



COST Action ENFiber | CA24111

D3 - Database of Fiber Sources

WG1 - Fiber Source Identification and Feasibility Analysis

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Executive Summary

This deliverable presents the Month-12 Fiber Sources Database compiled by WG1, documenting the compositional profile and preliminary feasibility of plant-based food processing by-products as candidate sources of dietary fiber. The database currently compiles 29 by-products across three categories: 10 seed by-products from oilseed- and cereal-crushing industries, 10 fruit by-products, and 9 vegetable by-products, drawn from peer-reviewed literature and unpublished data contributed directly by WG1 members. Total dietary fiber (TDF) content varies widely across the database, ranging from 17.39 g/100 g dw (pumpkin flour/press cake) to 89.17 g/100 g dw (tomato peel), with the highest-TDF sources concentrated among vegetable and fruit pomaces, including tomato peel, coffee silverskin, garlic husk, grape pomace, artichoke bracts, and olive pomace. Building on this compositional evidence, Section 4.2 identifies a shortlist of priority by-products, including soybean okara, potato peel, wheat bran, banana peel, rapeseed meal, sunflower meal, citrus peel, grape pomace, apple pomace, tomato pomace, pea hulls, coffee silverskin, and poppy seed cake, recommended for further extraction feasibility and sustainability assessment in the next phase of the Action. This deliverable directly fulfils Main Objective O1 (identifying fiber-rich food sources and conducting a preliminary feasibility analysis for large-scale production) and Research Coordination Objective RCO2 (Internal Data Management), establishing the structured, traceable database from which WG1's subsequent feasibility work, and WG2's Feasibility Analysis Report (D4, Month 24), will proceed.

1. Introduction

1.1 Background and Context

The ENFiber COST Action (CA24111 — European Network for Valorizing Food Processing Waste into Sustainable Fibers) was approved by the COST Committee of Senior Officials on 19 May 2025 (COST 020/25) with the overarching aim of developing scalable, sustainable, and standardized methods to convert food processing waste (FPW) into commercially viable fiber, as set out in the Memorandum of Understanding (MoU) and its Technical Annex. The Action addresses five primary challenges identified in the Technical Annex, the first of which (Ch1 — Scalability of Fiber Extraction Techniques, Sustainability Assessments, and Feasibility of Fiber Sources) explicitly calls for diverse FPW sources rich in fiber to be investigated to evaluate their extraction potential, followed by a preliminary feasibility analysis.

Within the Action's implementation structure, Working Group 1 (WG1 — Fiber Source Identification and Feasibility Analysis) is responsible for identifying high-potential food waste streams for fiber extraction and for maintaining an evolving database of promising fiber sources, together with an environmentally sustainable and economically viable assessment of each source (Technical Annex, Section 4.1.1). This responsibility is operationalized through Key Task KT1.1 ("Create and maintain an evolving database of food waste streams with fiber potential") and Key Activity KA1.1 ("Conduct literature review and data from industry partners to identify new fiber sources"), and it directly underpins Main Objective O1 of the Action ("Identifying fiber rich food sources and conduct a preliminary feasibility analysis for its large-scale production"), which carries the Month-24 KPI of identifying 20+ food waste sources rich in fiber, of which 10 or more are shown to be feasible for production if optimized. At the level of the Action's Research Coordination Objectives, this work corresponds to RCO2 (Internal Data Management): coordinating systematic, regularly updated data collection from participants on food waste sources, extraction, and sustainability assessments, and creating an internally accessible, structured database that supports standardized knowledge exchange and informed decision-making across the network.

This deliverable (D3 — Database of Fiber Sources; due Month 12; responsible Working Group: WG1; related Objective: O1) presents the first consolidated compilation of that database. Data were contributed directly by WG1 members with relevant research expertise and supplemented by a targeted literature review addressing gaps in contributor-submitted data. This document reflects the status of a continuously updated database at Month 12, rather than a final, closed dataset; this is addressed further in Section 1.3.

1.2 Objectives of this Deliverable

This deliverable pursues four specific objectives, aligned with KT1.1–KT1.3 and KA1.1–KA1.3 of the Technical Annex:

- **Compile a structured inventory** of food processing by-products with documented potential for fiber extraction, drawing on both direct WG1 member contributions and complementary literature search, organized by category (fruit, vegetable, and seed by-products).
- **Report, for each by-product**, the mean value and reported range for key compositional and fiber-related parameters (proximate composition, total/insoluble/soluble dietary fiber, carbohydrate fraction, cellulose/hemicellulose content, and, where available, bioactivity data), together with the analytical method applied and the underlying literature reference for each figure.
- **Provide a preliminary evidence base** for extraction feasibility, based on a screening and prioritization exercise. For each by-product, four criteria were applied: estimated production and availability; concentration of generation at processing sites; existing utilization in food and/or feed; and the level of available knowledge. These criteria were

used to develop a ranked shortlist of priority sources, contributing toward the Month-24 KPI under Objective O1 (identification of 20+ fiber-rich sources, with 10 or more shown to be feasible for production if optimized). A more detailed assessment of extraction specific feasibility, including extraction yield, technological maturity, processing costs, and scalability, falls beyond the scope of this deliverable. These aspects will be addressed jointly with WG2.

- **Establish the database as a dynamic resource** under RCO2, to be expanded and refined by WG1 members throughout the remainder of the Action, with this deliverable serving as its first formally reported compilation.

Collectively, these objectives establish which food processing waste streams demonstrate documented, quantifiable potential as fiber sources, and on what evidence basis. The primary output of this deliverable is the structured Fiber Sources Database presented in Section 3, with full raw contributor and literature data retained in Annex A to ensure traceability.

1.3 Scope and Structure

The scope of this deliverable is limited to plant-based food processing by-products, in line with the focus of Main Objective O1 on "plant-based waste from fruits, vegetables, and cereals". At the time of writing, the database covers three by-product categories: seed by-products (10 selected), fruit by-products (10 selected), and vegetable by-products (9 selected). Data collection and verification across all three categories has now been completed by WG1. For each by-product, the underlying WG1 working spreadsheets record, per contributor and per literature source, the amount/value, units (fresh weight or dry weight), analytical method applied, publication reference, and any relevant comments, structured across standard compositional parameters (moisture, total carbohydrates, proteins, fat, ash, total/insoluble/soluble dietary fiber, carbohydrate fraction, and fiber sub-fractions such as cellulose and hemicellulose). Only the calculated mean and range per parameter, plus consolidated references, are presented in the main body of this deliverable (Section 3); the complete raw, per-source data is retained in Annex A so that every reported figure remains traceable to its origin.

In addition to compositional data, this deliverable addresses the extraction-feasibility element of D3's official description through a screening and prioritization exercise. Four criteria were applied to each by-product: estimated production and availability; concentration of generation at processing sites (e.g., mills, crushers, breweries, juice plants, roasteries); existing utilization in food and/or feed; and the level of available knowledge. This screening produced a ranked shortlist of priority by-products, comprising higher-volume, better-characterized sources. This screening excludes extraction yield, method maturity, processing cost, and scalability data; these extraction-specific dimensions of feasibility require dedicated experimental and economic input and will be planned as a joint WG1–WG2 activity. WG1's data collection constitutes an ongoing, iterative process; additional by-products, contributors, and literature sources will continue to be incorporated following this deliverable's submission. This document therefore presents a Month-12 status report of a dynamic database rather than a final, closed dataset. The underlying WG1 working spreadsheets remain the authoritative, continuously updated reference at this stage; per KA1.4 of the Technical Annex, the longer-term intention is to migrate the database to a dedicated public web portal, which will subsequently serve as the authoritative, continuously updated version, with future deliverable revisions referencing it accordingly.

2. Methodology

Data for this deliverable were collected through a combination of direct WG1 member contribution and structured literature research, consolidated into a shared set of working spreadsheets maintained by WG1; these will be migrated to the public web portal described in KA1.4 upon implementation of that infrastructure.

2.1 Data Collection and Compilation Approach

Data collection followed a two-stage process. First, WG1 members were asked to indicate, for each food by-product in which they hold direct research experience, whether data on insoluble fiber, soluble fiber, other bioactive compounds, and/or bioactivity were available.

In an initial survey of WG members who expressed an interest in participating in the database, a total of 52 potential by-products as shown in Table 1 (21 seeds by-products, 18 fruits by-products and 13 vegetables by-products) were identified from 47 different food sources (21 seeds, 15 fruits and 11 vegetables food matrices), of which 29 were ultimately worked on (10 seeds by-products, 10 fruits by-products and 9 vegetables by-products), based on the direct experience of the WG1 members who were finally involved (Table 2), all of them were classified according to fruits by-products, vegetables by-products and seed by-products in order to facilitate discussion of the results obtained, taking into account their specific characteristics (e.g. galactosides were mainly found in seed by-products, while pectins were found in fruit by-products).

Table 1. Potential identified by-products during WG1 survey

SEED BY-PRODUCTS	FRUITS BY-PRODUCTS	VEGETABLE BY-PRODUCTS
Amaranth	Apple pomace	Artichoke bracts
Aquafaba	Banana peel	Bean pods
Black cumin cake	Berry pomaces	Purple cabbage
Brazilian nuts meal	Carob pomace	Carrot pomace
Brewery spent grain	Citrus peel	Cruciferous by-products
Cotton seed meal	Citrus pomace	Garlic husk
Flax seeds cake	Coffee bean pulp	Pea pods
Hazelnut	Coffee silverskin	Potato peel
Hemp press cake	Date Palm pits	Saffron petals
Lentil	Grape peel	Sugar Beet Pulp
Macadamia nuts meal	Grapes seeds	Tomato pomace (peel + seed)
Soybean - Okara	Jaboticaba pomace	Tomato peel
Poppy seed cake	Olive pomace	Tomato seed
Pumpkin defatted flour	Persimmon peel	
Quinoa seeds	Pumpkin skins	
Rapeseed meal	Pomegranate peels	
Rice husk	Sour cherry pomace	
Sunflower meal	Strawberry pomace	
Sweet corn		
Walnut semi-defatted flour		
Wheat bran		

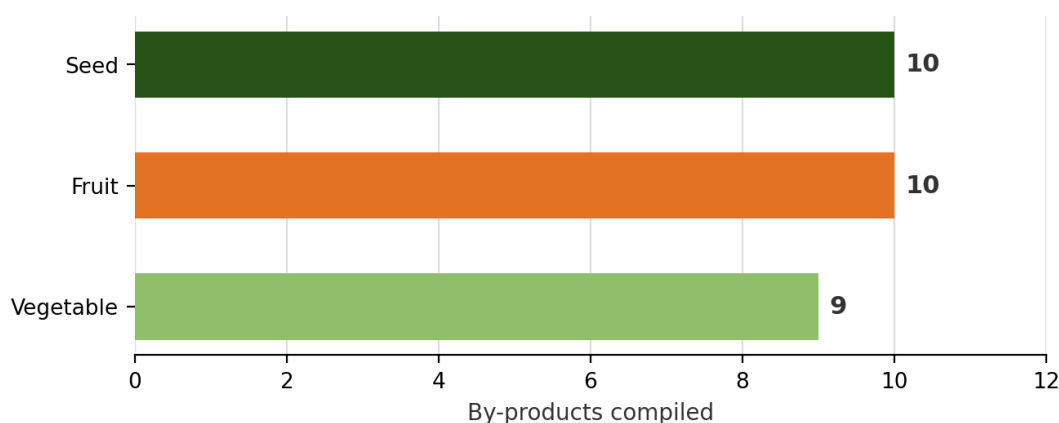


Figure 1. Database composition: 29 selected by-products across three categories (seed, fruit and vegetable).

Table 2 shows the 29 selected by-products that were included in the database at this moment (their distribution by category is shown in Figure 1). Since the database is a living document, this selection could be increased and enriched throughout the duration of the project.

Table 2. Database selected by-products

SEED BY-PRODUCTS	FRUITS BY-PRODUCTS	VEGETABLE BY-PRODUCTS
Black cumin cake	Apple pomace	Artichoke bracts
Cotton seed meal	Banana peel	Bean pods
Flax seeds cake	Carob pomace	Carrot pomace
Hemp press cake	Citrus peel	Garlic husk
Okara	Coffee bean pulp	Pea pods
Poppy seed cake	Coffee silverskin	Potato peel
Pumpkin defatted flour	Grape peel	Tomato pomace (peel + seed)
Rapeseed meal	Grapes seeds	Tomato peel
Sunflower meal	Olive pomace	Tomato seed
Wheat bran	Sour cherry pomace	

The WG members submit the corresponding values, units (fresh weight or dry weight), analytical method, and supporting reference into a shared by-product-specific worksheet (see Table 3) of each by-product. Second, where contributor-submitted data did not cover a parameter, a targeted literature search was conducted to address identified gaps.

This literature review was also carried out to enrich the database with information from other authors (for each of the parameters) so that the database would cover the inherent variability of the plant species from which the by-products originate (in terms of potential differences due to subspecies, geographical locations, environmental variability, etc.).

The search focused on compiling values for centesimal composition, fiber fraction, other possible bioactive compounds (e.g. total phenolic compounds, main phenolic fraction, tocopherols, fatty acid profile, etc.) and potential bioactivities (antioxidant, antimicrobial, antidiabetic, among others) of the by-products; data from the original food matrix (e.g. wheat seed) or from fiber-rich extracts and/or ingredients obtained following the optimization process applied to those food matrices were not included.

The literature search focused on publications from the last 10 years, although in some cases an exception was made to include earlier publications given the scarcity of viable information available for that by-product. Of all the publications found, those in which official (e.g. AOAC International methods) and/or internationally validated analytical methods used by the scientific community (e.g. DPPH for in vitro antioxidant activity) were employed were selected, to enable a comparison of results. Each spreadsheet groups entries in parallel by source (contribution from a member of WG1 and/or individual bibliographic reference), recording, in each parameter row, the quantity or value, the units, the method applied, the reference and any comments; this allows each reported figure to be traced back to its original contributor or publication. Once all entries corresponding to a given by-product had been compiled, the units were standardized (e.g. g/kg to g/100g), and values were converted from fw to dw (where the publication reported data in fw), taking into account the moisture content published in that article, so that the data would be comparable and mean values and ranges could be calculated for each parameter from all available sources for inclusion in the consolidated database presented in Section 3, while retaining all source-specific details in Annex A.

Table 3. Example of a table for compiling information

FOOD INDUSTRIAL BY-PRODUCTS	By-product				
	Amount	UNITS, fw or dw	Method applied	Reference (if these values are already published)	Comments
Proximate composition (g/100g)					
Moisture					
Total carbohydrates					
Total proteins					
Total fat					
Total ashes					
Total Dietary Fiber					
Insoluble Dietary Fiber					
Soluble Dietary Fiber					
Carbohydrate Fraction					
Soluble sugars (glucose, fructose, sucrose....)					
Starch					
Insoluble DF fraction					
Cellulose					
Hemicellulose					

Resistant starch					
Lignine					
Quitine (in applied)					
Others compounds (Insoluble Fraction) - include as much rows as needed.					
Soluble DF fraction					
Total Oligosaccharides**					
alpha-galactosides (total amount and individual compounds)					
Fructooligosaccharides (total amount and individual compounds)					
Arabinoxylans					
Pectines					
Other Compounds (soluble fraction) - include as much rows as needed.					
Bioactive compounds					
Total phenolic compounds					
Total flavonols					
Total flavonoids					
Total hidroxi benzoic acids					
Total hidroxicynamic acids					
Individual phenolic compounds **					
Vitamines? **					
Minerals? **					
Pigments? **					
Others?? **					
Bioactivity					
In vitro antioxidant activity (please indicate assay)					
Antimicrobial activity (0: No; 1: yes)					
Antidiabetic activity (please indicate assay and values)					
Others??					

** For individual compounds, please create another table

2.2 Preliminary Feasibility Screening (Extraction Potential)

To address the extraction-feasibility element of D3's official description, a separate screening and prioritization exercise was conducted, drawing on European production and utilization data for candidate by-products. Four criteria were applied to each by-product: (i) estimated production and availability; (ii) concentration of generation at processing sites (e.g., mills, crushers, breweries, juice plants, roasteries); (iii) existing utilization in food and/or feed; and (iv) the level of available knowledge, i.e., the extent to which the by-product has already been studied. These criteria were used to develop a ranked shortlist of priority by-products, comprising higher-volume, better-characterized sources. The outcomes of this screening are presented in Section 3.2.

The detailed method applied was described as follows:

To ensure the traceability and comparability of the estimates, a hierarchy of information sources was established:

- ✓ Main-product volumes: Statista was used preferentially when it offers global production series for 2023-2025 for the main crops (wheat, sugar beet, potato, tomato, orange, banana, coffee, among others).
- ✓ Alternative (fallback) source: syntheses based on FAO/FAOSTAT (for example, for pea and potato) and sector organizations such as the International Organisation of Vine and Wine (OIV, for grapes/wine) and the International Olive Council (IOC, for olive oil), in cases where these summarize the most recent FAO data more clearly than Statista.
- ✓ By-product fractions: peer-reviewed articles and technical reviews were used to obtain typical mass fractions for by-products such as pomace, peels, bran, pulp and spent grain.

In all cases, priority was given to data from 2023, 2024 or 2025; where only data from the 2022/23 or 2023/24 marketing year was available, the most recent year within that interval was used.

For the calculation of secondary-stream volumes of each WG1 ingredient for which it was possible, the following steps were applied:

1. Identification of the associated main product (for example, wheat for wheat bran, sugar beet for beet pulp, potato for potato peel, beer for brewery spent grain).
2. Retrieval of the most recent global production of the main product, in tonnes/year (from Statista or FAO-based sources).
3. Determination of the applicable by-product fraction (for example, "bran accounts for 14.5% of the mass of the wheat grain"; "brewery spent grain amounts to 20 kg per hectolitre of beer"; "potato peel accounts for between 15% and 40% of the tuber mass, depending on the peeling method").
4. Where a directly reported by-product tonnage was not available, it was calculated as: estimated by-product = main-product volume × by-product fraction, and the result was labelled "assumed (calculated)".
5. Where a range of published fractions existed, the midpoint of the range was adopted for the calculation, and this range is explicitly indicated in the corresponding section.

All volumes are expressed as wet-mass equivalent in metric tonnes per year, unless expressly stated otherwise.

Once the secondary-stream volumes had been derived, the ingredients were ranked in ascending order according to their by-product volume (from smallest to largest), both within each category and in the combined summary table (Table 4), in order to facilitate comparative reading. Ingredients for which a reasonable global mass balance could not be constructed from the available literature (for example, minor seed meals, fungal residues, kefir grains or microalgae) were excluded from the numerical ranking and are not included in Table 4.

It should be noted that, given the exploratory nature of this literature search, some estimates depend on additional assumptions about the proportion of the main product that is actually sent for industrial processing (for example, the percentage of peas that are dehulled or of rapeseed that is pressed); these assumptions are made explicit in each entry and introduce an additional margin of uncertainty beyond that of the by-product fraction itself.

3. Fiber Sources Database and Feasibility Screening

3.1 By-Product Composition Tables (Seed, Fruit and Vegetable By-Products)

The tables below summarize the mean values and range of variation for each parameter assessed, based on the data collected by the various WG1 members and that derived from the literature review, in accordance with the criteria described above.

The information gathered has been categorized into by-products derived from seeds, fruit and vegetables and as seen in Table 2.

3.1.1. Seeds by-products composition tables

Source: Black cumin

Botanical name: *Nigella sativa* L.

