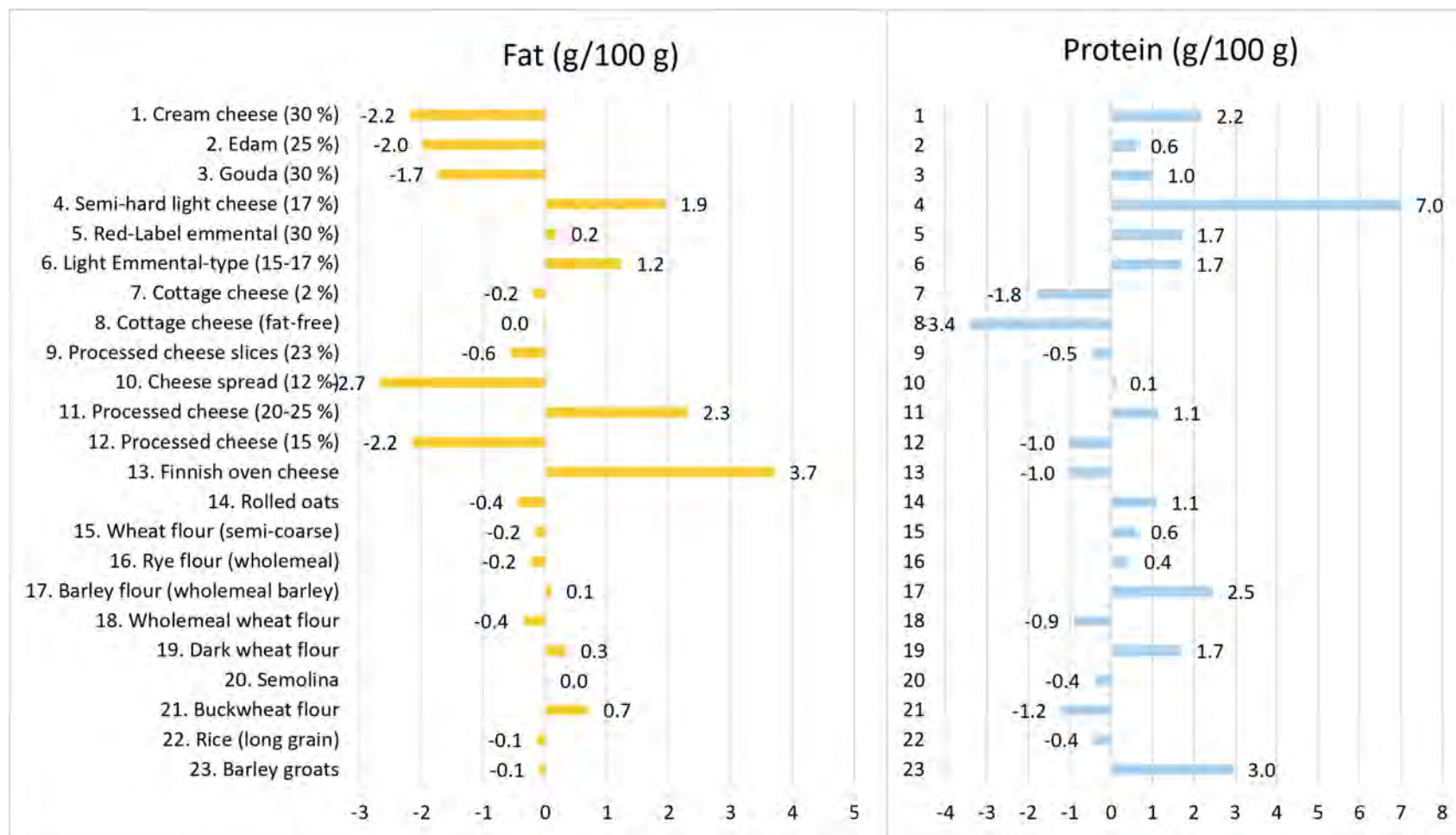


Figure 7. Comparison of fat (yellow) and protein (blue) analysis results with Fineli values. The differences are obtained by subtracting the Fineli value from the new analytical result (analytical result – Fineli value = difference (g/100 g)). The negative bars indicate that the new analytical results are lower than the previous values in Fineli, while the positive bars indicate higher analytical results than the current values in Fineli.

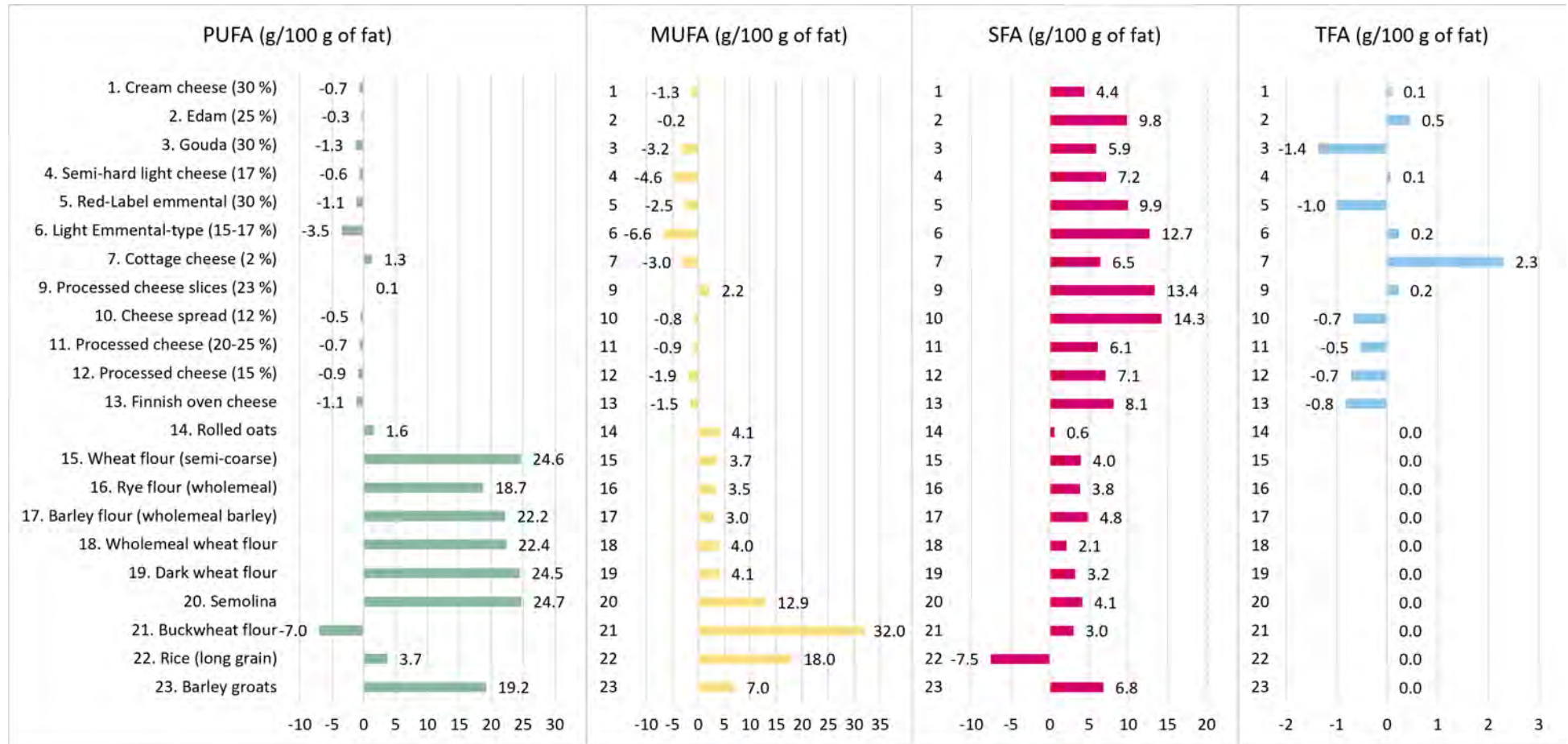


Figure 8. Comparing fatty acid analysis results (g/100 g fat) with previous values from Fineli. The bars represent the difference between the new analytical results and Fineli values (g/100 g; (analytical result – Fineli value = difference (g/100 g) of fat); polyunsaturated (PUFA = green), monounsaturated (MUFA = yellow), saturated (SFA = pink), trans fatty acids (TFA = blue)). A negative number indicates that the new analytical result is lower than Fineli value and a positive number indicates a higher analytical content.