By-product: seed press cake

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	5.03	4.50 – 5.56
Soluble sugars	g/100 g, dw	5.50	5.10 – 5.90
Total proteins	g/100 g, dw	23.72	7.50 – 35.37
Total fat	g/100 g, dw	12.39	0.52 – 20.00
Total ashes	g/100 g, dw	6.57	6.20 – 6.94
Total dietary fiber	g/100 g, dw	51.69	
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	48.16	
Soluble dietary fiber	g/100 g, dw	3.53	
Cellulose	g/100 g, dw	11.98	3.50 – 24.40
Hemicellulose	g/100 g, dw	9.74	0.80 – 14.10
Lignin	g/100 g, dw	7.87	4.14 – 14.00

	Units	Mean value	Range value
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	3.08	1.20 – 4.26
Total flavonoids	mg QE/g, dw	3.64	0.27 – 9.13
Fatty acid profile			
Palmitic acid (C16:0)	% of total fatty acids	12.30	12.05 – 12.64
Oleic acid (C18:1)	% of total fatty acids	23.78	23.14 – 24.31
Linoleic acid (C18:2)	% of total fatty acids	57.35	56.50 – 58.06
Potential Bioactivities			
Assays			
In vitro antioxidant activity	DPPH		

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Source: Cotton

Botanical name: *Gossypium* spp.

By-product: seed cake

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	26.05	12.33 – 37.11
Total proteins	g/100 g, dw	36.60	32.33 – 44.23
Total fat	g/100 g, dw	11.23	2.76 – 25.39
Total ashes	g/100 g, dw	5.84	4.65 – 6.73
Total dietary fiber	g/100 g, dw	24.10	13.94 – 43.78
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	13.94	
Hemicellulose	g/100 g, dw	9.70	
Lignin	g/100 g, dw	10.44	
Macro and microelements			
Calcium (Ca)	mg/100, dw	560	
Phosphorus (P)	mg/100, dw	880	
Magnesium (Mg)	mg/100, dw	570	
Potassium (K)	mg/100, dw	1690	
Sodium (Na)	mg/100, dw	120	
Iron (Fe)	mg/100, dw	13.60	
Manganese (Mn)	mg/100, dw	6.00	
Zinc (Zn)	mg/100, dw	10.30	
Copper (Cu)	mg/100, dw	1.80	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	5.86	
Tannins	g/100 g, dw	4.22	
Saponins	g/100 g, dw	1.72	
Phytates	g/100 g, dw	2.45	
Gossypol	g/100 g, dw	1.24	
Oxalates	g/100 g, dw	0.88	
Potential bioactivities			
Assays			
In vitro antioxidant activity	DPPH, ABTS, FRAP, CUPRAC		

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Source: Soybean

Botanical name: *Glycine max* L. Merr.

By-product: Okara

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	3.04	2.56 – 3.80
Total proteins	g/100 g, dw	27.71	20.00 – 33.00
Total fat	g/100 g, dw	8.32	6.22 – 9.84
Total ashes	g/100 g, dw	3.54	3.50 – 3.61
Total dietary fiber	g/100 g, dw	53.17	46.20 – 60.00
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	46.65	42.52 – 50.77
Soluble dietary fiber	g/100 g, dw	3.89	3.67 – 4.10
Cellulose	g/100 g, dw	13.35	
Hemicellulose	g/100 g, dw	26.72	
Macro and microelements			
Potassium (K)	mg/100 g, dw	1125.00	1040.00 – 1210.00
Phosphorus (P)	mg/100 g, dw	475.00	450.00 – 500.00
Calcium (Ca)	mg/100 g, dw	325.00	260.00 – 390.00
Iron (Fe)	mg/100 g, dw	8.20	5.45 – 10.95
Zinc (Zn)	mg/100 g, dw	3.02	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g dw	1.30	
Total tocopherols	mg/100 g dw	1.19	
Total isoflavones (sum of HPLC compounds)	mg/100 g dw	21.20	
Potential Bioactivities			
Assays			
In vitro antioxidant activity	DPPH, FRAP, ORAC		

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Source: Flax

Botanical name: *Linum usitatissimum* L.

By-product: seed press cake

	Units	Mean value	Range value
Proximate composition			
Total carbohydrates	g/100 g, dw	30.79	23.30 – 46.41
Total proteins	g/100 g, dw	25.69	9.63 – 46.80
Total fat	g/100 g, dw	13.61	8.10 – 23.50
Total ashes	g/100 g, dw	5.22	4.70 – 5.70
Total dietary fiber	g/100 g, dw	27.13	23.53 – 28.53
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	19.74	
Soluble dietary fiber	g/100 g, dw	7.52	
Cellulose	g/100 g, dw	5.70	3.00 – 8.40
Hemicellulose	g/100 g, dw	8.30	2.80 – 13.80
Lignin (ADL)	g/100 g, dw	7.70	7.00 – 8.40
Macro and microelements			
Calcium (Ca)	mg/100 g, dw	235.61	110.22 – 361.00
Magnesium (Mg)	mg/100 g, dw	397.18	353.36 – 441.00
Potassium (K)	mg/100 g, dw	1006.29	771.57 – 1241.00
Sodium (Na)	mg/100 g, dw	25.56	17.11 – 34.00
Phosphorus (P)	mg/100 g, dw	952.00	
Iron (Fe)	mg/100 g, dw	22.15	
Zinc (Zn)	mg/100 g, dw	5.48	4.86 – 6.11
Manganese (Mn)	mg/100 g, dw	2.30	1.37 – 3.22
Copper (Cu)	mg/100 g, dw	1.73	1.68 – 1.78
Bioactive compounds and others			
Total phenolic compounds (gallic acid std.)	mg GAE/g dw	1.49	1.44 – 1.53
Total flavonoids	mg QE/g dw	1.31	1.17 – 1.44
Vitamin C	mg/100 g dw	4.90	
Total carotenoids	mg/100 g dw	36.53	
Potential Bioactivities			
Assays			
In vitro antioxidant activity	ABTS, DPPH, FRAP		
Antimicrobial activity	Antifungal activity		
Antidiabetic activity	% inhibition		

References:

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Source: Hemp

Botanical name: *Cannabis sativa* L.

By-product: seed press cake

	Units	Mean value	Range value
Proximate composition			
Total carbohydrates	g/100 g, dw	3.12	3.12 – 6.30
Total proteins	g/100 g, dw	29.01	26.49 – 31.62
Total fat	g/100 g, dw	10.08	6.95 – 15.94
Total ashes	g/100 g, dw	8.63	6.75 – 11.60
Total dietary fiber	g/100 g, dw	45.98	37.20 – 52.60
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	46.55	44.09 – 49.00
Soluble dietary fiber	g/100 g, dw	3.84	3.60 – 4.07
Raffinose family oligosaccharides (RFO)	g/100 g, dw	0.63	
Lignin	g/100 g, dw	20.62	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	1.73	0.98 – 2.48
Phytic acid	g/100 g, dw	1.34	1.08 – 1.59

References:

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Source: Poppy seed

Botanical name: *Papaver somniferum* L.

By-product: seed press cake

	Units	Mean value	Range value
Proximate composition			
Total proteins	g/100 g, dw	28.50	26.00 – 35.14
Total fat	g/100 g, dw	6.65	2.32 – 10.00
Total ashes	g/100 g, dw	9.96	8.70 – 10.00
Total dietary fiber	g/100 g, dw	38.00	
Bioactive compounds and others			
Phytic acid	g/100 g, dw	1.44	1.18 – 1.70
Fatty acid profile			

	Units	Mean value	Range value
Saturated fatty acids (SFA)	% of total fatty acids	29.00	
Monounsaturated fatty acids (MUFA)	% of total fatty acids	19.00	
Polyunsaturated fatty acids (PUFA)	% of total fatty acids	52.00	
Potential Bioactivities	Assays		
In vitro antioxidant activity	FRAP, DPPH		

References:

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Source: Pumpkin

Botanical name: *Cucurbita* spp.

By-product: flour / seed press cake

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	12.24	4.05 – 20.43
Total proteins	g/100 g, dw	53.71	38.73 – 68.68
Total fat	g/100 g, dw	17.45	0.77 – 34.12
Total ashes	g/100 g, dw	7.91	6.72 – 9.11
Total dietary fiber	g/100 g, dw	17.39	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	7.89	
Fatty acid profile			
Palmitic acid (C16:0)	% of total fatty acids	12.15	
Stearic acid (C18:0)	% of total fatty acids	6.00	
Oleic acid (C18:1 n-9c)	% of total fatty acids	29.10	
Linoleic acid (C18:2 n-6c)	% of total fatty acids	52.75	
Total saturated fatty acids (SFA)	% of total fatty acids	18.15	
Potential Bioactivities	Assays		
In vitro antioxidant activity	DPPH		

References:

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Source: Sunflower

Botanical name: *Helianthus annuus* L.

By-product: seeds press cake

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	12.09	10.41 – 13.77
Soluble sugars	g/100 g, dw	5.13	2.50 – 7.40
Starch	g/100 g, dw	3.89	2.65 – 4.91
Total proteins	g/100 g, dw	40.00	36.10 – 43.84
Total fat	g/100 g, dw	1.62	0.70 – 2.80
Total ashes	g/100 g, dw	7.02	5.60 – 7.70
Total dietary fiber	g/100 g, dw	39.87	33.57 – 45.14
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	26.93	24.85 – 29.00
Soluble dietary fiber	g/100 g, dw	10.31	8.72 – 11.90
Cellulose	g/100 g, dw	13.50	
Hemicellulose	g/100 g, dw	12.70	
Lignin	g/100 g, dw	7.30	6.80 – 7.60
Total oligosaccharides	g/100 g, dw	2.20	
Macro and microelements			
Potassium (K)	mg/100 g, dw	1190	670 – 1660
Phosphorus (P)	mg/100 g, dw	96	60 – 115
Sulfur (S)	mg/100 g, dw	39	26 – 49
Magnesium (Mg)	mg/100 g, dw	21	5 – 41
Calcium (Ca)	mg/100 g, dw	27	8 – 44
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g dw	18.35	10.00 – 40.00
Total flavonoids	mg QE/g dw	7.45	7.00 – 7.90
Choline	mg/100 g dw	280	
Carotenoids	mg/100 g dw	20.00	10.00 – 20.00
Potential Bioactivities			
In vitro antioxidant activity	DPPH, ABTS, FRAP, CUPRAC		
Anticholesterolemic activity	% inhibition		

References:

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Source: Rapeseed

Botanical name: *Brassica napus* L.

By-product: extraction meal (RSM)

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	37.82	34.50 – 40.38
Total soluble sugars	g/100 g, dw	11.44	
Starch	g/100 g, dw	2.50	
Total proteins	g/100 g, dw	37.32	34.00 – 42.82
Total fat	g/100 g, dw	5.49	1.33 – 13.24
Total ashes	g/100 g, dw	7.25	6.06 – 8.80
Total dietary fiber	g/100 g, dw	34.97	31.80 – 40.23
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	29.25	
Soluble dietary fiber	g/100 g, dw	3.64	
Raffinose family oligosaccharides	g/100 g, dw	3.11	
Cellulose	g/100 g, dw	13.02	12.65 – 13.38
Hemicellulose	g/100 g, dw	14.08	7.72 – 20.75
Lignin	g/100 g, dw	16.00	2.60 – 34.93
Pectins	g/100 g, dw	7.55	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	70	

	Units	Mean value	Range value
Total phenolic compounds (sinapic acid equivalents)	mg SAE/g, dw	13.3	8.9 – 17.7
Potential Bioactivities	Assays		
In vitro antioxidant activity	DPPH, FRAP, CAA		
Antimicrobial activity	Antibacterial activity		
Antidiabetic activity	IC50 α -glucosidase; murine T2D model		

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Source: Wheat

Botanical name: *Triticum* spp.

By-product: bran

	Units	Mean value	Range value
Proximate composition			
Total carbohydrates	g/100 g, dw	72.74	63.14 – 92.31
Starch	g/100 g, dw	29.80	9.60 – 50.00
Total proteins	g/100 g, dw	16.70	12.27 – 22.54
Total fat	g/100 g, dw	3.54	2.56 – 6.25
Total ashes	g/100 g, dw	6.06	5.28 – 7.31

	Units	Mean value	Range value
Total dietary fiber	g/100 g, dw	42.19	23.10 – 55.75
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	36.94	18.91 – 49.41
Soluble dietary fiber	g/100 g, dw	3.67	1.55 – 8.41
Klason lignin	g/100 g, dw	9.16	
Total arabinoxylans (TO-AX)	g/100 g, dw	10.05	6.30 – 13.80
Water-extractable arabinoxylans (WE-AX)	g/100 g, dw	1.26	0.30 – 1.90
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g	2.45	0.45 – 6.70
Ferulic acid	mg/100g, dw	215	77 – 353
p-Coumaric acid	mg/100g, dw	6.5	3 – 10
Phytic acid	g/100 g, dw	2.46	1.02 – 3.90
Total tocopherols	mg/100 g, dw	203.46	120.06 – 286.87
Total carotenoids	mg/100 g, w	2.53	0.07 – 4.99
Fatty acid profile			
Saturated fatty acids (SFA)	% of total fatty acids	23.26	15.81 – 38.99
Monounsaturated fatty acids (MUFA)	% of total fatty acids	19.63	14.24 – 29.86
Polyunsaturated fatty acids (PUFA)	% of total fatty acids	62.56	59.50 – 67.42
Linoleic acid (C18:2)	% of total fatty acids	49.88	42.62 – 57.14
Potential Bioactivities			
Assays			
In vitro antioxidant activity	DPPH, FRAP		

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3.1.2. Fruits by-products composition tables

Source: Apple

Botanical name: *Malus domestica* Borkh.

By-product: pomace

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g dw	48.57	64.44 – 81.87
Fructose	g/100 g dw	18.35	3.52 – 44.44
Glucose	g/100 g dw	16.71	8.33 – 27.14
Sucrose	g/100 g dw	12.42	1.58 – 20.44
Soluble sugars (total)	g/100 g dw	48.73	46.03 – 68.89
Starch	g/100 g dw	0.47	
Total proteins	g/100 g dw	3.23	1.62 – 5.60
Total fat	g/100 g dw	1.48	0.90 – 3.03
Total ashes	g/100 g dw	2.17	0.56 – 4.78
Total dietary fiber	g/100 g dw	36.40	17.38 – 57.29
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g dw	12.60	11.86 – 13.33
Soluble dietary fiber	g/100 g dw	18.16	4.29 – 32.03
Cellulose	g/100 g dw	1.52	
Hemicellulose	g/100 g dw	3.11	
Lignin	g/100 g dw	13.53	
Pectins	g/100 g dw	7.12	4.43 – 8.68
Bioactive compounds and others			
Total phenolic compounds	mg TE/g dw	0.929	0.810 – 1.087
alpha-Tocopherol	mg/100 g dw	5.14	1.75 – 10.95
Anthocyanins	mg/g dw	0.19	
Potential Bioactivities			
Assays			
In vitro antioxidant activity	DPPH and FRAP		

References:

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Source: Banana

Botanical name: *Musa* spp.

By-product: peel

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g dw	48.91	29.49 – 64.52
Soluble sugars (total)	g/100 g dw	19.27	0.47 – 33.20
Starch	g/100 g dw	4.81	1.32 – 14.00
Total proteins	g/100 g dw	8.68	3.95 – 11.29
Total fat	g/100 g dw	6.83	3.23 – 11.50
Total ashes	g/100 g dw	12.50	8.23 – 17.78
Total dietary fiber	g/100 g dw	37.47	12.26 – 51.90
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g dw	37.55	35.20 – 39.90
Soluble dietary fiber	g/100 g dw	12.80	12.00 – 13.60
Cellulose	g/100 g dw	15.45	15.20 – 15.70
Hemicellulose	g/100 g dw	0.50	0.40 – 0.60
Lignin	g/100 g dw	14.15	13.30 – 15.00
Pectins	g/100 g dw	13.06	
Macro and microelements			
Potassium (K)	mg/100 g dw	100.08	
Calcium (Ca)	mg/100 g dw	24.72	
Sodium (Na)	mg/100 g dw	31.14	
Iron (Fe)	mg/100 g dw	0.78	
Magnesium (Mg)	mg/100 g dw	97.64	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g dw	30.71	
Total flavonoids	mg/g dw	12.82	
Potential Bioactivities			
Assays			
Antioxidant activity	ABTS, DPPH, FRAP		
Prebiotic activity			

References:

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Source: Carob

Botanical name: *Ceratonia siliqua* L.

By-product: pomace

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g dw	53.91	42.70 – 70.10
Fructose	g/100 g dw	5.02	0.48 – 11.65
Glucose	g/100 g dw	3.69	0.43 – 9.30
Sucrose	g/100 g dw	30.04	4.23 – 59.90
Soluble sugars, total	g/100 g dw	34.54	22.50 – 62.50
Total proteins	g/100 g dw	5.60	2.18 – 10.46
Total fat	g/100 g dw	1.24	0.10 – 3.49
Total ashes	g/100 g dw	3.36	1.04 – 7.11
Total dietary fiber	g/100 g dw	42.05	22.60 – 56.49
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g dw	26.85	
Soluble dietary fiber	g/100 g dw	22.21	
Lignin	g/100 g dw	27.30	
Arabinose (structural compounds)	g/100 g dw	13.25	
Xylose (structural compounds)	g/100 g dw	8.85	
Macro and microelements			
Potassium (K)	mg/100 g, dw	1640.54	
Magnesium (Mg)	mg/100 g, dw	47.96	
Calcium (Ca)	mg/100 g, dw	129.16	
Phosphorus (P)	mg/100 g, dw	73.86	
Iron (Fe)	mg/100 g, dw	5.91	
Zinc (Zn)	mg/100 g, dw	1.23	
Manganese (Mn)	mg/100 g, dw	0.58	
Copper (Cu)	mg/100 g, dw	0.26	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	53.37	5.05 – 148.93
Total tannin content	mg GAE/g, dw	17.00	6.00 – 28.00
Syringic acid	mg/g, dw	0.376	
Caffeic acid	mg/g, dw	0.034	
trans-Cinnamic acid	mg/g, dw	0.007	
Myricetin	mg/g, dw	0.008	
Naringin	mg/g, dw	0.001	
(-)-Epicatechin	mg/g, dw	0.0009	
Fatty acid profile			
Oleic acid	% of total fatty acids	46.55	32.30 – 60.80
Palmitic acid	% of total fatty acids	24.95	13.30 – 36.60
Stearic acid	% of total fatty acids	3.95	2.40 – 5.50
Linoleic acid	% of total fatty acids	13.80	9.70 – 20.20
Butyric acid	% of total fatty acids	5.80	1.80 – 15.80
Potential Bioactivities			
Assays			
In vitro antioxidant assays	DPPH, ABTS, FRAP, CUPRAC		

References:

- ✓ Ozyurt et al., 2020. Food Sci. Technol. 2020, 14(4). <https://doi.org/10.15673/fst.v14i4.1767>
- ✓ Tounsi et al., 2022. J. Food Meas. Charact. 2022, 16, 3957-3966. <https://doi.org/10.1007/s11694-022-01494-z>
- ✓ El Chami et al., 2025. Appl. Sci. 2025, 15, 1340. <https://doi.org/10.3390/app15031340>
- ✓ Garau et al., 2025. Molecules 2025, 30, 2715. <https://doi.org/10.3390/molecules30132715>