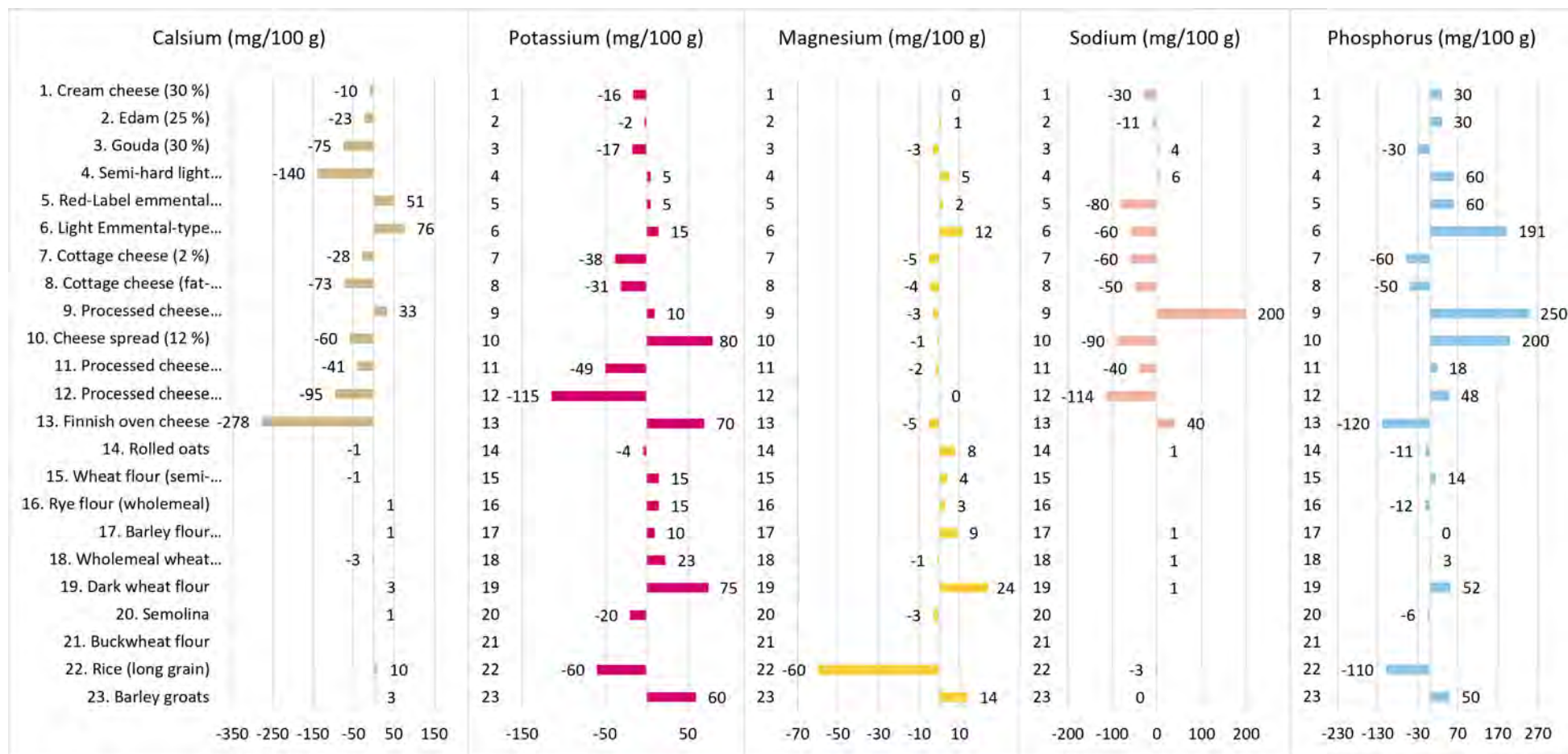


Figure 9. Comparison of calcium (light brown), potassium (pink), magnesium (yellow), sodium (light pink) and phosphorus (light blue) analysis results with Fineli values. The differences are obtained by subtracting the Fineli value from the new analytical result (analytical result – Fineli value = difference (mg/100 g)). The negative bars mean that the new analytical results are lower than the previous Fineli values, while the positive bars mean that the analytical results are higher than the current values of Fineli.