Source: Coffee

Botanical name: *Coffea arabica* L. Sp. Pl. / *C. canephora*

By-product: bean pulp

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g dw	29.07	26.90 – 31.23
Total proteins	g/100 g dw	10.78	9.20 – 12.90
Total amino acids	g/100 g dw	2.12	
Total fat	g/100 g dw	2.37	1.70 – 2.80
Total ashes	g/100 g dw	9.16	7.60 – 10.72
Total dietary fiber	g/100 g dw	49.04	46.12 – 51.20
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g dw	40.39	36.99 – 45.57
Soluble dietary fiber	g/100 g dw	8.65	5.63 – 11.20
Macro and microelements			
Potassium (K)	mg/100 g dw	2420.00	
Sum of macroelements (K+Ca+Mg+P)	mg/100 g dw	2870.00	
Bioactive compounds and others			
Total phenolic compounds (HPLC-DAD-ESI/MSn)	mg/g dw	3.56	
Total phenolic compounds (Folin, eq. ác. clorogénico)	mg GAE/g dw	23.7	
Total hydroxybenzoic acids	mg/g dw	2.23	
Total hydroxycinnamic acids	mg/g dw	1.11	
Total flavonoids (eq. catequina)	mg CE/g dw	12.3	
4-CQA (ác. 4-cafeoilquínico)	mg/g dw	0.50	0.15 – 0.85
5-CQA (ác. 5-cafeoilquínico)	mg/g dw	2.21	
3-CQA (ác. 3-cafeoilquínico)	mg/g dw	0.07	
Caffeine	mg/100 g dw	661.55	473 – 850
Potential Bioactivities			
Assays			
In vitro antioxidant assays	ABTS, DPPH, FRAP		
Antidiabetic activity			
Anticholesterolemic activity			

References:

- ✓ Gil-Ramírez et al., 2024. Foods 2024, 13, 3006. <https://doi.org/10.3390/foods13183006>
- ✓ Machado et al., 2023. Foods 2023, 12, 2354. <https://doi.org/10.3390/foods12122354>
- ✓ Cañas et al., 2021. Proceedings 2021, 70, 65. https://doi.org/10.3390/foods_2020-07623

Source: Coffee

Botanical name: *Coffea arabica* / *C. canephora*

By-product: silverskin

	Units	Mean value	Range value
Proximate composition			
Total carbohydrates	g/100 g dw	8.88	0.28 – 19.50
Total proteins	g/100 g dw	18.25	12.95 – 22.87
Total fat	g/100 g dw	2.46	1.26 – 4.01
Total ashes	g/100 g dw	7.15	4.45 – 11.58
Total dietary fiber	g/100 g dw	64.80	52.51 – 80.48
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g dw	55.11	47.35 – 64.23
Soluble dietary fiber	g/100 g dw	11.32	6.60 – 20.33
Macro and microelements			
Calcium	mg/100 g dw	928.91	562.13 – 1721.47
Potassium	mg/100 g dw	2131.30	702.98 – 5225.75
Magnesium	mg/100 g dw	683.79	223.31 – 2102.06
Phosphorus	mg/100 g dw	345.29	107.66 – 554.55
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g dw	18.17	3.16 – 58.56
Total flavonoids (catechin)	mg/g dw	4.63	2.36 – 5.41
Caffeine	mg/100 g dw	1014.11	89.01 – 2055.00
5-caffeoylquinic acid	mg/100 g dw	238.88	2.23 – 905.27
3-caffeoylquinic acid	mg/100 g dw	626.72	0.91 – 2465.00
4-caffeoylquinic acid	mg/100 g dw	243.63	1.62 – 723.00
Vitamin E	mg/100 g dw	7.93	4.38 – 18.56
Potential Bioactivities			
Assays			
In vitro antioxidant assays	ABTS, FRAP, DPPH		

References:

- ✓ WG1 member contribution (Gianni Zoccatelli, University of Verona, Italy)
- ✓ Behrouzian et al., 2016. Bioactive Carbohydrates and Dietary Fibre, 8(2), 58–64. <https://doi.org/10.1016/j.bcdf.2016.11.004>
- ✓ Bessada et al., 2018. Sci. Total Environ. 2018, 645, 1021-1028. <https://doi.org/10.1016/j.scitotenv.2018.07.201>
- ✓ Candela-Salvador et al., 2026. Foods 2026, 15, 97. <https://doi.org/10.3390/foods15010097>
- ✓ Castaldo et al., 2020. Molecules 2020, 25, 2132. <https://doi.org/10.3390/molecules25092132>
- ✓ Costa et al., 2018. Food Chemistry, 267, 28–35. <https://doi.org/10.1016/j.foodchem.2017.03.106>
- ✓ Gottstein et al., 2021. Foods 2021, 10, 1705. <https://doi.org/10.3390/foods10081705>
- ✓ Martuscelli et al., 2021. Foods 2021, 10, 1367. <https://doi.org/10.3390/foods10061367>

- ✓ Nzekoue et al., 2020. Food Res. Int. 2020, 133, 109128.
<https://doi.org/10.1016/j.foodres.2020.109128>
- ✓ Nzekoue et al., 2022. Food Chem. 2022, 372, 131188.
<https://doi.org/10.1016/j.foodchem.2021.131188>

Source: Grape

Botanical name: *Vitis vinifera* L. / *Vitis* spp.

By-product: pomace

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g dw	6.81	
Arabinose (free sugar)	g/100 g dw	2.10	
Fructose (free sugar)	g/100 g dw	1.80	
Soluble sugars (total)	g/100 g dw	3.14	3.00 – 3.27
Total proteins	g/100 g dw	13.45	12.00 – 15.48
Total fat	g/100 g dw	11.74	7.00 – 14.95
Total ashes	g/100 g dw	6.64	5.50 – 9.00
Total dietary fiber	g/100 g dw	60.18	50.93 – 74.50
Dietary fiber fraction and compounds			
Insoluble dietary fiber (IDF)	g/100 g dw	53.24	46.39 – 63.70
Soluble dietary fiber (SDF)	g/100 g dw	6.78	4.53 – 10.80
Klason lignin (IDF fraction)	g/100 g dw	28.70	
Pectins (SDF fraction)	g/100 g dw	6.20	
Neutral sugars (IDF fraction)	g/100 g dw	29.60	
Uronic acids (IDF fraction)	g/100 g dw	5.32	
Resistant protein (IDF fraction)	g/100 g dw	4.18	
Neutral sugars (SDF fraction)	g/100 g dw	4.60	
Uronic acids (SDF fraction)	g/100 g dw	6.21	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g dw	45.99	26.30 – 58.95
Total flavonols	mg CE/g dw	1.461	
Total flavonoids	mg QE/g dw	16.41	6.90 – 25.91
Total anthocyanins	mg/g dw	0.98	
Condensed tannins (proanthocyanidins)	g/100 g dw	21.88	16.00 – 26.90
Gallic acid	mg/g dw	0.04	
Protocatechuic acid	mg/g dw	0.05	
Ellagic acid	mg/g dw	0.03	
Tyrosol	mg/g dw	0.07	
Catechin	mg/g dw	0.80	
Epicatechin derivative	mg/g dw	0.22	
Quercetin	mg/g dw	0.06	
Apigenin	mg/g dw	0.04	

	Units	Mean value	Range value
Kaempferol	mg/g dw	0.04	
Fatty acid profile			
Palmitic acid (C16:0)	% of total fatty acids	10.21	
Palmitoleic acid (C16:1)	% of total fatty acids	0.39	
Stearic acid (C18:0)	% of total fatty acids	3.75	
Oleic acid (C18:1)	% of total fatty acids	13.54	
Linolenic acid	% of total fatty acids	66.18	
Linoleic acid	% of total fatty acids	1.56	
SFA (saturated)	% of total fatty acids	14.78	
MUFA (monounsaturated)	% of total fatty acids	15.38	
PUFA (polyunsaturated)	% of total fatty acids	68.81	
Conjugated linoleic acid (CLA)	% of total fatty acids	0.22	
Omega-3	% of total fatty acids	1.77	
Omega-6	% of total fatty acids	66.84	
Potential Bioactivities			
Assays			
In vitro antioxidant activity	DPPH, FRAP, AAR		

References:

- ✓ Gjore Nakov et al., 2020. LWT 2020, 134, 109950. <https://doi.org/10.1016/j.lwt.2020.109950>
- ✓ Bravo & Saura-Calixto, 1998. Am. J. Enol. Vitic. 1998, 49, 135-141.
- ✓ Ivanov et al., 2025. Molecules 2025, 30, 2029. <https://doi.org/10.3390/molecules30092029>
- ✓ Olt et al., 2023. Front. Nutr. 2023, 10, 1241105. <https://doi.org/10.3389/fnut.2023.1241105>
- ✓ Zhang et al., 2017. Food Funct. 2017, 8, 341-351. <https://doi.org/10.1039/C6FO01423B>
- ✓ Mildner-Szkudlarz et al., 2011. Int. J. Food Sci. Technol. 2011, 46, 1485-1493. <https://doi.org/10.1111/j.1365-2621.2011.02643.x>
- ✓ Llobera & Cañellas, 2007. Food Chem. 2007, 101, 659-666. <https://doi.org/10.1016/j.foodchem.2006.02.025>

Source: Grape

Botanical name: *Vitis vinifera* L.

By-product: seed

	Units	Mean value	Range value
Proximate composition			

	Units	Mean value	Range value
Total available carbohydrates	g/100 g, dw	28.23	22.45 – 31.68
Total proteins	g/100 g, dw	14.60	13.14 – 16.87
Total fat	g/100 g, dw	13.30	10.48 – 16.41
Total ashes	g/100 g, dw	3.53	3.42 – 3.61
Total dietary fiber	g/100 g, dw	33.52	32.05 – 34.02
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	13.24	
Soluble dietary fiber	g/100 g, dw	21.91	
Macro and microelements			
Sodium (Na)	mg/100 g, dw	15.79	12.08 – 19.50
Magnesium (Mg)	mg/100 g, dw	143.26	140.12 – 146.41
Aluminium (Al)	mg/100 g, dw	13.26	11.20 – 15.32
Phosphorus (P)	mg/100 g, dw	343.57	304.99 – 382.15
Potassium (K)	mg/100 g, dw	441.31	371.83 – 510.80
Calcium (Ca)	mg/100 g, dw	186.63	185.38 – 187.88
Chromium (Cr)	mg/100 g, dw	0.08	0.07 – 0.09
Iron (Fe)	mg/100 g, dw	7.87	3.77 – 16.09
Zinc (Zn)	mg/100 g, dw	1.26	0.93 – 1.98
Copper (Cu)	mg/100 g, dw	1.49	1.01 – 1.97
Bioactive compounds and others			
Total phenolic compounds	mg GAE/ g	0.456	
Total flavonoids	mg QE/ g	0.406	
p-Hydroxybenzoic acid	mg/g	5.39	
Gallic acid	mg/g	23.87	
Protocatechuic acid	mg/g	17.45	
Caffeic acid	mg/g	1.49	
Rutin	mg/g	3.58	
Potential Bioactivities			
Antioxidant – TEAC	TEAC		

References:

- ✓ Elkatry et al., 2022. Foods 2022, 11, 1948. <https://doi.org/10.3390/foods11131948>
- ✓ Costa et al., 2019. J. Sci. Food Agric. 2019, 99, 4593-4601. <https://doi.org/10.1002/jsfa.9698>
- ✓ Di Stefano et al., 2022. Sustainability 2022, 14, 6702. <https://doi.org/10.3390/su14116702>
- ✓ Ivanov et al., 2025. Molecules 2025, 30, 2029. <https://doi.org/10.3390/molecules30092029>

Source: Olive

Botanical name: *Olea europaea* L.

By-product: pomace

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g dw	4.88	0.58 – 9.19
Soluble sugars (total)	g/100 g dw	4.62	0.09 – 11.97
Total proteins	g/100 g dw	9.28	5.00 – 13.34
Total fat	g/100 g dw	14.96	4.00 – 21.34

	Units	Mean value	Range value
Total ashes	g/100 g dw	3.97	2.50 – 5.11
Total dietary fiber	g/100 g dw	56.68	25.00 – 66.73
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g dw	51.52	32.39 – 60.54
Soluble dietary fiber	g/100 g dw	10.24	6.24 – 18.42
Hemicellulose	g/100 g fiber dw	19.00	18.00 – 20.00
Lignin	g/100 g fiber dw	21.08	13.00 – 28.16
Pectins (uronic acids)	g/100 g fiber dw	6.54	
Macro and microelements			
Potassium (K)	mg/100 g dw	1921.25	1250.00 – 2923.00
Calcium (Ca)	mg/100 g dw	174.00	149.00 – 217.00
Magnesium (Mg)	mg/100 g dw	96.25	50.00 – 157.00
Sodium (Na)	mg/100 g dw	5.50	4.00 – 7.00
Iron (Fe)	mg/100 g dw	9.00	7.00 – 11.00
Copper (Cu)	mg/100 g dw	1.68	1.55 – 1.81
Phosphorus (P)	mg/100 g dw	159.00	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g dw	23.52	11.28 – 65.87
Tocopherols (vitamin E)	mg/100 g dw	5.41	4.77 – 6.05
Potential Bioactivities			
In vitro antioxidant activity	FRAP, DPPH, ABTS, ORAC, CUPRAC, MCA		
Antimicrobial activity	Antibacterial activity		

References:

- ✓ WG1 Member Contribution - Zoccatelli, Santisteban Soto & Mainente (University of Verona, Italy).
- ✓ Fierri et al., 2024. *Antioxidants* 2024, 13(12), 1522; <https://doi.org/10.3390/antiox13121522>
- ✓ Cecchi et al., 2018. *Journal of Functional Foods*, 40, 751-759. <https://doi.org/10.1016/j.jff.2017.12.018>;
- ✓ Santisteban Soto et al., 2026. *International Journal of Food Science and Technology*, 61. <https://doi.org/10.1093/ijfood/vvag108>;
- ✓ Giuseppe Di Leo et al., 2025. *Molecules* 2025, 30(15), 3095; <https://doi.org/10.3390/molecules30153095>
- ✓ Nunes et al., 2018. *Sci. Total Environ.* 644:229-236. DOI: 10.1016/j.scitotenv.2018.06.350
- ✓ Carboni et al., 2025. *Foods* 2025, 14, 3118. <https://doi.org/10.3390/foods14173118>
- ✓ Ribeiro et al., 2021. *J. Sci. Food Agric.* 101:1963-1978.
- ✓ Simsek & Sufer, 2022. *J. Food Process Preserv.* 46:e15705. <https://doi.org/10.1111/jfpp.15705>
- ✓ Loschi et al., 2024. *Process Biochemistry* 137, 153-163. <https://doi.org/10.1016/j.procbio.2024.01.001>

Source: Orange

Botanical name: *Citrus sinensis* (L.) Osbeck

By-product: peel

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	59.28	50.53 – 68.04
Soluble sugars (total)	g/100 g, dw	18.66	
Total proteins	g/100 g, dw	10.62	6.32 – 17.32
Total fat	g/100 g, dw	6.04	1.81 – 9.98
Total ashes	g/100 g, dw	5.94	3.03 – 12.18
Total dietary fiber	g/100 g, dw	48.40	33.09 – 63.70
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	38.73	29.26 – 48.20
Soluble dietary fiber	g/100 g, dw	9.86	4.13 – 15.60
Cellulose	g/100 g, dw	15.04	
Hemicellulose	g/100 g, dw	13.70	
Lignin	g/100 g, dw	6.80	
Pectins	g/100 g, dw	27.31	21.63 – 33.00
Bioactive compounds and others			
Vitamin C (ascorbic acid)	mg/100 g, dw	663.35	524.80 – 801.89
Total carotenoids	mg/100 g, dw	146.23	1.21 – 430.00
Potential Bioactivities			
Assays			
In vitro antioxidant activity	ABTS, DPPH, ORAC		
Antidiabetic activity			

References:

- ✓ Teixeira et al., 2020. Molecules 2020, 25, 1670. <https://doi.org/10.3390/molecules25071670>
- ✓ Reisi et al., 2026. Int. J. Food Sci. Technol. 2026, 61, vvag057. <https://doi.org/10.1093/ijfood/vvag057>
- ✓ Crizel et al., 2013. LWT - Food Sci. Technol. 2013, 53, 9-14. <https://doi.org/10.1016/j.lwt.2013.02.002>
- ✓ Şengül et al., 2025. Pharmata 2025, 5, 1-6. <https://doi.org/10.62425/pharmata.1605470>
- ✓ Kohli et al., 2024. J. Stored Prod. Res. 2024, 107, 102349. <https://doi.org/10.1016/j.jspr.2024.102349>

Source: Sour cherry

Botanical name: *Prunus cerasus* L.

By-product: pomace

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g dw	55.81	42.50 – 69.30
Total proteins	g/100 g dw	11.18	9.05 – 13.95
Total fat	g/100 g dw	5.09	1.22 – 8.21
Total ashes	g/100 g dw	6.88	1.88 – 11.19

	Units	Mean value	Range value
Total dietary fiber	g/100 g dw	26.47	11.70 – 42.00
Dietary fiber fraction and compounds			
Cellulose	g/100 g dw	11.00	
Hemicellulose	g/100 g dw	24.50	
Pectins	g/100 g dw	24.70	
Macro and microelements			
Potassium (K)	mg/100 g, dw	1678.31	
Calcium (Ca)	mg/100 g, dw	253.45	
Magnesium (Mg)	mg/100 g, dw	66.95	
Bioactive compounds and others			
Total phenolics	mg GAE/g, dw	37.49	2.72 – 39.18
Total carotenoids	mg/100 g dw		
Potential Bioactivities	Assays		
In vitro antioxidant activity	DPPH, ABTS		

References:

- ✓ Djordjević and Djordjević, unpublished data. WG1 member contribution. Institute of Food Technology in Novi Sad, University of Novi Sad, Serbia.
- ✓ Kosmala et al., 2009. Plant Foods Hum. Nutr. 2009, 64, 279–285. <https://doi.org/10.1007/s11130-009-0134-z>
- ✓ Górnaś et al., 2016. LWT 2016, 65, 946–953. <https://doi.org/10.1016/j.lwt.2015.09.029>
- ✓ Sezer et al., 2021. J. Food Meas. Charact. 2021, 15, 3015–3025. <https://doi.org/10.1007/s11694-021-00883-0>
- ✓ Jūrienė et al., 2024. J. CO2 Util. 2024, 85, 102890. <https://doi.org/10.1016/j.jcou.2024.102890>
- ✓ Cucuiet et al., 2026. Appl. Sci. 2026, 16, 5763. <https://doi.org/10.3390/app16125763>

3.1.3. Vegetables by-products composition tables

Source: Artichoke

Botanical name: *Cynara scolymus* L.

By-product: bracts

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100, dw	27.80	22.71 – 36.69
Total proteins	g/100, dw	15.90	12.00 – 20.47
Total fat	g/100, dw	1.36	0.47 – 2.50
Total ashes	g/100, dw	7.43	6.10 – 9.36
Total dietary fiber	g/100, dw	57.01	39.69 – 66.00
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100, dw	39.35	33.24 – 45.45
Soluble dietary fiber	g/100, dw	12.34	6.41 – 26.76
Cellulose	g/100, dw	28.26	25.42 – 31.09
Hemicellulose	g/100, dw	15.40	15.13 – 15.67
Lignin	g/100, dw	11.81	5.27 – 18.34
Inulin	g/100, dw	8.29	6.58 – 10.00
Macro and microelements			

	Units	Mean value	Range value
Potassium (K)	mg/100g, dw	3089.12	
Calcium (Ca)	mg/100g, dw	73.66	
Sodium (Na)	mg/100g, dw	54.17	
Magnesium (Mg)	mg/100g, dw	47.67	
Iron (Fe)	mg/100g, dw	14.95	
Zinc (Zn)	mg/100g, dw	3.03	
Copper (Cu)	mg/100g, dw	1.39	
Manganese (Mn)	mg/100g, dw	0.63	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	6.47	4.50 – 7.84
Total flavonoids	mg CE/g, dw	1.99	1.87 – 2.10
Potential Bioactivities			
In vitro antioxidants activity	DPPH, FRAP, ABTS		
Antimicrobial activity	Antibacterial activity		

References:

- ✓ Ruiz-Cano et al., 2014. Food Chem., 160, 134-140. DOI: 10.1016/j.foodchem.2014.03.091
- ✓ Eman et al., 2018. J. Adv. Agric. Res. 23(1), 112–129.
- ✓ Quintero-Ruiz et al., 2021. International Journal of Food Properties, 24(1), 1693-1704. <https://doi.org/10.1080/10942912.2021.1995409>
- ✓ Ammar et al., 2024. Food Systems, 7(3), 438–443. DOI:<https://doi.org/10.21323/2618-9771-2024-7-3-438-443>
- ✓ Cannas et al., 2024. Foods, 13(16), 2639; <https://doi.org/10.3390/foods13162639>
- ✓ Caponio et al., 2025. J Sci Food Agric, 105: 5062-5073. <https://doi.org/10.1002/jsfa.14232>
- ✓ Melini et al., 2025. Foods, 14(13), 2395; <https://doi.org/10.3390/foods14132395>
- ✓ Amara et al., 2026. Journal of Advanced Research. <https://doi.org/10.1016/j.jare.2026.01.056>

Source: Pea

Botanical name: *Pisum sativum* L.

By-product: pods

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100, dw	22.35	10.08 – 34.61
Soluble sugars (total)	g/100, dw	20.57	
Starch	g/100, dw	10.23	8.76 – 11.70
Total proteins	g/100, dw	13.19	12.13 – 14.19
Total fat	g/100, dw	1.01	0.64 – 1.48
Total ashes	g/100, dw	4.42	2.81 – 5.55
Total dietary fiber	g/100, dw	50.46	37.67 – 67.01
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100, dw	48.10	37.45 – 60.17
Soluble dietary fiber	g/100, dw	6.84	
Cellulose	g/100, dw	19.24	18.08 – 20.39
Hemicellulose	g/100, dw	16.34	15.81 – 16.86
Lignin	g/100, dw	6.50	2.51 – 10.49
Total α-galactosides	g/100, dw	0.73	

	Units	Mean value	Range value
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	5.43	3.77 – 7.10
Total flavonoids	mg QE/g, dw	1.60	
Phytic acid	g/100, dw	0.14	
Potential Bioactivities			
In vitro antioxidants activity	DPPH, ABTS, FRAP		
Antimicrobial activity	Antibacterial activity		

References:

- ✓ Ramirez et al., 2021. The Journal of Supercritical Fluids, 178, 105349. <https://doi.org/10.1016/j.supflu.2021.105349>
- ✓ Castaldo et al., 2022; Antioxidants 2022, 11, 105. <https://doi.org/10.3390/antiox11010105>
- ✓ Nasir et al., 2023. J. Food Sci. Technol. <https://doi.org/10.1007/s13197-023-05718-y>
- ✓ Ben Said et al., 2025. Foods 14, 2167. <https://doi.org/10.3390/foods14132167>
- ✓ Amara et al., 2026. Journal of Advanced Research. <https://doi.org/10.1016/j.jare.2026.01.056>

Source: Carrot

Botanical name: *Daucus carota* L.

By-product: pomace

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100, dw	39.62	23.80 – 61.95
Starch	g/100, dw	1.43	
Total proteins	g/100, dw	10.68	7.22 – 12.94
Total fat	g/100, dw	0.96	0.74 – 1.19
Total ashes	g/100, dw	5.87	5.56 – 6.19
Total dietary fiber	g/100, dw	28.08	21.11 – 35.04
Dietary fiber fraction and compounds			
Soluble sugars – glucose	g/100, dw	0.59	
Soluble sugars – fructose	g/100, dw	0.55	
Cellulose	g/100, dw	28.00	
Hemicellulose	g/100, dw	6.66	
Lignin	g/100, dw	17.50	
Pectins	g/100, dw	2.10	
Macro and microelements			
Potassium (K)	mg/100, dw	350	
Sodium (Na)	mg/100, dw	180	
Calcium (Ca)	mg/100, dw	50	
Magnesium (Mg)	mg/100, dw	60	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	42.84	0.68 – 85.00
Total flavonoids	mg QE/g, dw	0.37	
Ascorbic acid (vitamin C)	mg/100, dw	13.68	
β-carotene	mg/100, dw	1.14	

	Units	Mean value	Range value
Potential Bioactivities			
In vitro antioxidant activity	DPPH		
Antimicrobial activity	Antibacterial activity		

References:

- ✓ Nagraj et al., 2020. Academic Press, 2020, Pages 323-337, <https://doi.org/10.1016/B978-0-12-812780-3.00020-9>
- ✓ Luca et al., 2022. Applied Sciences 12(16), 7989. <https://doi.org/10.3390/app12167989>
- ✓ Akter et al., 2024. Heliyon, 2024, 10. <https://doi.org/10.1016/j.heliyon.2024.e24165>
- ✓ Nawirska-Olszańska & Oziembłowski, 2025. Food Science & Nutrition 13(8), e70766. DOI:10.1002/fsn3.70766

Source: Beans

Botanical name: *Phaseolus vulgaris* L. / *Vicia faba* L.

By-product: pods

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100, dw	30.67	15.65 – 48.29
Total proteins	g/100, dw	6.01	2.42 – 15.81
Total fat	g/100, dw	1.13	0.58 – 2.04
Total ashes	g/100, dw	6.75	5.32 – 7.75
Total dietary fiber	g/100, dw	51.16	41.21 – 66.93
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100, dw	47.99	36.00 – 59.97
Soluble dietary fiber	g/100, dw	8.15	6.96 – 9.33
Soluble sugars (total)	g/100, dw	26.25	3.48 – 48.29
Soluble sugars – glucose	g/100, dw	2.26	2.20 – 2.32
Soluble sugars – fructose	g/100, dw	1.20	1.13 – 1.26
Soluble sugars – sucrose	g/100, dw	0.17	0.15 – 0.18
Starch	g/100, dw	8.05	7.90 – 8.20
Cellulose	g/100, dw	21.17	
Hemicellulose	g/100, dw	19.26	
Lignin	g/100, dw	6.39	
Macro and microelements			
Potassium (K)	mg/100, dw	3060	
Phosphorus (P)	mg/100, dw	300	
Calcium (Ca)	mg/100, dw	270	
Sodium (Na)	mg/100, dw	60	
Magnesium (Mg)	mg/100, dw	190	
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	16.55	3.77 – 26.90
Total flavonoids	mg QE/g, dw	7.36	3.30 – 13.94
Potential Bioactivities			
In vitro antioxidant activity	DPPH, ABTS, FRAP		

	Units	Mean value	Range value
Antimicrobial activity	Antibacterial activity		

References:

- ✓ Martínez-Castaño et al., 2020. Revista Facultad Nacional de Agronomía Medellín, 73(2), 9179-9187. <https://doi.org/10.15446/rfnam.v73n2.81564>
- ✓ Karavidas et al., 2023. Plants, 12(1), 32. <https://doi.org/10.3390/plants12010032>
- ✓ Smeriglio et al., 2025. Antioxidants, 14(6), 625. <https://doi.org/10.3390/antiox14060625>
- ✓ Vlasova et al., 2025. Sci Rep 15, 1234 (2025). <https://doi.org/10.1038/s41598-024-84925-9>
- ✓ Amara et al., 2026. Journal of Advanced Research. <https://doi.org/10.1016/j.jare.2026.01.056>

Source: Garlic

Botanical name: *Allium sativum* L.

By-product: husk

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100, dw	24.37	6.75 – 50.20
Soluble sugars	g/100, dw	1.41	
Total proteins	g/100, dw	7.24	2.70 – 14.27
Total fat	g/100, dw	2.23	0.23 – 4.58
Total ashes	g/100, dw	7.73	4.50 – 14.40
Total dietary fiber	g/100, dwf	63.99	63.62 – 64.37
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100, dw	60.35	
Soluble dietary fiber	g/100, dw	4.31	
Cellulose	g/100, dw	36.78	24.50 – 41.70
Hemicellulose	g/100, dw	35.15	29.80 – 40.50
Lignin	g/100, dw	18.72	2.06 – 34.50
Pectins	g/100, dw	6.10	1.50 – 10.70
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	11.61	0.52 – 22.67
Total flavonoids	mg QE/g, dw	0.62	
Potential Bioactivities			
Antimicrobial activity	Antibacterial activity		

References:

- ✓ Reddy & Rhim, 2014. Material Letters, 129, 20-23. <https://doi.org/10.1016/j.matlet.2014.05.019>
- ✓ Hitlamani et al., 2024. Food and Humanity, 3, 100437. <https://doi.org/10.1016/j.foohum.2024.100437>
- ✓ Bampidis et al., 2005. Animal Feed Science and Technology, 121, 273-283. <https://doi.org/10.1016/j.anifeedsci.2005.02.003>
- ✓ Heredia Martin et al., 2026. Bioresources Technology Reports, 35, 102842. <https://doi.org/10.1016/j.biteb.2026.102842>

Source: Potato
Botanical name: *Solanum tuberosum* L.
By-product: peel

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100, dw	51.13	49.51 – 52.75
Total proteins	g/100, dw	13.89	8.75 – 31.80
Total fat	g/100, dw	1.08	0.70 – 1.30
Total ashes	g/100, dw	7.71	6.25 – 9.17
Total dietary fiber	g/100, dw	20.98	12.50 – 29.47
Starch	g/100, dw	39.00	
Macro and microelements			
Potassium (K)	mg/100g, dw	3270.25	1399.60 – 4653.00
Calcium (Ca)	mg/100g, dw	516.70	
Magnesium (Mg)	mg/100g, dw	175.73	141.40 – 188.50
Sodium (Na)	mg/100g, dw	32.88	7.50 – 93.00
Iron (Fe)	mg/100g, dw	29.85	12.60 – 71.30
Zinc (Zn)	mg/100g, dw	3.20	1.60 – 3.75
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	18.63	3.01 – 58.50
Chlorogenic acid (CGA)	mg/g, dw	5.86	
Caffeic acid	mg/g, dw	0.12	
Anthocyanins (individual compounds)	mg/g, dw	3.65	
Potential Bioactivities			
In vitro antioxidant activity	DPPH, FRAP, TEAC		

References:

- ✓ Javed et al., 2019. Potato peel waste - its nutraceutical, industrial and biotechnological applications. *AIMS Agriculture and Food*, 4(3), 807-823. <https://doi.org/10.3934/agrfood.2019.3.807>
- ✓ Yuksel & Durmaz, 2022. Evaluation of By-Products of Potato Peel as Food Additive. *Current Nutrition & Food Science*, 18(1), 15-21. <https://doi.org/10.2174/1573401317666210702110412>
- ✓ Rodríguez-Martínez et al., 2023. *Waste Management*, 155, 320-328. <https://doi.org/10.1016/j.wasman.2022.11.007>
- ✓ Hagenimana et al. 2024. *American Journal of Food Sciences and Nutrition* 6(2):58-77. <https://doi.org/10.47672/ajfsn.2367>
- ✓ Dessì, Fais & Sarais, 2025. Nutritional and Chemical Characterization of Red and Purple Potatoes Peels: A Polyphenol-Rich By-Product. *Foods*, 14(10), 1740. <https://doi.org/10.3390/foods14101740>
- ✓ Çağlar, Seçilmiş & Demirci, 2025. Comparison of Functional and Nutritional Properties of Potato Peel Waste as Alternative for Potato Flour. *Potato Research*. <https://doi.org/10.1007/s11540-025-09868-8>

Source: Tomato

Botanical name: *Solanum lycopersicum* L.

By-product: pomace (peel+seeds)

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	20.60	1.21 – 57.42
Total proteins	g/100 g, dw	17.09	5.79 – 26.60
Total fat	g/100 g, dw	10.65	4.48 – 20.00
Total ashes	g/100 g, dw	3.54	0.97 – 5.45
Total dietary fiber	g/100 g, dw	53.61	25.04 – 85.75
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	51.74	32.00 – 79.85
Soluble dietary fiber	g/100 g, dw	5.48	4.46 – 8.56
Soluble sugars (total)	g/100 g, dw	19.65	0.26 – 48.97
Starch	g/100 g, dw	0.74	0.42 – 1.05
Lignin (Acid Detergent Lignin)	g/100 g, dw	24.95	22.90 – 27.00
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	1.62	0.0319 – 3.40
Total flavonoids	mg QE/g, dw	0.77	0.13 – 1.39
Vitamin C	mg EAA/100 g, dw	27.82	
Total carotenoids	mg/100 g, dw	117.16	1.33 – 464.00
β-carotene	mg/100 g, dw	10.13	0.23 – 32.45
Lycopene	mg/100 g, dw	20.25	0.33 – 105.00
Anthocyanins	mg/100 g, dw	601.50	420.00 – 783.00
Potential Bioactivities			
Antioxidant activity – capacity	ABTS, DPPH, FRAP		

References:

- ✓ Del Valle (2004). Utilidad del subproducto obtenido en la elaboración de derivados de tomate. PhD Thesis. Universidad Complutense de Madrid.
- ✓ Del Valle et al. 2006. Journal of the Science of Food and Agriculture 86(8):1232-1236. <https://doi.org/10.1002/jsfa.2474>
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- ✓ García-Herrera et al. 2010. Innovative Food Science & Emerging Technologies 11(4):707-711. <https://doi.org/10.1016/j.ifset.2010.07.005>
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- ✓ Brighina et al. 2024. Foods 13(21):3492. <https://doi.org/10.3390/foods13213492>
- ✓ Kaboré et al. 2022. CyTA – Journal of Food 20(1):404-411. <https://doi.org/10.1080/19476337.2022.2148755>

✓ Becze et al. 2025. Molecules 30(23):4502. <https://doi.org/10.3390/molecules30234502>

Source: Tomato

Botanical name: *Solanum lycopersicum* L.

By-product: pomace (peel)

	Units	Mean value	Range value
Proximate composition			
Total proteins	g/100 g, dw	11.55	8.96 – 14.15
Total fat	g/100 g, dw	5.99	3.73 – 8.25
Total ashes	g/100 g, dw	2.93	2.66 – 3.21
Total dietary fiber	g/100 g, dw	89.17	88.14 – 90.20
Dietary fiber fraction and compounds			
Insoluble dietary fiber	g/100 g, dw	78.45	75.37 – 81.65
Soluble dietary fiber	g/100 g, dw	12.08	8.55 – 15.62
Uronic acid	g/100 g, dw	6.71	2.23 – 11.22
Macro and microelements			
Calcium	mg/100 g, dw	29.97	14.11 – 45.84
Magnesium	mg/100 g, dw	166.86	145.51 – 188.21
Sodium	mg/100 g, dw	83.07	80.16 – 85.99
Potassium	mg/100 g, dw	1193.13	1093.86 – 1292.40
Iron	mg/100 g, dw	2.37	1.78 – 2.96
Zinc	mg/100 g, dw	0.56	0.21 – 0.91
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	0.177	0.029 – 0.32
Chlorogenic acid derivatives	mg/100g, dw	8.14	1.76 – 14.52
p-Coumaric acid	mg/100g, dw	1.80	0.08 – 2.82
p-Coumaric acid derivatives	mg/100g, dw	6.29	1.77 – 10.82
Quercetin	mg/100g, dw	0.99	0.53 – 1.45
Rutin	mg/100g, dw	27.42	11.35 – 43.49
Rutin derivatives	mg/100g, dw	7.73	3.82 – 11.64
Naringenin	mg/100g, dw	19.15	7.79 – 30.50
Potential Bioactivities			
Antioxidant in vitro activity	TEAC, DPPH, FRAP		

References:

- ✓ Del Valle (2004). Utilidad del subproducto obtenido en la elaboración de derivados de tomate. PhD Thesis. Universidad Complutense de Madrid.
- ✓ Del Valle, M., Cámara, M. and Torija, M.E. (2007). Acta Hort. 758, 165-172
DOI: 10.17660/ActaHortic.2007.758.18
- ✓ Navarro-González et al. 2011. Food Research International 44(5):1528-1535.
<https://doi.org/10.1016/j.foodres.2011.04.005>

✓ Kaboré et al. 2022. CyTA – Journal of Food 20(1):404-411.
<https://doi.org/10.1080/19476337.2022.2148755>

Source: Tomato

Botanical name: *Solanum lycopersicum* L.

By-product: pomace (seeds)

	Units	Mean value	Range value
Proximate composition			
Total available carbohydrates	g/100 g, dw	11.38	8.68 – 14.07
Total proteins	g/100 g, dw	24.76	22.87 – 26.65
Total fat	g/100 g, dw	21.87	21.00 – 22.74
Total ashes	g/100 g, dw	4.79	4.51 – 5.06
Total dietary fiber	g/100 g, dw	45.33	43.27 – 47.38
Bioactive compounds and others			
Total phenolic compounds	mg GAE/g, dw	1.01	7.69 – 12.51
Total flavonoids	mg QE/g, dw	1.33	
Vitamin C	mg EAA/100 g, dw	9.63	8.85 – 10.42
β-carotene	mg/100 g, dw	0.80	0.75 – 0.85
Lycopene	mg/100 g, dw	20.35	14.20 – 26.50
Anthocyanins	mg/100 g, dw	62.00	41.00 – 83.00
Potential Bioactivities			
Antioxidant activity – capacity	ABTS, DPPH, FRAP		

References:

- ✓ Del Valle (2004). Utilidad del subproducto obtenido en la elaboración de derivados de tomate. PhD Thesis. Universidad Complutense de Madrid.
- ✓ Del Valle, M., Cámara, M. and Torija, M.E. (2007). Acta Hortic. 758, 165-172
DOI: 10.17660/ActaHortic.2007.758.18
- ✓ Kaboré et al. 2022. CyTA – Journal of Food 20(1):404-411.
<https://doi.org/10.1080/19476337.2022.2148755>

3.2 Feasibility and Prioritization Screening

Table 4 combines, in a single listing ranked from smallest to largest estimated secondary-stream volume, the fruit ingredients analyzed in a previous project report with the vegetable, seed and “other” by-products developed in this document. Only ingredients for which a global by-product volume could be estimated are included in the numerical ranking; ingredients for which no reliable estimate could be made are not included.

Table 4. Estimated global volumes of main product and secondary stream for selected WG1 ingredients (most recent data ≥2023; wet-mass equivalents; ranked from smallest to largest by-product volume).