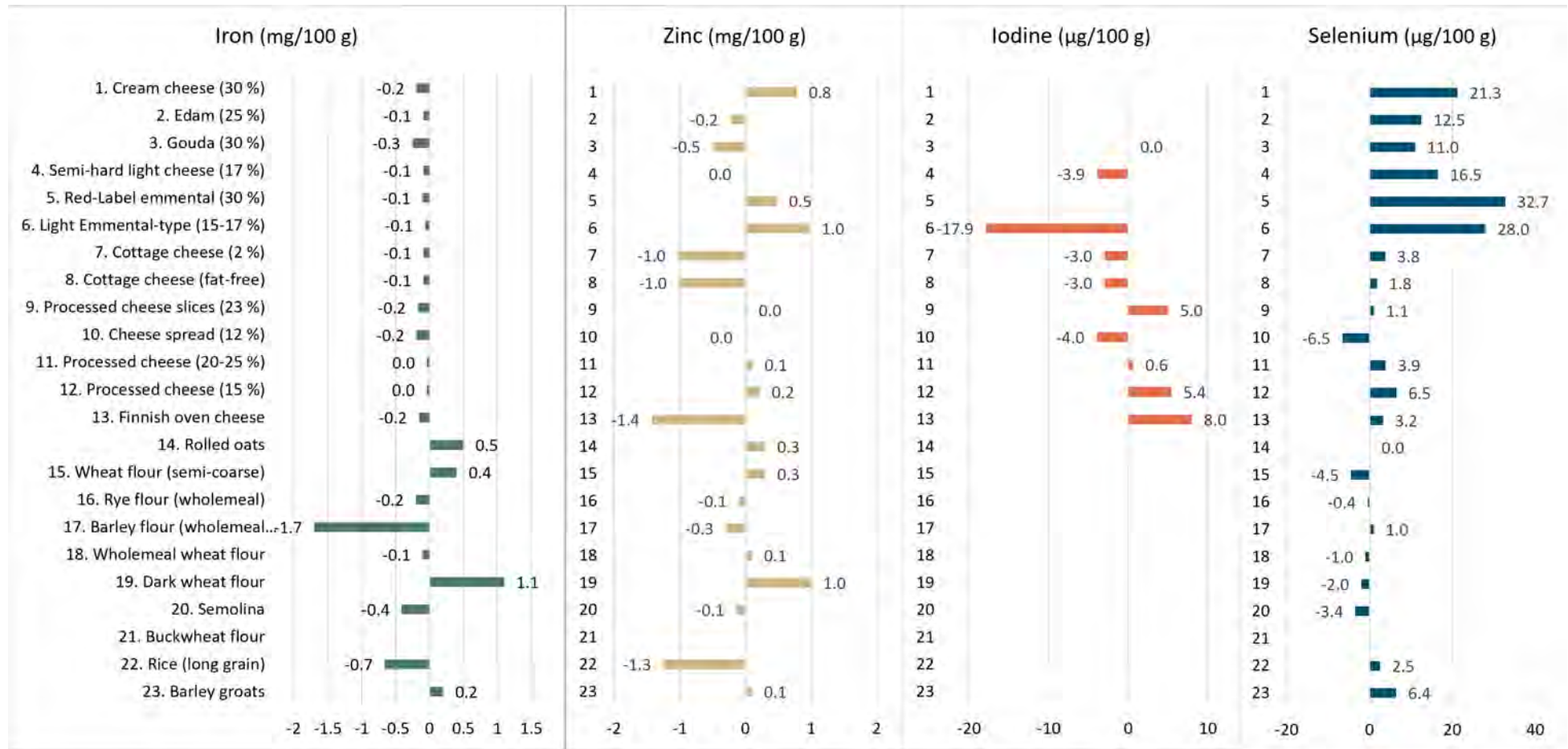


Figure 10. Comparison of iron (green), zinc (brown), iodine (orange) and selenium (blue) analysis results with Fineli values. The differences are obtained by subtracting the Fineli value from the new analytical result (analytical result – Fineli value = difference (mg/100 g, iron and zinc; mg/100 g, iodine and selenium)). The negative bars indicate that the new analytical results are lower than the previous Fineli values, while the positive bars indicate higher analytical results than the current values of Fineli.