Ingredient	WG1 category	Main product	Year	Main product vol. (t/year)	Estimated by-product vol. (t/year)	Assumption applied (summary)
Coffee silverskin	Other / Fruit	Green coffee	2024	11,000,000	≈100,000–200,000	1–2% of roasted coffee bean mass
Pea hulls	Vegetable	Pea (dry + green)	2023	≈30,000,000	≈1,100,000	30% of dehulled peas; hull = 12.5% of dehulled mass.
Carrot pomace	Vegetable	Carrot	2023	≈50,000,000	≈1,750,000	20% of processed carrots; pomace = 17.5% of processed mass.
Tomato pomace *	Fruit	Tomato	2023	192,300,000	4,800,000	25% of processed tomatoes; pomace = 10% of processed mass (range 4-30%).
Apple pomace *	Fruit	Apple	2023	97,340,000	6,700,000	25% of apples to juice; pomace = 27.5% of processed mass.
Spent coffee grounds *	Other / Fruit	Green coffee	2023/24	≈11,000,000	≈7,200,000	0.65 t of spent grounds per tonne of green coffee.
Grape pomace *	Fruit	Wine-press grapes	2023	33,000,000	≈7,400,000	20-25% of grape weight as pomace; midpoint 22.5%.
Citrus peel/pulp *	Fruit	Orange (citrus proxy)	2023	69,800,000	≈14,000,000	40% of processed oranges; 50% of the mass to by-product.
Sunflower meal	Seed	Sunflower seed	~2023	≈57,000,000	≈31,000,000	90% of seed pressed; meal = 60% of pressed mass.
Brewery spent grain (BSG)	Other	Beer	2023	1,880 million hL	≈37,600,000	20 kg of wet spent grain per hectolitre of beer.

Ingredient	WG1 category	Main product	Year	Main product vol. (t/year)	Estimated by-product vol. (t/year)	Assumption applied (summary)
Rapeseed meal	Seed	Rapeseed / canola	~2023	≈82,000,000	≈44,000,000	90% of seed pressed; meal = 60% of pressed mass.
Banana peel *	Fruit	Banana	2023	139,000,000	≈55,600,000	Peel fraction ≈40% of fruit mass.
Wheat bran	Seed	Wheat	2023/24	791,530,000	≈80,000,000	70% of wheat milled; bran = 14.5% of grain mass.
Potato peel	Vegetable	Potato	2023	383,000,000	≈95,800,000	Peel = 25% of tuber mass (range 15-40%).
Sugar beet pulp	Vegetable	Sugar beet	2023	≈282,000,000	≈170,000,000	86% of processed sugar beet; wet pulp ≈70% of processed mass.
Soybean meal	Seed	Soybean	2023/24	≈385,000,000	≈262,000,000	85% of processed soybean; meal = 80% of processed mass.

* Fruit ingredient estimated in the project's previous fruit by-products report; included here only for the purposes of the combined classification by volume. All figures are order-of-magnitude estimates ("assumed/calculated"), except for main-product volumes taken directly from Statista/FAO/OIV/IOC, which are reported as they appear in the source.

4. Results and Summary

In this section we are going to highlight and discuss the selected by-products as a potential source of dietary fiber. This analysis, together with the analysis of feasibility and prioritization by-product selection, will enable us to select the most promising sources to consider for the next stages of the project to be addressed in WG2 and subsequent working groups. Figure 2 gives an overview of the mean total dietary fiber content of all 29 by-products.

4.1 Dietary Fiber Content and Fiber Fractions by Category

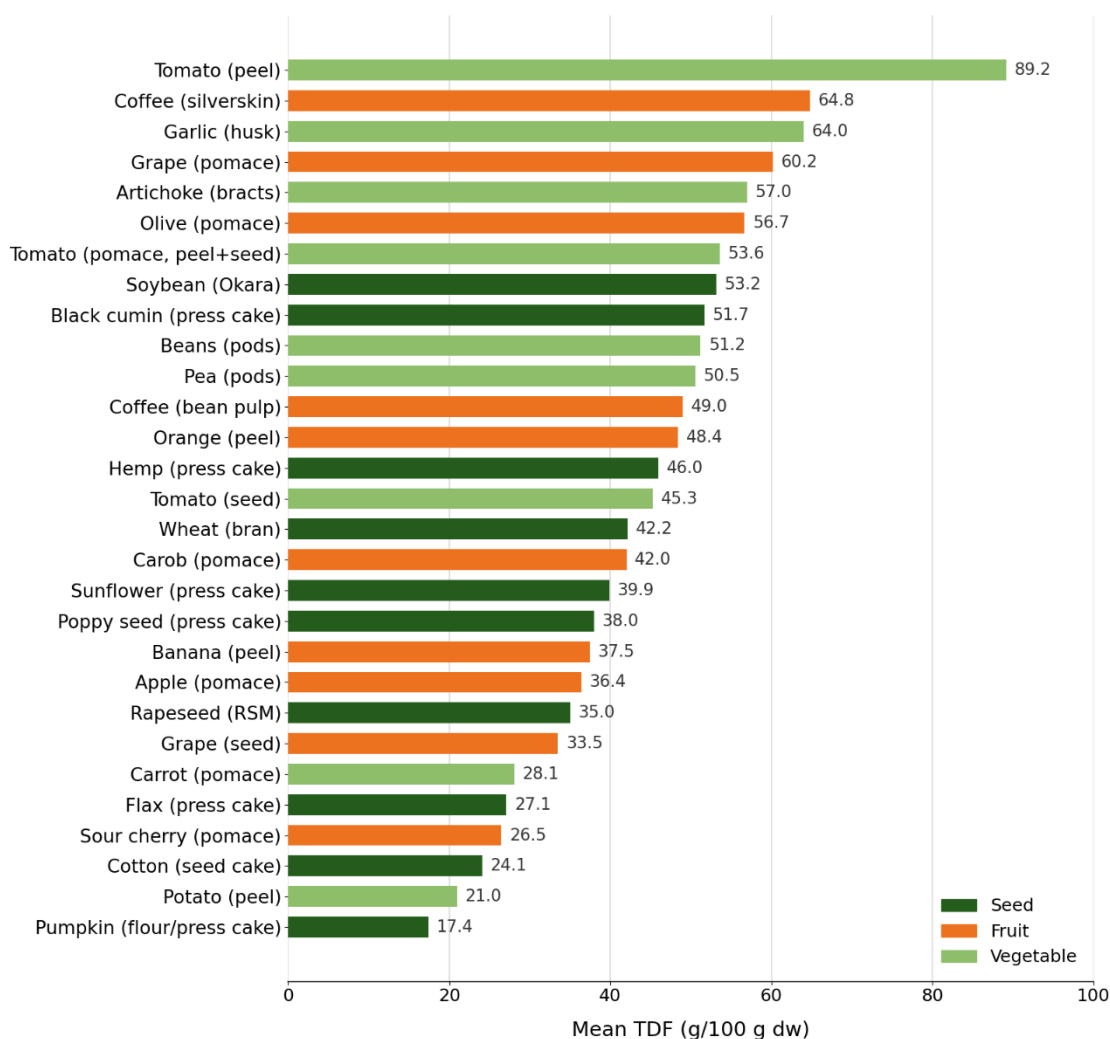


Figure 2. All 29 by-products ranked by mean total dietary fiber (g/100 g dw), colored by category.

Regarding seed by-products, the WG1 compiles the proximate composition, dietary fiber fraction and bioactive compounds of ten by-products from the oilseed- and cereal-crushing and pressing industry, drawn from peer-reviewed scientific literature and unpublished data contributed by consortium members.

Table 5 ranks the ten by-products from highest to lowest mean total dietary fiber content. Values range from 53.17 g/100 g dw (soybean okara) to 17.39 g/100 g dw (pumpkin flour/press cake) — a threefold difference between the top and bottom of the range (Figure 3).

Table 5. Total dietary fiber by seed by-product, ranked from highest to lowest.

By-product type	Main source	Mean TDF (g/100 g dw)
Okara	Soybean	53.17
Press cake	Black cumin	51.69
Press cake	Hemp	45.98
Bran	Wheat	42.19
Press cake	Sunflower	39.87
Press cake	Poppy seed	38.00
Extraction meal (RSM)	Rapeseed	34.97
Press cake	Flax	27.13
Seed cake	Cotton	24.10
Flour/press cake	Pumpkin	17.39

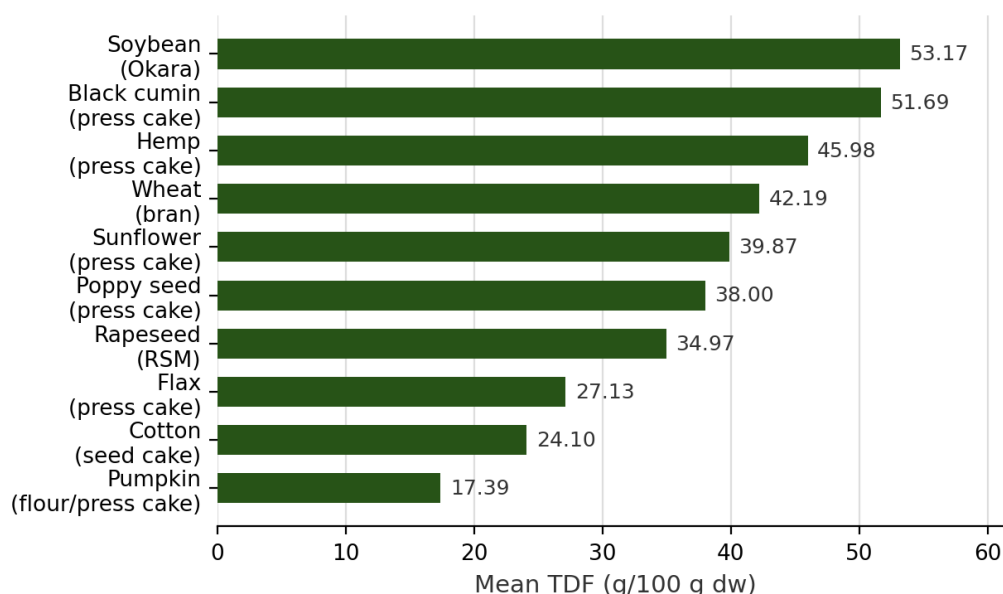


Figure 3. Total dietary fiber by seed by-product, ranked from highest to lowest (Table 5).

The by-products with the highest TDF — soybean okara, black cumin press cake, hemp press cake and wheat bran, all above 40 g/100 g dw — correspond to matrices rich in residual cell wall left after oil, protein or starch extraction. At the opposite end, pumpkin flour/press cake shows the lowest mean values (17.39 g/100 g dw).

Seven of the ten by-products report the breakdown of total dietary fiber into insoluble (IDF) and soluble (SDF) fractions; cotton reports only the insoluble fraction, and poppy seed and pumpkin report no breakdown at all. In the by-products with internally consistent data (soybean, black cumin press cake, wheat, rapeseed, sunflower and flax), insoluble fiber clearly dominates over soluble fiber, though with notable nuances: sunflower and flax stand out for an SDF proportion markedly higher than the rest — 25.9% and 27.7% of TDF, respectively — more than double that of soybean, wheat or rapeseed

(7-10%). Sunflower also has the highest absolute SDF value among the seed by-products (10.31 g/100 g dw).

Beyond the IDF/SDF split, each by-product shows a distinctive profile of compounds within the fiber fraction (cellulose, hemicellulose, lignin, arabinoxylans, pectins or raffinose-family oligosaccharides). **Table 6** identifies, for each by-product, the quantitatively dominant or distinctive compound reported in the compiled literature.

Table 6. Quantitatively dominant or distinctive fiber-fraction compound by seed by-product

By-product	Characteristic compound	Value (g/100 g dw)	Comment
Soybean (okara)	Hemicellulose	26.72	Dominant compound: roughly double the cellulose value (13.35) and ~50% of TDF
Hemp	Lignin	20.62	Highest lignin value in the entire seed by-product database (~45% of TDF)
Rapeseed (RSM)	Lignin / Pectins	16.00 / 7.55	Lignin dominant (wide range 2.60-34.93); only by-product with quantified pectins
Wheat (bran)	Total arabinoxylans	10.05	Characteristic marker of wheat bran; ~24% of TDF, mostly not water-extractable (WE-AX 1.26)
Sunflower	Soluble fiber (SDF)	10.31	Highest absolute SDF among the seed by-products; cellulose (13.50) leads the insoluble fraction
Flax	Soluble fiber / mucilage	7.52	Highest SDF proportion of TDF (27.7%), attributable to flaxseed's characteristic mucilage
Black cumin	Cellulose	11.98	Dominant structural compound among those quantified
Cotton	Lignin	10.44	Slightly higher than hemicellulose (9.70)

Three notable patterns emerge from this analysis:

- **Hemicellulose as the majority component:** in soybean okara, hemicellulose (26.72 g/100 g dw) is by far the most abundant fiber compound, well ahead of cellulose; it is the only by-product where this component dominates so markedly.
- **Lignin as a distinguishing trait:** hemp (20.62 g/100 g, dw) and rapeseed (16.00 g/100 g, dw) show the highest lignin contents among the seed by-products, well above sunflower, wheat or black cumin (7-9 g/100 g dw); in cotton, lignin also slightly exceeds hemicellulose, although at much lower absolute values.
- **Arabinoxylans as the exclusive marker of wheat bran:** wheat is the only by-product in the database for which arabinoxylans are quantified, a compound widely recognized in the

literature as the characteristic insoluble fiber of wheat bran; its water-extractable fraction (WE-AX) is minor (1.26 g/100 g dw), consistent with the predominance of insoluble fiber in this matrix.

Regarding **fruits by-products**, the WG1 compiles the proximate composition, dietary fiber fraction and bioactive compounds of ten by-products from fruit-processing industries (juicing, pulping, oil extraction and roasting), drawn from peer-reviewed scientific literature and unpublished data contributed by consortium members. **Table 7** ranks the ten by-products from highest to lowest mean total dietary fiber content. Values range from 64.80 g/100 g dw (coffee silverskin) to 26.47 g/100 g dw (sour cherry pomace) — a narrower spread (2.4-fold) than typically seen among seed by-products, reflecting that all ten matrices are fiber-rich residues of fruit processing (Figure 4).

Table 7. Total dietary fiber by fruit by-product, ranked from highest to lowest.

Main source	By-product type	Mean TDF (g/100 g dw)
Coffee	Silverskin	64.80
Grape	Pomace	60.18
Olive	Pomace	56.68
Coffee	Bean pulp	49.04
Orange	Peel	48.40
Carob	Pomace	42.05
Banana	Peel	37.47
Apple	Pomace	36.40
Grape	Seed	33.52
Sour cherry	Pomace	26.47

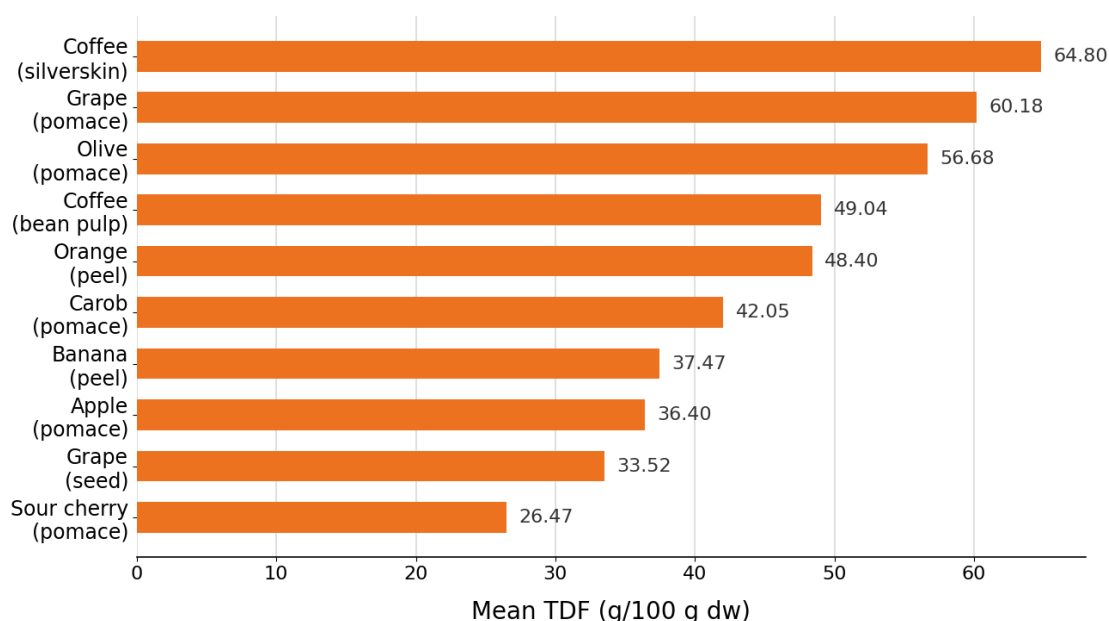


Figure 4. Total dietary fiber by fruit by-product, ranked from highest to lowest (Table 7).

The three by-products with the highest TDF were coffee silverskin, grape pomace, and olive pomace, all above 56 g/100 g dw. These materials represent different processing streams: coffee silverskin is the seed coat released during coffee roasting, whereas grape pomace and olive pomace are residues rich in skins, seeds and other structural cell-wall tissues remaining after juice and oil extraction. At the opposite end, sour cherry pomace shows the lowest mean TDF (26.47 g/100 g dw). Interestingly, grape seed shows by far the narrowest published TDF range (32.05 – 34.02 g/100 g dw) in the entire database, indicating unusually consistent reporting across studies; olive pomace, by contrast, has the widest range (25.00 – 66.73), reflecting high variability in olive-oil extraction methods and residual pulp/stone content across sources.

Eight of the ten by-products report a breakdown of total dietary fiber into insoluble (IDF) and soluble (SDF) fractions. Coffee silverskin, grape pomace, olive pomace, coffee bean pulp and orange peel are markedly insoluble-fiber dominant (80-91% of TDF as IDF), consistent with the lignified skins, husks and cell-wall residues that make up these matrices. Carob pomace, grape seed and apple pomace break this pattern: all three show a soluble-fiber proportion at or above 50% of TDF, with grape seed the most extreme case (65.4% SDF) — a striking result for a seed matrix, where insoluble fiber normally predominates, as seen throughout the WG1 seed by-products database.

Beyond the IDF/SDF split, several by-products show a distinctive profile of compounds within the fiber fraction (cellulose, hemicellulose, lignin or pectins). Table 8 identifies, for each by-product, the quantitatively dominant or distinctive compound reported in the compiled literature.

Table 8. Quantitatively dominant or distinctive fiber-fraction compound by fruits by-product.

By-product	Characteristic compound	Value (g/100 g dw)	Comment
Grape (pomace)	Lignin	28.70	Highest lignin content in the fruit database; IDF fraction also rich in neutral sugars (29.60)
Olive (pomace)	Lignin	21.08	Reported per 100 g fiber, not whole dry matter (see limitations); dominant compound within the fiber fraction, ahead of hemicellulose (19.00)
Orange (peel)	Pectins	27.31	Highest pectin content in the fruit database; classic marker of citrus peel
Carob (pomace)	Lignin	27.30	Second-highest lignin value in the fruit database, essentially tied with grape pomace
Sour cherry (pomace)	Hemicellulose and pectins	24.50 and 24.70, respectively	Highest hemicellulose value and the second-highest pectins in the fruit database.
Banana (peel)	Cellulose	15.45	Narrow published range (15.20 – 15.70)
Apple (pomace)	Pectins	7.12	Classic pectin-rich pomace matrix; lignin (13.53) is numerically the highest single compound, but pectins define its soluble-fiber character

Three notable patterns emerge from this analysis:

- **Lignin as the dominant structural signature:** grape pomace (28.70 g/100 g dw) and carob pomace (27.30 g/100 g dw) show the highest lignin contents in the entire fruit database, well above orange peel (6.80) or apple pomace (13.53); olive pomace's fiber fraction is also lignin-rich, though expressed on a different basis (per 100 g fiber, not whole dry matter).
- **Pectins as the citrus- and pome-fruit marker:** orange peel (27.31 g/100 g dw), sour cherry pomace (24.70 g/100 g dw), and apple pomace (7.12 g/100 g dw) are the only by-products in the database with quantified pectins, consistent with the well-known pectin richness of citrus albedo and apple cell walls; orange peel's pectin content is roughly four times that of apple pomace.
- **Grape seed and carob pomace as soluble-fiber outliers:** both show a soluble-fiber proportion (65.4% and 52.8% of TDF) well above the insoluble-dominant matrices (grape

pomace, olive pomace, coffee bean pulp, orange peel, all >80% IDF), despite belonging to botanically very different by-product types — a seed versus a pod pomace.

Finally, regarding vegetable by-products, the WG1 compiles the proximate composition, dietary fiber fraction and bioactive compounds of by-products from vegetable-processing industries (canning, juicing and fresh-cut processing), drawn from peer-reviewed scientific literature and unpublished data contributed by consortium members. Table 9 ranks the nine by-products with available data from highest to lowest mean total dietary fiber content. Values range from 89.17 g/100 g dw (tomato peel) to 20.98 g/100 g dw (potato peel) — a 4.3-fold difference between the top and bottom of the range (Figure 5).

Table 9. Total dietary fiber by vegetable by-product, ranked from highest to lowest.

Main source	By-product type	Mean TDF (g/100 g, dw)
Tomato	Peel	89.17
Garlic	Husk	63.99
Artichoke	Bracts	57.01
Tomato	Pomace (peel and seeds)	53.61
Beans	Pods	51.16
Pea	Pods	50.46
Tomato	Seeds	45.33
Carrot	Pomace	28.08
Potato	Peel	20.98

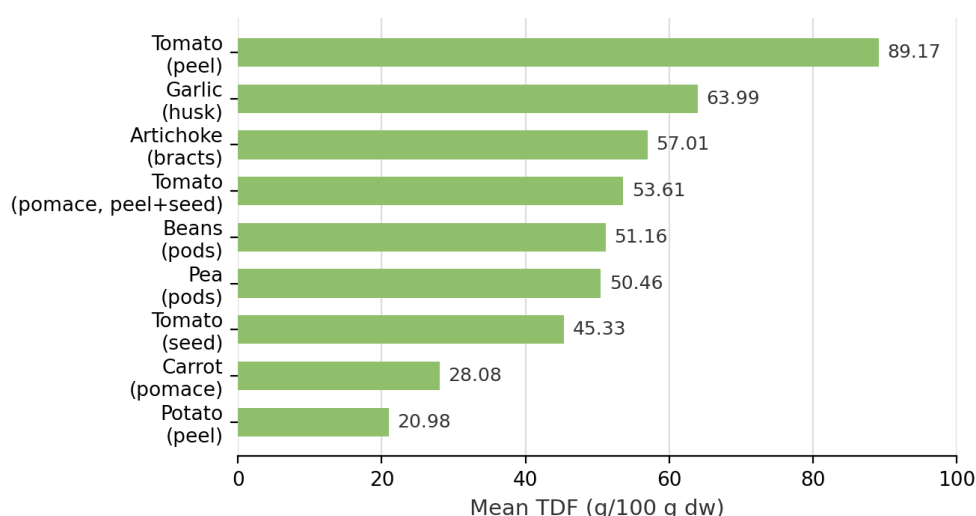


Figure 5. Total dietary fiber by vegetable by-product, ranked from highest to lowest (Table 9).

Tomato peel stands out as the single highest value in the database (89.17 g/100 g dw), well above every other by-product. Garlic husk, artichoke bracts, tomato pomace (peel and seeds), bean pods, pea pods and tomato seeds form a second, more tightly clustered high-fiber group (45–64 g/100 g

dw), all well above carrot pomace and potato peel, which fall below 30 g/100 g dw. Pea pods have the highest published upper bound among the clustered group (67.01 g/100 g dw).

Six of the nine by-products with TDF data also report a consistent breakdown of total dietary fiber into insoluble (IDF) and soluble (SDF) fractions: pea pods, garlic husk, bean pods, artichoke bracts, tomato pomace (peel and seeds) and tomato peel. In all six, insoluble fiber clearly dominates over soluble fiber, at proportions broadly comparable to (and, for tomato pomace, slightly above) those seen in the WG1 seed and fruit by-products databases (69-95% IDF). Pea pods and bean pods, both legume pod matrices, show very similar IDF/TDF proportions (95.3% and 93.8%); tomato pomace (peel and seeds) shows an even higher share (96.5%). Tomato peel (88.0% IDF) and artichoke bracts (78.4% IDF) show comparatively higher soluble-fiber contributions, with artichoke's soluble-fiber share (21.6% of TDF) consistent with its characteristic inulin content. **Table 10** identifies, for each by-product, the quantitatively dominant or distinctive compound reported in the compiled literature.

Table 10. Quantitatively dominant or distinctive fiber-fraction compound by vegetable by-product

By-product	Characteristic compound	Value (g/100 g dw)	Comment
Artichoke (bracts)	Inulin	8.29	Distinctive soluble fructan unique to this by-product in the database; cellulose (28.26) is the quantitatively dominant compound (~50% of TDF)
Pea (pods)	Cellulose	19.24	Dominant structural compound, closely followed by hemicellulose (16.34); only by-product reporting quantified α -galactosides (RFOs, 0.73), a characteristic legume soluble compound
Carrot (pomace)	Lignin	17.50	Unusually high proportion of TDF (~62%) for a root-vegetable matrix; reported compound values exceed total TDF, see limitations
Beans (pods)	Cellulose	21.17	Dominant, closely followed by hemicellulose (19.26); together account for nearly all of IDF (47.99)
Garlic (husk)	Cellulose	36.78	Highest cellulose content in the vegetable database; hemicellulose (35.15) nearly as high
Potato (peel)	No fraction data	–	Only TDF reported; no IDF/SDF or compound breakdown available
Tomato (pomace: peel+seed)	Lignin (ADL)	24.95	Only fiber-fraction compound individually quantified for this combined matrix (~46.5% of TDF, 53.61 g/100 g dw); IDF (51.74) and SDF (5.48) are reported but not further resolved into cellulose/hemicellulose.
Tomato (peel)	Uronic acid	6.71	Indicator of pectin-rich cell-wall composition characteristic of peel tissue; highest TDF of any by-product in the vegetable database (89.17 g/100 g, dw); no cellulose/hemicellulose/lignin breakdown reported.

Four notable patterns emerge from this analysis:

- **Inulin as artichoke's distinguishing compound:** artichoke bracts (8.29 g/100 g dw) are the only by-product in the vegetable database — and across the WG1 databases surveyed so far

— to report inulin, a soluble fructan widely recognized as the signature bioactive fiber compound of *Cynara scolymus*, even though cellulose (28.26 g/100 g dw) remains the quantitatively larger structural component.

- **Cellulose as the dominant structural compound elsewhere:** garlic husk (36.78 g/100 g dw), bean pods (21.17) and pea pods (19.24) are all cellulose-dominant, with garlic husk showing the highest cellulose content of any vegetable by-product, closely followed by an equally high hemicellulose value (35.15) — together indicating a highly lignified, fibrous husk matrix.
- **Legume pod similarity:** pea pods and bean pods show closely matched cellulose and hemicellulose profiles, consistent with their shared botanical origin as legume pod walls; pea pods are additionally the only by-product reporting quantified α -galactosides (raffinose-family oligosaccharides), a characteristic soluble legume compound (0.73 g/100 g dw).
- **Tomato as a high-fiber outlier with two distinct signature compounds:** tomato peel reports both the highest total dietary fiber of any by-product in the database (89.17 g/100 g dw) and a distinctive pectin-related compound, uronic acid (6.71 g/100 g dw), not quantified for any other vegetable by-product; the combined peel+seed pomace is instead distinguished by a comparatively high lignin (ADL) content (24.95 g/100 g dw, ~46.5% of its TDF).

4.2 Key Observations

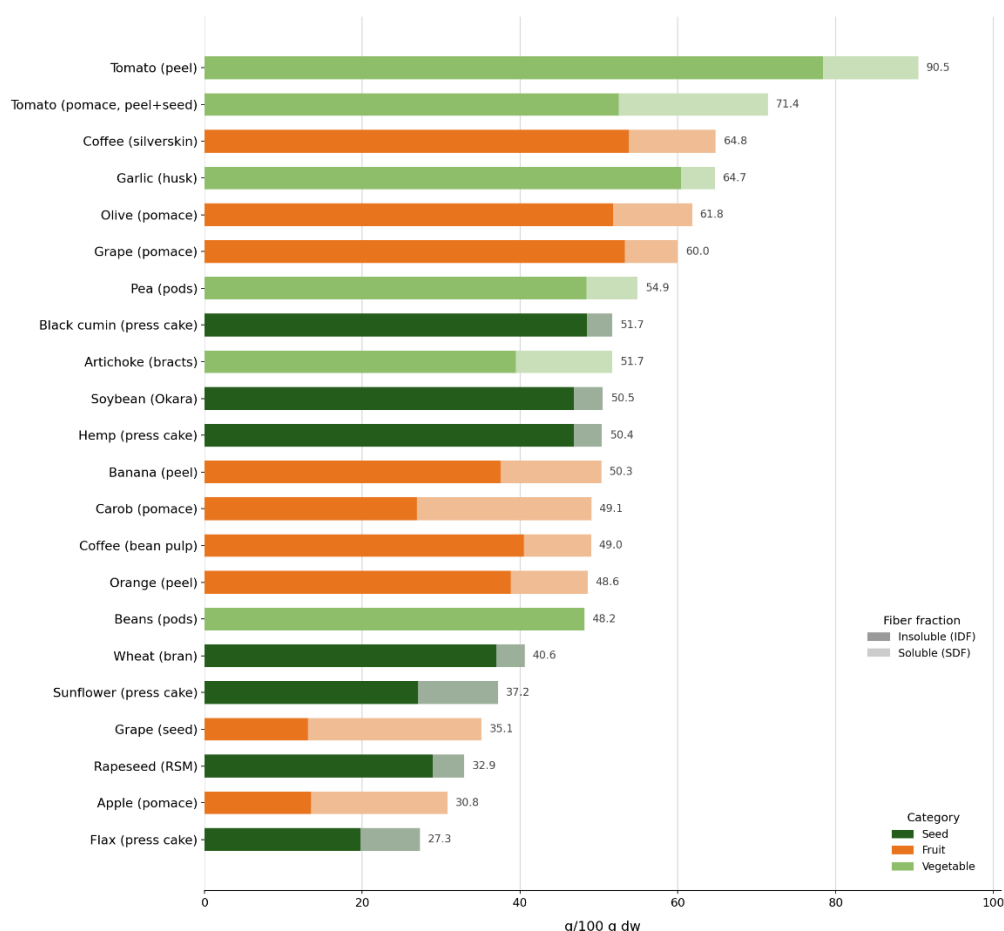


Figure 6. Insoluble vs. soluble dietary fiber (IDF/SDF) for by-products reporting both fractions.

The proportion of insoluble and soluble dietary fiber across all by-products that report both fractions is summarized in Figure 6.

As a proposal for WG1, based on the Global volumes of secondary streams (by-products) according to the production statistics (Statista/FAOSTAT/OIV/IOC), the fiber content of the analyzed by-products, the following 12 by-products look most promising to take forward:

- Soybean meal – Okara
- Potato peel
- Wheat bran
- Banana peel
- Rapeseed meal
- Sunflower meal
- Citrus peel
- Grape pomace
- Apple pomace
- Tomato pomace
- Pea hulls
- Coffee silverskin

Moreover, the poppy seed press cake has been identified as a potential by-product given its fiber content and the limited knowledge of it to date; it is one of the least studied by-products amongst those included in this database. Therefore, WG1 proposes the following 13 by-products (the 12 listed above plus poppy seed cake) for further studies on extraction feasibility and sustainability assessment: Soybean meal – Okara, Potato peel, Wheat bran, Banana peel, Rapeseed meal, Sunflower meal, Citrus peel, Grape pomace, Apple pomace, Tomato pomace, Pea hulls, Coffee silverskin, Poppy seed cake.

Coffee silverskin has also been added to the shortlist. Despite its lower global volume compared with matrices such as pea hulls or tomato pomace, it combines a high fiber content (64.80 g/100 g dw, the second highest in the database) with year-round availability linked to continuous coffee roasting. Its distinctive melanoidin fraction, which is expected from roasting but is not yet quantified in the database, may support the development of a differentiated, fiber-rich ingredient; this will be tested in the subsequent feasibility assessments.

In the following steps, WG1 will also check which by-products have already been evaluated by the EFSA (European Food Safety Authority) for its use as novel food and/or food additive.

As this will be a dynamic database, the data will be updated as scientific evidence regarding the included by-products becomes available, and further by-products of interest will be added throughout the duration of the project.

5. Link to MoU Objectives and Action Progress

D3 delivers Main Objective O1 of the Action ("Identifying fiber rich food sources and conduct a preliminary feasibility analysis for its large-scale production"), addressing Challenge Ch1 (Scalability of Fiber Extraction Techniques, Sustainability Assessments, and Feasibility of Fiber Sources) as identified in the Technical Annex. The database presented in Section 3 provides documented compositional data and a preliminary feasibility screening for all the evaluated by-products across the fruit, vegetable, and seed categories, constituting a substantive contribution toward the Month-24 KPI under O1 (identification of 20+ fiber-rich sources, with 10 or more shown to be feasible for production if optimized).

At the level of the Action's Research Coordination Objectives, D3 fulfils RCO2 (Internal Data Management), which calls for the coordination of systematic, regularly updated data collection on food waste sources, extraction, and sustainability assessments, and the creation of an internally accessible, structured database supporting standardized knowledge exchange and informed decision-making. The dynamic structure of the database, described in Sections 1.3 and 2, ensures that this objective continues to be met as WG1 incorporates further by-products beyond Month 12.

D3 also establishes the evidentiary basis for subsequent Action milestones. The feasibility screening presented in Section 3.2 is a direct precursor to Milestone Ms4 (feasibility assessment completed for at least two novel fiber sources, due Month 22) and to D4 (Feasibility Analysis Report, WG2, due Month 24), which builds on this shortlist to assess extraction-specific feasibility.

6. Conclusions and Next Steps

D3 delivers the compositional database and preliminary feasibility screening required by its official description, fulfilling Main Objective O1 and RCO2 at Month 12. The following items are identified as WG1's next steps:

- **Extraction-specific feasibility work** (extraction yield, method maturity, processing cost, and scalability), planned as a joint WG1–WG2 activity following D3's submission, toward Milestone Ms4 (Month 22) and D4 (Month 24).
- **Continued database expansion** with additional by-products, contributors, and literature sources, consistent with the dynamic nature of the database described in Section 1.3.
- **Web portal migration** under KA1.4, to be scoped once the database structure is finalized.

7. References

This section consolidates, in alphabetical order, the literature references cited across the individual by-product profiles in Section 3.1 (compiled from the reference lists attached to each by-product entry). Data contributed directly by WG1 members, rather than drawn from the literature, is credited under “Contributing Authors” on the cover page and, where explicitly noted, in the relevant by-product’s reference list.

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8. Annexes

Annex A: Raw compiled data of the selected by-products

Annex A presents the full per-source compositional data for all 29 by-products, organized by seed, fruit and vegetable by-products.

The tables below reproduce, for each by-product, only the parameters included in its final Section 3.1 table (proximate composition, dietary fiber fraction, and the main phenolic/bioactive families reported there).

Black cumin (seed press cake)

Black cumin (seed press cake)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Kour & Gani 2021: 5.03 (4.5–5.56)	2	5.03	4.50 – 5.56
Soluble sugars	g/100 g, dw	Niyonshuti et al. 2024: 5.5 (5.1–5.9)	1	5.5	5.10 – 5.90
Total proteins	g/100 g, dw	Veljković, Innovation Center FTM Belgrade – BCC cake, unpublished: 32.26; Mladenov et al. 2026: 7.5; Kour & Gani 2021: 19.75 (19.3–20.19); 5.68: 35.38	4	23.72	7.50 – 35.37
Total fat	g/100 g, dw	Mladenov et al. 2026: 20; Kour & Gani 2021: 16.65 (16.42–16.88); 5.68: 0.52	3	12.39	0.52 – 20.00
Total ashes	g/100 g, dw	Mladenov et al. 2026: 6.2; 5.68: 6.94	3	6.57	6.20 – 6.94
Total dietary fiber	g/100 g, dw	Krawecka et al. 2022: 51.69	1	51.69	
Insoluble dietary fiber	g/100 g, dw	Krawecka et al. 2022: 48.16	1	48.16	
Soluble dietary fiber	g/100 g, dw	Krawecka et al. 2022: 3.53	1	3.53	
Cellulose	g/100 g, dw	Veljković, Innovation Center FTM Belgrade – BCC cake, unpublished: 9.25; Niyonshuti et al. 2024: 4.35 (3.5–5.2); Ciurko et al. 2023: 9.93; Hallouch et al. 2024: 24.4	4	11.98	3.50 – 24.40
Hemicellulose	g/100 g, dw	Veljković, Innovation Center FTM Belgrade – BCC cake, unpublished: 11.65; Niyonshuti et al. 2024: 12.4 (10.7–14.1); Ciurko et al. 2023: 14.09; Hallouch et al. 2024: 0.8	4	9.73	0.80 – 14.10
Lignin	g/100 g, dw	Veljković, Innovation Center FTM Belgrade – BCC cake, unpublished: 4.14; Niyonshuti et al. 2024: 12.25 (10.5–14); Ciurko et al. 2023: 5.68; Hallouch et al. 2024: 9.4	4	7.87	4.14 – 14.00
Total phenolic compounds	mg GAE/g, dw	Niyonshuti et al. 2024: 1.58 (1.2–1.97); Hallouch et al. 2024: 3.53; Krawecka et al. 2022: 2.93; Rabiej-Kozioł et al. 2024: 4.26	4	3.08	1.20 – 4.26
Total flavonoids	mg QE/g, dw	Niyonshuti et al. 2024: 1.51 (0.87–2.15); Hallouch et al. 2024: 9.13; Krawecka et al. 2022: 0.27	3	3.64	0.27 – 9.13
Palmitic acid (C16:0)	% of total fatty acids	Ciurko et al. 2023: 12.64; Hallouch et al. 2024: 12.05; Aydin et al. 2021: 12.2	3	12.3	12.05 – 12.64
Oleic acid (C18:1)	% of total fatty acids	Ciurko et al. 2023: 24.31; Hallouch et al. 2024: 23.14; Aydin et al. 2021: 23.9	3	23.78	23.14 – 24.31
Linoleic acid (C18:2)	% of total fatty acids	Ciurko et al. 2023: 57.48; Hallouch et al. 2024: 58.06; Aydin et al. 2021: 56.5	3	57.35	56.50 – 58.06

Cotton (seed cake)