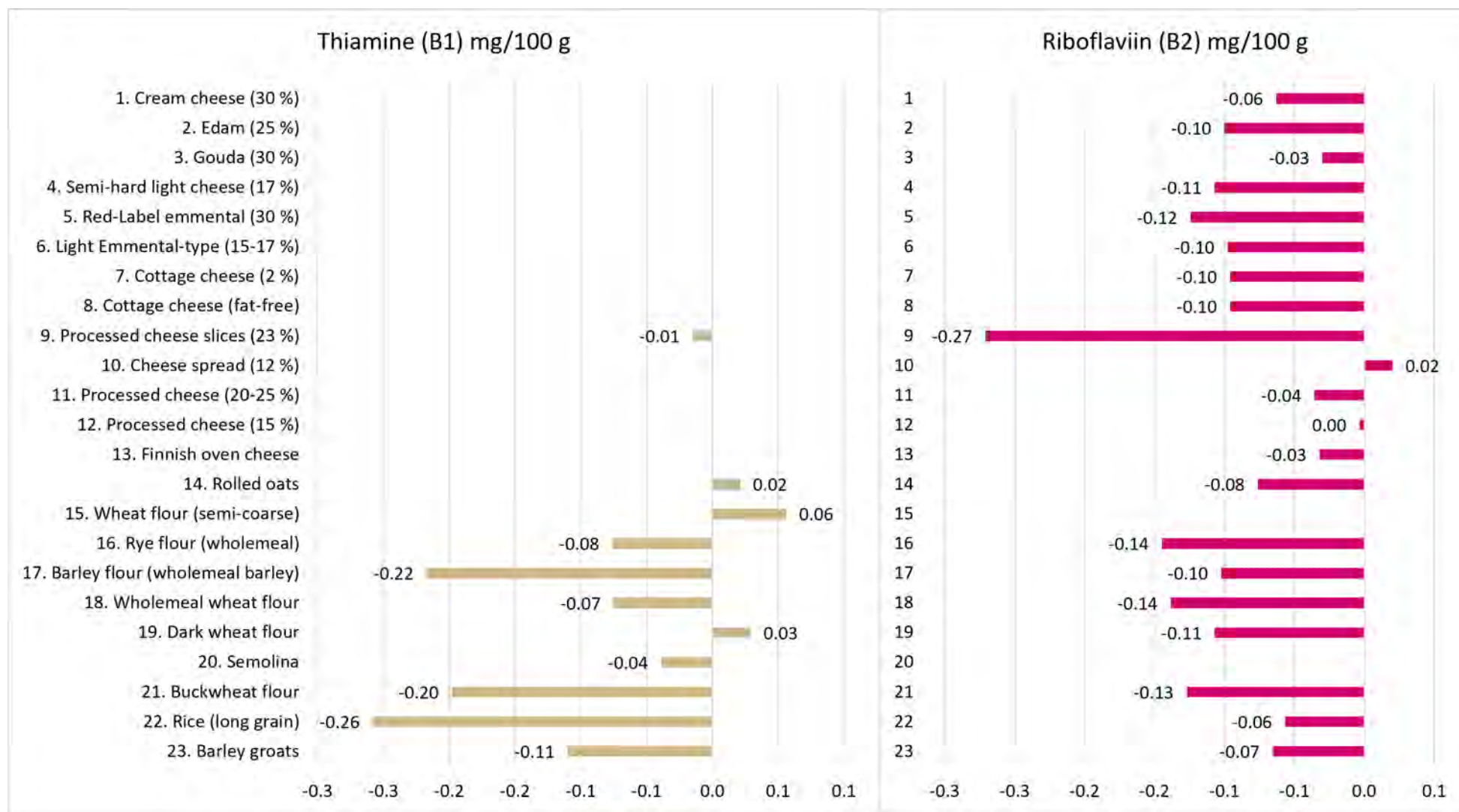


Figure 11. Comparison of thiamine (vitamin B1; brown) and riboflavin (vitamin B2; pink) analysis results with Fineli values. The differences are obtained by subtracting the Fineli value from the new analytical result (analytical result – Fineli value = difference (mg/100 g)). The negative bars mean that the new analytical results are lower than the previous Fineli values, while the positive bars mean that the analytical results are higher than the current values of Fineli.



RUOKAVIRASTO

Livsmedelsverket • Finnish Food Authority



Finnish Food Authority publications 4/2024

ISSN 2669-8307

ISBN 978-952-358-062-6 (pdf)

foodauthority.fi