Cotton (seed cake)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Canikli et al. 2023: 37.11; Umar et al. 2019: 28.71; Webb, Bernard & Tao 2019: 12.33	3	26.05	12.33 – 37.11
Total proteins	g/100 g, dw	Canikli et al. 2023: 33.24; Umar et al. 2019: 44.23; Webb, Bernard & Tao 2019: 32.33	3	36.6	32.33 – 44.23
Total fat	g/100 g, dw	Canikli et al. 2023: 25.39; Umar et al. 2019: 2.76; Webb, Bernard & Tao 2019: 5.53	3	11.23	2.76 – 25.39
Total ashes	g/100 g, dw	Canikli et al. 2023: 4.65; Umar et al. 2019: 6.73; Webb, Bernard & Tao 2019: 6.14	3	5.84	4.65 – 6.73
Total dietary fiber	g/100 g, dw	Canikli et al. 2023: 13.94; Umar et al. 2019: 14.58; Webb, Bernard & Tao 2019: 43.78	3	24.1	13.94 – 43.78
Insoluble dietary fiber	g/100 g, dw	Canikli et al. 2023: 13.94	1	13.94	
Hemicellulose	g/100 g, dw	Webb, Bernard & Tao 2019: 9.7	1	9.7	
Lignin	g/100 g, dw	Umar et al. 2019: 10.44	1	10.44	
Calcium (Ca)	mg/100, dw	Webb, Bernard & Tao 2019: 0.56	1	0.56	
Phosphorus (P)	mg/100, dw	Webb, Bernard & Tao 2019: 0.88	1	0.88	
Magnesium (Mg)	mg/100, dw	Webb, Bernard & Tao 2019: 0.57	1	0.57	
Potassium (K)	mg/100, dw	Webb, Bernard & Tao 2019: 1.69	1	1.69	
Sodium (Na)	mg/100, dw	Webb, Bernard & Tao 2019: 0.12	1	0.12	
Iron (Fe)	mg/100, dw	Webb, Bernard & Tao 2019: 136	1	136	
Manganese (Mn)	mg/100, dw	Webb, Bernard & Tao 2019: 60	1	60	
Zinc (Zn)	mg/100, dw	Webb, Bernard & Tao 2019: 103	1	103	
Copper (Cu)	mg/100, dw	Webb, Bernard & Tao 2019: 18	1	18	
Total phenolic compounds	mg GAE/g, dw	Canikli et al. 2023: 5.86	1	5.86	5.86 – 5.86
Tannins	g/100 g, dw	Umar et al. 2019: 4.22	1	4.22	
Saponins	g/100 g, dw	Umar et al. 2019: 2.9	1	1.72	
Phytates	g/100 g, dw	Umar et al. 2019: 2.45	1	2.45	
Gossypol	g/100 g, dw	Umar et al. 2019: 2.46	1	1.24	
Oxalates	g/100 g, dw	Umar et al. 2019: 0.88	1	0.88	

Soybean (Okara)

Soybean (Okara)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Redondo-Cuenca et al. 2008: 2.56; Nile et al. 2020: 3.8; Spréa et al. 2024: 2.77	3	3.04	2.56 – 3.80
Total proteins	g/100 g, dw	Redondo-Cuenca et al. 2008: 28.52; Nile et al. 2020: 33; Spréa et al. 2024: 24.31; Iorver et al. 2026: 25 (20–30)	4	27.71	20.00 – 33.00
Total fat	g/100 g, dw	Redondo-Cuenca et al. 2008: 9.84; Nile et al. 2020: 8.7; Spréa et al. 2024: 8.54; Iorver et al. 2026: 6.22	4	8.32	6.22 – 9.84

Soybean (Okara)					
Total ashes	g/100 g, dw	Redondo-Cuenca et al. 2008: 3.61; Nile et al. 2020: 3.5; Spréa et al. 2024: 3.52	3	3.54	3.50 – 3.61
Total dietary fiber	g/100 g, dw	Redondo-Cuenca et al. 2008: 55.48; Nile et al. 2020: 56; Spréa et al. 2024: 46.2; Iorver et al. 2026: 55 (50–60)	4	53.17	46.20 – 60.00
Insoluble dietary fiber	g/100 g, dw	Redondo-Cuenca et al. 2008: 50.77; Spréa et al. 2024: 42.52	2	46.65	42.52 – 50.77
Soluble dietary fiber	g/100 g, dw	Redondo-Cuenca et al. 2008: 4.1; Spréa et al. 2024: 3.67	2	3.89	3.67 – 4.10
Cellulose	g/100 g, dw	Redondo-Cuenca et al. 2008: 13.35	1	13.35	
Hemicellulose	g/100 g, dw	Redondo-Cuenca et al. 2008: 26.72	1	26.72	
Potassium (K)	mg/100 g, dw	Iorver et al. 2026: 1040.00–1210.00		1125.00	1040.00 – 1210.00
Phosphorus (P)	mg/100 g, dw	Iorver et al. 2026: 475 (450–500)	1	475	450.00 – 500.00
Calcium (Ca)	mg/100 g, dw	Iorver et al. 2026: 260.00–390.00		325.00	260.00 – 390.00
Iron (Fe)	mg/100 g, dw	Iorver et al. 2026: 5.45–10.95		8.20	5.45 – 10.95
Zinc (Zn)	mg/100 g, dw	Iorver et al. 2026: 3.02	1	3.02	
Total phenolic compounds	mg GAE/g dw	Iorver et al. 2026: 1.3	1	1.3	
Total tocopherols	mg/100 g dw	Spréa et al. 2024: 1.19	1	1.19	
Total isoflavones (sum of HPLC compounds)	mg/100 g dw	Nile et al. 2020: 21.2	1	21.2	

Flax (seed press cake)

Flax (seed press cake)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total carbohydrates	g/100 g, dw	Drozdowska et al. 2025: 44.12 (41.83–46.41); Gumul et al. 2025: 24.25; Niyonshuti & Kirkpinar 2024: 24 (23.3–24.7)	3	30.79	23.30 – 46.41
Total proteins	g/100 g, dw	Drozdowska et al. 2025: 9.64 (9.63–9.66); Gumul et al. 2025: 32.64; Niyonshuti & Kirkpinar 2024: 34.8 (22.8–46.8)	3	25.69	9.63 – 46.80
Total fat	g/100 g, dw	Drozdowska et al. 2025: 15.16 (15.12–15.2); Gumul et al. 2025: 9.88; Niyonshuti & Kirkpinar 2024: 15.8 (8.1–23.5)	3	13.61	8.10 – 23.50
Total ashes	g/100 g, dw	Drozdowska et al. 2025: 5.41 (5.38–5.44); Gumul et al. 2025: 4.7; Niyonshuti & Kirkpinar 2024: 5.55 (5.4–5.7)	3	5.22	4.70 – 5.70
Total dietary fiber	g/100 g, dw	Drozdowska et al. 2025: 25.73 (23.53–27.93); Gumul et al. 2025: 28.53	2	27.13	23.53 – 28.53
Insoluble dietary fiber	g/100 g, dw	Gumul et al. 2025: 19.74	1	19.74	
Soluble dietary fiber	g/100 g, dw	Gumul et al. 2025: 7.52	1	7.52	
Cellulose	g/100 g, dw	Niyonshuti & Kirkpinar 2024: 5.7 (3–8.4)	1	5.7	3.00 – 8.40
Hemicellulose	g/100 g, dw	Niyonshuti & Kirkpinar 2024: 8.3 (2.8–13.8)	1	8.3	2.80 – 13.80
Lignin (ADL)	g/100 g, dw	Niyonshuti & Kirkpinar 2024: 7.7 (7–8.4)	1	7.7	7.00 – 8.40
Calcium (Ca)	mg/100 g, dw	Drozdowska et al. 2025: 110.22; Talwar et al. 2025: 361.00	2	235.61	110.22 – 361.00
Magnesium (Mg)	mg/100 g, dw	Drozdowska et al. 2025: 353.36; Talwar et al. 2025: 441.00	2	397.18	353.36 – 441.00

Flax (seed press cake)					
Potassium (K)	mg/100 g, dw	Drozdowska et al. 2025: 771.57; Talwar et al. 2025: 1241.00	2	1006.29	771.57 – 1241.00
Sodium (Na)	mg/100 g, dw	Drozdowska et al. 2025: 17.11; Talwar et al. 2025: 34.00	2	25.56	17.11 – 34.00
Phosphorus (P)	mg/100 g, dw	Talwar et al. 2025: 952	1	952.00	
Iron (Fe)	mg/100 g, dw	Drozdowska et al. 2025: 22.15	1	22.15	
Zinc (Zn)	mg/100 g, dw	Drozdowska et al. 2025: 6.11; Talwar et al. 2025: 4.86	2	5.48	4.86 – 6.11
Manganese (Mn)	mg/100 g, dw	Drozdowska et al. 2025: 3.22; Talwar et al. 2025: 1.37	2	2.30	1.37 – 3.22
Copper (Cu)	mg/100 g, dw	Drozdowska et al. 2025: 1.68; Talwar et al. 2025: 1.78	2	1.73	1.68 – 1.78
Total phenolic compounds (gallic acid std.)	mg GAE/g dw	Niyonshuti & Kirkpinar 2024: 1.48 (1.44–1.53)	1	1.48	1.44 – 1.53
Total flavonoids	mg QE/g dw	Niyonshuti & Kirkpinar 2024: 1.3 (1.17–1.44)	1	1.3	1.17 – 1.44
Vitamin C	mg/100 g dw	Drozdowska et al. 2025: 4.90	1	4.90	
Total carotenoids	mg/100 g dw	Drozdowska et al. 2025: 36.53	1	36.53	
Antimicrobial activity	Antifungal activity	Talwar et al. 2025: 1	1	1	
Antidiabetic activity	% inhibition	Talwar et al. 2025: 67.81 (64.62–71)	1	67.81	64.62 – 71.00

Hemp (seed press cake)

Hemp (seed press cake)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total carbohydrates	g/100 g, dw	Nakov et al. 2025: 3.12; Ambroziak et al. 2025, compilation with ranges across varieties: 6.13	1	3.12	3.12 – 6.30
Total proteins	g/100 g, dw	Nakov et al. 2025: 29; Capcanari et al. 2023: 31.62; Jakab et al. 2025: 26.49; Carrà et al. 2026: 28; Ambroziak et al. 2025, compilation with ranges across varieties: 29.95	5	29.01	26.49 – 31.62
Total fat	g/100 g, dw	Nakov et al. 2025: 8.13; Capcanari et al. 2023: 8.19; Jakab et al. 2025: 6.95; Carrà et al. 2026: 11.2; Ambroziak et al. 2025, compilation with ranges across varieties: 15.94	5	10.08	6.95 – 15.94
Total ashes	g/100 g, dw	Nakov et al. 2025: 11.6; Carrà et al. 2026: 7.55; Ambroziak et al. 2025, compilation with ranges across varieties: 6.75	3	8.63	6.75 – 11.60
Total dietary fiber	g/100 g, dw	Nakov et al. 2025: 48.16; Capcanari et al. 2023: 43.76; Jakab et al. 2025: 46.14; Carrà et al. 2026: 52.6; Ambroziak et al. 2025, compilation with ranges across varieties: 39.23 (37.2–41.26)	5	45.98	37.20 – 52.60
Insoluble dietary fiber	g/100 g, dw	Nakov et al. 2025: 44.09; Carrà et al. 2026: 49	2	46.55	44.09 – 49.00
Soluble dietary fiber	g/100 g, dw	Nakov et al. 2025: 4.07; Carrà et al. 2026: 3.6	2	3.83	3.60 – 4.07
Raffinose family oligosaccharides (RFO)	g/100 g, dw	Ambroziak et al. 2025: 0.63		0.63	
Lignin	g/100 g, dw	Ambroziak et al. 2025: 20.62		20.62	
Total phenolic compounds	mg GAE/g, dw	Ambroziak et al. 2025, compilation with ranges across varieties: 1.73 (0.98–2.48)	1	1.73	0.98 – 2.48
Phytic acid	g/100 g, dw	Ambroziak et al. 2025, compilation with ranges across varieties: 1.33 (1.08–1.59)	1	1.34	1.08 – 1.59

Poppy seed (seed press cake)

Poppy seed (seed press cake)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total proteins	g/100 g, dw	Melo et al. 2022: 28.5; Yilmaz & Dündar Emir, 2017: 31 (26.87–35.14)		28.50	26 - 35.14
Total fat	g/100 g, dw	Melo et al. 2022: 6.65; Yilmaz & Dündar Emir, 2017: 3.3 (2.32–4.28)		6.65	2.32 – 10.00
Total ashes	g/100 g, dw	Melo et al. 2022: 9.96; Yilmaz & Dündar Emir, 2017: 9.92 (8.7–11.14)		9.96	8.70 – 10.00
Total dietary fiber	g/100 g, dw	Melo et al. 2022: 38		38.00	
Phytic acid	g/100 g, dw	Yilmaz & Dündar Emir 2017		1.44	1.18 – 1.70
Saturated fatty acids (SFA)	% of total fatty acids	Melo et al. 2022: 29%		29.00	
Monounsaturated fatty acids (MUFA)	% of total fatty acids	Melo et al. 2022: 19%		19.00	
Polyunsaturated fatty acids (PUFA)	% of total fatty acids	Melo et al. 2022: 52%		52.00	

Pumpkin (flour / seed press cake)

Pumpkin (flour / seed press cake)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Trajkovska et al. 2025: 20.43; Jakab et al. 2025: 0; Sert et al. 2022: 4.05	2	12.24	4.05–20.43
Total proteins	g/100 g, dw	Trajkovska et al. 2025: 38.73; Jakab et al. 2025: 44.5; Sert et al. 2022: 68.68	2	53.7	38.73 – 68.68
Total fat	g/100 g, dw	Trajkovska et al. 2025: 34.12; Jakab et al. 2025: 34.69; Sert et al. 2022: 0.77	2	17.45	0.77 – 34.12
Total ashes	g/100 g, dw	Trajkovska et al. 2025: 6.72; Sert et al. 2022: 9.11	2	7.91	6.72 – 9.11
Total dietary fiber	g/100 g, dw	Jakab et al. 2025: 24.46; Sert et al. 2022: 17.39	1	17.39	
Total phenolic compounds	mg GAE/g, dw	Trajkovska et al. 2025: 7.89	1	7.89	
Palmitic acid (C16:0)	% of total fatty acids	Jakab et al. 2025: 12.15	1	12.15	
Stearic acid (C18:0)	% of total fatty acids	Jakab et al. 2025: 6	1	6	
Oleic acid (C18:1 n-9c)	% of total fatty acids	Jakab et al. 2025: 29.1	1	29.1	
Linoleic acid (C18:2 n-6c)	% of total fatty acids	Jakab et al. 2025: 52.75	1	52.75	
Total saturated fatty acids (SFA)	% of total fatty acids	Jakab et al. 2025: 18.15	1	18.15	

Sunflower (seeds press cake)

Sunflower (seeds press cake)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Tewelde et al.: 13.77; Njeri et al.: 10.41	2	12.09	10.41–13.77
Soluble sugars	g/100 g, dw	partially dehulled sunflower meal (SFM), Milica Veljković and Lara Denić, Innovation Center FTM Belgrade, unpublished: 5.5; Feed tables INRAE-CIRAD-AFZ: 7.4; Mironova et al.: 2.5	3	5.13	2.50 – 7.40
Starch	g/100 g, dw	Tewelde et al.: 2.65; Feed tables INRAE-CIRAD-AFZ: 3.9; Njeri et al.: 4.11; Li et al.: 4.91	4	3.89	2.65 – 4.91
Total proteins	g/100 g, dw	partially dehulled sunflower meal (SFM), Milica Veljković and Lara Denić, Innovation Center FTM Belgrade, unpublished: 42.8; Tewelde et al.: 43.84; She et al.: 36.5; Feed tables INRAE-CIRAD-AFZ: 40.4; Mironova et al.: 40.98; Saleh et al.: 36.1; Njeri et al.: 39.35	7	40	36.10 – 43.84
Total fat	g/100 g, dw	partially dehulled sunflower meal (SFM), Milica Veljković and Lara Denić, Innovation Center FTM Belgrade, unpublished: 2.8; Tewelde et al.: 1.14; Feed tables INRAE-CIRAD-AFZ: 1.4; Mironova et al.: 0.7; Njeri et al.: 2.06	5	1.62	0.70 – 2.80
Total ashes	g/100 g, dw	partially dehulled sunflower meal (SFM), Milica Veljković and Lara Denić, Innovation Center FTM Belgrade, unpublished: 7.4; Tewelde et al.: 7.68; She et al.: 5.6; Feed tables INRAE-CIRAD-AFZ: 7.2; Mironova et al.: 7.7; Saleh et al.: 6.3; Njeri et al.: 7.28	7	7.02	5.60 – 7.70
Total dietary fiber	g/100 g, dw	Tewelde et al.: 33.57; Njeri et al.: 40.9; Li et al.: 45.14	3	39.87	33.57 – 45.14
Insoluble dietary fiber	g/100 g, dw	Tewelde et al.: 24.85; Njeri et al.: 29	2	26.93	24.85 – 29.00
Soluble dietary fiber	g/100 g, dw	Tewelde et al.: 8.72; Njeri et al.: 11.9	2	10.31	8.72 – 11.90
Cellulose	g/100 g, dw	partially dehulled sunflower meal (SFM), Milica Veljković and Lara Denić, Innovation Center FTM Belgrade, unpublished: 13.5	1	13.5	13.50 – 13.50
Hemicellulose	g/100 g, dw	partially dehulled sunflower meal (SFM), Milica Veljković and Lara Denić, Innovation Center FTM Belgrade, unpublished: 12.7	1	12.7	12.70 – 12.70
Lignin	g/100 g, dw	partially dehulled sunflower meal (SFM), Milica Veljković and Lara Denić, Innovation Center FTM Belgrade, unpublished: 6.8; Feed tables INRAE-CIRAD-AFZ: 7.5; Saleh et al.: 7.6	3	7.3	6.80 – 7.60
Total oligosaccharides	g/100 g, dw	Carré: 2.2	1	2.2	2.20 – 2.20
Potassium (K)	mg/100 g, dw	INRAE-CIRAD-AFZ: 1660; Vershinina et al. 2025: 670–750	2	1190	670 – 1660
Phosphorus (P)	mg/100 g, dw	INRAE-CIRAD-AFZ: 115; Vershinina et al. 2025: 600–940	2	96	60 – 115
Sulfur (S)	mg/100 g, dw	INRAE-CIRAD-AFZ: 49; Vershinina et al. 2025: 260–320	2	39	26 – 49
Magnesium (Mg)	mg/100 g, dw	INRAE-CIRAD-AFZ: 5; Vershinina et al. 2025: 350–410	2	21	5 – 41
Calcium (Ca)	mg/100 g, dw	INRAE-CIRAD-AFZ: 44; Vershinina et al. 2025: 80–100	2	27	8 – 44
Total phenolic compounds	mg GAE/g dw	Alexandrino et al.: 25 (10–40); Multescu et al.: 11.7	2	18.35	10.00 – 40.00

Sunflower (seeds press cake)					
Total flavonoids	mg QE/g dw	Multescu et al.: 7.45 (7.9–7)	1	7.45	7.90 – 7.00
Choline	mg/100 g dw	INRAE-CIRAD-AFZ: 280	1	280	
Carotenoids	mg/100 g dw	Vershinina et al. 2025: dehulled seeds (10–20)	1	20.00	10.00 – 20.00
Anticholesterolemic activity	% inhibition	Hernández-Barillas et al.: 74.69 (74.63–74.76)	1	74.69	74.63 – 74.76

Rapeseed (extraction meal (RSM))

Rapeseed (extraction meal (RSM))					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Petraru et al. 2024: 40.38; Long et al. 2022: 35.25 (34.5–36)	2	37.81	34.50 – 40.38
Total soluble sugars	g/100 g, dw	Kasprowicz-Potocka et al. 2024: 11.44	1	11.44	
Starch	g/100 g, dw	Long et al. 2022: 2.5	1	2.5	
Total proteins	g/100 g, dw	RSM, Milica Veljković and Teodora Zakić, Innovation Center FTM Belgrade, unpublished: 34; Petraru et al. 2024: 35.04; Kalaydzhiev et al. 2020: 37.41; Du et al. 2025: 42.82	4	37.32	34.00 – 42.82
Total fat	g/100 g, dw	Petraru et al. 2024: 13.24; Kalaydzhiev et al. 2020: 1.9; Du et al. 2025: 1.33	3	5.49	1.33 – 13.24
Total ashes	g/100 g, dw	Petraru et al. 2024: 6.06; Kalaydzhiev et al. 2020: 6.9; Du et al. 2025: 8.8	3	7.25	6.06 – 8.80
Total dietary fiber	g/100 g, dw	Petraru et al. 2024: 31.8; Kalaydzhiev et al. 2020: 40.23; Nguyen et al. 2019: 32.88	3	34.97	31.80 – 40.23
Insoluble dietary fiber	g/100 g, dw	Nguyen et al. 2019: 29.25	1	29.25	
Soluble dietary fiber	g/100 g, dw	Nguyen et al. 2019: 3.64	1	3.64	
Raffinose family oligosaccharides	g/100 g, dw	Kasprowicz-Potocka et al. 2024: 3.11	1	3.11	
Cellulose	g/100 g, dw	RSM, Milica Veljković and Teodora Zakić, Innovation Center FTM Belgrade, unpublished: 12.65; Remón et al. 2018: 13.38	2	13.02	12.65 – 13.38
Hemicellulose	g/100 g, dw	RSM, Milica Veljković and Teodora Zakić, Innovation Center FTM Belgrade, unpublished: 20.75; Du et al. 2025: 13.76; Remón et al. 2018: 7.72	3	14.08	7.72 – 20.75
Lignin	g/100 g, dw	RSM, Milica Veljković and Teodora Zakić, Innovation Center FTM Belgrade, unpublished: 10.46; Long et al. 2022: 2.6; Remón et al. 2018: 34.93	3	16	2.60 – 34.93
Pectins	g/100 g, dw	Veljković & Zakić, Innovation Center FTM Belgrade (unpublished): 7.55	1	7.55	
Total phenolic compounds	mg GAE/g, dw	Kalaydzhiev et al. 2020: 0.7	1	0.7	0.70 – 0.70
Total phenolic compounds (sinapic acid equivalents)	mg SAE/g, dw	Kalaydzhiev et al. 2020: 0.7	1	0.7	0.70 – 0.70
Antimicrobial activity	Antibacterial activity	Anghel et al. 2023: 1	1	1	1.00 – 1.00
Antidiabetic activity	IC ₅₀ α-glucosidase; murine T2D model	Liu et al. 2023: 0.32	1	0.32	0.32 – 0.32

Wheat (bran)

Wheat (bran)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total carbohydrates	g/100 g, dw	Rico, Martín-Diana, García-Casas, Martínez-Villaluenga, Frías & Peñas 2021: 63.14; Sharanappa, Chetana & Suresh Kumar 2016: 72.24 (65.91–78.57); Saroj et al. 2022: 82.85 (73.4–92.31)	3	72.74	63.14 – 92.31
Starch	g/100 g, dw	Suanno et al. 2025: 29.8 (9.6–50)	1	29.8	9.60 – 50.00
Total proteins	g/100 g, dw	Rico, Martín-Diana, García-Casas, Martínez-Villaluenga, Frías & Peñas 2021: 13.19; Sharanappa, Chetana & Suresh Kumar 2016: 17.4 (12.27–22.54); Saroj et al. 2022: 19.5	3	16.7	12.27 – 22.54
Total fat	g/100 g, dw	Rico, Martín-Diana, García-Casas, Martínez-Villaluenga, Frías & Peñas 2021: 2.73; Sharanappa, Chetana & Suresh Kumar 2016: 4.4 (2.56–6.25); Saroj et al. 2022: 3.48	3	3.54	2.56 – 6.25
Total ashes	g/100 g, dw	Rico, Martín-Diana, García-Casas, Martínez-Villaluenga, Frías & Peñas 2021: 7.31; Sharanappa, Chetana & Suresh Kumar 2016: 6.09 (5.28–6.91); Saroj et al. 2022: 4.77	3	6.06	5.28 – 7.31
Total dietary fiber	g/100 g, dw	Aldura variety, T. turgidum: 23.55 (23.5–23.6); Endural variety, T. turgidum: 32.1; Cajeme variety, T. aestivum: 49.2 (46.8–51.6); Marius variety, T. aestivum — all four from the Complutense University of Madrid group (Cámara, Morales, Fernández-Ruiz, Cámara & Ciudad-Mulero): 46.75 (46.1–47.4); Rico, Martín-Diana, García-Casas, Martínez-Villaluenga, Frías & Peñas 2021: 53.89; Suanno et al. 2025: 46.4; Sharanappa, Chetana & Suresh Kumar 2016: 39.42 (23.1–55.75); Saroj et al. 2022: 46.23 (43.31–49.16)	4	42.19	23.10 – 55.75
Insoluble dietary fiber	g/100 g, dw	Aldura variety, T. turgidum: 23.1 (22.8–23.4); Endural variety, T. turgidum: 25.7; Cajeme variety, T. aestivum: 45.3 (43.2–47.4); Marius variety, T. aestivum — all four from the Complutense University of Madrid group (Cámara, Morales, Fernández-Ruiz, Cámara & Ciudad-Mulero): 44.55 (44.1–45); Rico, Martín-Diana, García-Casas, Martínez-Villaluenga, Frías & Peñas 2021: 43.18; Suanno et al. 2025: 42.6; Sharanappa, Chetana & Suresh Kumar 2016: 34.16 (18.91–49.41)	3	36.94	18.91 – 49.41
Soluble dietary fiber	g/100 g, dw	Aldura variety, T. turgidum: 2.5; Endural variety, T. turgidum: 6.5; Cajeme variety, T. aestivum: 3.75 (3.3–4.2); Marius variety, T. aestivum — all four from the Complutense University of Madrid group (Cámara, Morales, Fernández-Ruiz, Cámara & Ciudad-Mulero): 2.25 (2.1–2.4); Rico, Martín-Diana, García-Casas, Martínez-Villaluenga, Frías & Peñas 2021: 1.55; Suanno et al. 2025: 2.81 (1.8–3.83); Sharanappa, Chetana & Suresh Kumar 2016: 6.31 (4.21–8.41)	1	3.67	1.55 – 8.41
Klason lignin	g/100 g, dw	Rico, Martín-Diana, García-Casas, Martínez-Villaluenga, Frías & Peñas 2021: 9.16	1	9.16	
Total arabinoxylans (TO-AX)	g/100 g, dw	Aldura variety, T. turgidum: 10.6 (7.7–13.5); Endural variety, T. turgidum: 10.6; Cajeme variety, T. aestivum: 11.1 (8.4–13.8); Marius variety, T. aestivum — all four from the Complutense University of Madrid group	4	10.05	6.30 – 13.80

Wheat (bran)					
		(Cámara, Morales, Fernández-Ruiz, Cámara & Ciudad-Mulero): 7.9 (6.3–9.5)			
Water-extractable arabinoxylans (WE-AX)	g/100 g, dw	Aldura variety, T. turgidum: 1.1; Endural variety, T. turgidum: 1.9; Cajeme variety, T. aestivum: 1 (0.3–1.7); Marius variety, T. aestivum — all four from the Complutense University of Madrid group (Cámara, Morales, Fernández-Ruiz, Cámara & Ciudad-Mulero): 1.05 (0.9–1.2)	4	1.26	0.30 – 1.90
Total phenolic compounds	mg GAE/g	Sharanappa, Chetana & Suresh Kumar 2016: 62.52 (45.76–79.27); Verma, Hucl & Chibbar 2008: 505.45 (340.64–670.27); Saroj et al. 2022: 168.81 (114.37–223.25)	3	245.59	45.76 – 670.27
Ferulic acid	mg/100g, dw	Suanno et al. 2025: 215 (77–353)	1	215	77.00 – 353.00
p-Coumaric acid	mg/100g, dw	Suanno et al. 2025: 6.5 (3–10)	1	6.5	3.00 – 10.00
Phytic acid	g/100 g, dw	Suanno et al. 2025: 2.46 (1.02–3.9)	1	2.46	1.02 – 3.90
Total tocopherols	mg/100 g, dw	Sharanappa, Chetana & Suresh Kumar 2016: 203.46 (120.06–286.87)	1	203.46	120.06 – 286.87
Total carotenoids	mg/100 g, w	Sharanappa, Chetana & Suresh Kumar 2016: 2.53 (0.07–4.99)	1	2.53	0.07 – 4.99
Saturated fatty acids (SFA)	% of total fatty acids	Suanno et al. 2025: 17.5 (15.81–19.2); Sharanappa, Chetana & Suresh Kumar 2016: 29.01 (19.02–38.99)	2	23.26	15.81 – 38.99
Monounsaturated fatty acids (MUFA)	% of total fatty acids	Suanno et al. 2025: 17.2 (15.25–19.16); Sharanappa, Chetana & Suresh Kumar 2016: 22.05 (14.24–29.86)	2	19.63	14.24 – 29.86
Polyunsaturated fatty acids (PUFA)	% of total fatty acids	Suanno et al. 2025: 65.62 (63.82–67.42); Sharanappa, Chetana & Suresh Kumar 2016: 59.5	2	62.56	59.50 – 67.42
Linoleic acid (C18:2)	% of total fatty acids	Sharanappa, Chetana & Suresh Kumar 2016: 49.88 (42.62–57.14)	1	49.88	42.62 – 57.14

Apple (pomace)

Apple (pomace)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g dw	Pascoalino et al. 2025: 64.44; Nakov et al. 2020: 81.87; Literature research: 78.1; Salari et al. 2024: 0; Sudha et al. 2007: 0; Fernandes et al. 2019: 67	4	48.57	64.44 – 81.87
Fructose	g/100 g dw	Pascoalino et al. 2025: 44.44; Nakov et al. 2020: 3.52; Literature research: 4.76; Salari et al. 2024: 20.68	4	18.35	3.52 – 44.44
Glucose	g/100 g dw	Pascoalino et al. 2025: 14.67; Literature research: 27.14; Salari et al. 2024: 8.33	3	16.71	8.33 – 27.14
Sucrose	g/100 g dw	Pascoalino et al. 2025: 20.44; Nakov et al. 2020: 1.58; Literature research: 15.24	3	12.42	1.58 – 20.44
Soluble sugars (total)	g/100 g dw	Bindon et al. 2023: 48.73	1	48.73	46.03 – 68.89
Starch	g/100 g dw	Bindon et al. 2023: 0.47	1	0.47	
Total proteins	g/100 g dw	Pascoalino et al. 2025: 2.36; Nakov et al. 2020: 3.2; Literature research: 1.62; Bindon et al. 2023: 3.1; Salari et al. 2024: 4.45; Sudha et al. 2007: 2.31; Fernandes et al. 2019: 5.6	7	3.23	1.62 – 5.60
Total fat	g/100 g dw	Pascoalino et al. 2025: 0.98; Literature research: 0.9; Salari et al. 2024: 1; Sudha et al. 2007: 3.03	4	1.48	0.90 – 3.03
Total ashes	g/100 g dw	Pascoalino et al. 2025: 1.78; Nakov et al. 2020: 4.78; Literature research: 1.9; Salari et al. 2024: 1.85; Sudha et al. 2007: 0.56	5	2.17	0.56 – 4.78
Total dietary fiber	g/100 g dw	Pascoalino et al. 2025: 30.67; Nakov et al. 2020: 43.89; Literature research: 17.38; Salari et al. 2024: 32.8; Sudha et al. 2007: 57.29	5	36.4	17.38 – 57.29

Apple (pomace)					
Insoluble dietary fiber	g/100 g dw	Nakov et al. 2020: 11.86; Literature research: 13.33	2	12.6	11.86 – 13.33
Soluble dietary fiber	g/100 g dw	Nakov et al. 2020: 32.03; Literature research: 4.29	2	18.16	4.29 – 32.03
Cellulose	g/100 g dw	Bindon et al. 2023: 1.52	1	1.52	
Hemicellulose	g/100 g dw	Bindon et al. 2023: 3.11	1	3.11	
Lignin	g/100 g dw	Bindon et al. 2023: 13.53	1	13.53	
Pectins	g/100 g dw	Bindon et al. 2023: 7.12	1	7.12	4.426 - 8.676
Total phenolic compounds	mg TE/g dw	Pascoalino et al. 2025: 893; Nakov et al. 2020: 1086.9; Literature research: 810	3	929.97	810.00 – 1086.90
alpha-Tocopherol	mg/100 g dw	Pascoalino et al. 2025: 2.71; Literature research: 10.95; Salari et al. 2024: 1.75	3	5.14	1.75 – 10.95
Anthocyanins	mg/g dw	Bindon et al. 2023: 0.19	1	0.19	

Banana (peel)

Banana (peel)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g dw	Koraqi/Deb et al.: 47.63; Mosa & Khalil 2015: 54.01; Khamsaw et al. 2024: 64.52; Pyar & Peh 2018: 29.49	4	48.91	29.49 – 64.52
Soluble sugars (total)	g/100 g dw	Koraqi/Deb et al.: 29.23; Emaga et al. 2011: 28.1 (23–33.2); Khamsaw et al. 2024: 0.47	3	19.27	0.47 – 33.20
Starch	g/100 g dw	Koraqi/Deb et al.: 1.32; Emaga et al. 2011: 8.3 (2.6–14)	2	4.81	1.32 – 14.00
Total proteins	g/100 g dw	Koraqi/Deb et al.: 11.29; Mosa & Khalil 2015: 10.04; Emaga et al. 2011: 7.4 (6.9–7.9); Khamsaw et al. 2024: 3.95; Pyar & Peh 2018: 10.71	5	8.68	3.95 – 11.29
Total fat	g/100 g dw	Koraqi/Deb et al.: 11.5; Mosa & Khalil 2015: 5.32; Emaga et al. 2011: 8.6 (6.3–10.9); Khamsaw et al. 2024: 5.49; Pyar & Peh 2018: 3.23	5	6.83	3.23 – 11.50
Total ashes	g/100 g dw	Koraqi/Deb et al.: 17.28; Mosa & Khalil 2015: 8.23; Emaga et al. 2011: 10.6 (10.4–10.8); Khamsaw et al. 2024: 8.63; Pyar & Peh 2018: 17.78	5	12.5	8.23 – 17.78
Total dietary fiber	g/100 g dw	Koraqi/Deb et al.: 12.26; Mosa & Khalil 2015: 50.25; Emaga et al. 2011: 49.9 (47.9–51.9)	3	37.47	12.26 – 51.90
Insoluble dietary fiber	g/100 g dw	Emaga et al. 2011: 37.55 (35.2–39.9)	1	37.55	35.20 – 39.90
Soluble dietary fiber	g/100 g dw	Emaga et al. 2011: 12.8 (12–13.6)	1	12.8	12.00 – 13.60
Cellulose	g/100 g dw	Emaga et al. 2011: 15.45 (15.2–15.7)	1	15.45	15.20 – 15.70
Hemicellulose	g/100 g dw	Emaga et al. 2011: 0.5 (0.4–0.6)	1	0.5	0.40 – 0.60
Lignin	g/100 g dw	Emaga et al. 2011: 14.15 (13.3–15)	1	14.15	13.30 – 15.00
Pectins	g/100 g dw	Koraqi/Deb et al.: 13.06	1	13.06	
Potassium (K)	mg/100 g dw	Mosa & Khalil 2015: 100.08	1	100.08	
Calcium (Ca)	mg/100 g dw	Mosa & Khalil 2015: 24.72	1	24.72	
Sodium (Na)	mg/100 g dw	Mosa & Khalil 2015: 31.14	1	31.14	
Iron (Fe)	mg/100 g dw	Mosa & Khalil 2015: 0.78	1	0.78	
Magnesium (Mg)	mg/100 g dw	Mosa & Khalil 2015: 97.64	1	97.64	

Banana (peel)					
Total phenolic compounds	mg GAE/g dw	Khamsaw et al. 2024: 30.71	1	30.71	
Total flavonoids	mg/g dw	Khamsaw et al. 2024: 12.82	1	12.82	
Antioxidant activity	ABTS, DPPH, FRAP	Khamsaw et al. 2024: 34.36	1	34.36	
Prebiotic activity		Khamsaw et al. 2024 (evaluated qualitatively; assay values not directly comparable)			

Carob (pomace)

Carob (pomace)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g dw	Ozyurt et al. 2020: 47.11; Garau et al. 2025: 60.7 (42.7–70.1)	3	53.91	42.70 - 70.1
Fructose	g/100 g dw	El Chami et al. 2025: 6.73 (0.48–11.65); Garau et al. 2025: 3.3 (1.4–5.2)	2	5.02	0.48 - 11.65
Glucose	g/100 g dw	El Chami et al. 2025: 2.68 (0.43–6.81); Garau et al. 2025: 4.7 (1–9.3)	2	3.69	0.43 - 9.30
Sucrose	g/100 g dw	El Chami et al. 2025: 22.47 (4.23–48.36); Garau et al. 2025: 37.6 (14.2–59.9)	2	30.04	4.23 - 59.90
Soluble sugars, total	g/100 g dw	Tounsi et al. 2022: 23.18; Garau et al. 2025: 45.9 (22.5–62.5)	2	34.54	22.50 - 62.50
Total proteins	g/100 g dw	Ozyurt et al. 2020: 6.51; Tounsi et al. 2022: 6.68; El Chami et al. 2025: 4.82 (2.18–10.46); Garau et al. 2025: 4.4 (3.3–5.5)	4	5.6	2.18 - 10.46
Total fat	g/100 g dw	Ozyurt et al. 2020: 3.49; Tounsi et al. 2022: 0.58; El Chami et al. 2025: 0.31 (0.17–0.85); Garau et al. 2025: 0.6 (0.1–1.4)	4	1.24	0.10 - 3.49
Total ashes	g/100 g dw	Ozyurt et al. 2020: 5; Tounsi et al. 2022: 2.41; El Chami et al. 2025: 2.94 (1.04–7.11); Garau et al. 2025: 3.1 (2.7–3.7)	4	3.36	1.04 - 7.11
Total dietary fiber	g/100 g dw	Ozyurt et al. 2020: 51.17; Ramos-Pineda et al. 2016: 35; Tounsi et al. 2022: 56.49; El Chami et al. 2025: 35.87 (34.2–37.6); Garau et al. 2025: 31.7 (22.6–47.4)	5	42.05	22.60 - 56.49
Insoluble dietary fiber	g/100 g dw	Ozyurt et al. 2020: 26.85	1	26.85	
Soluble dietary fiber	g/100 g dw	Ozyurt et al. 2020: 22.21	1	22.21	
Lignin	g/100 g dw	Ozyurt et al. 2020: 27.3	1	27.3	
Arabinose (structural compounds)	g/100 g dw	Ozyurt et al. 2020: 13.25	1	13.25	
Xylose (structural compounds)	g/100 g dw	Ozyurt et al. 2020: 8.85	1	8.85	
Potassium (K)	mg/100 g, dw	Tounsi et al. 2022: 1640.54	1	1640.54	
Magnesium (Mg)	mg/100 g, dw	Tounsi et al. 2022: 47.96	1	47.96	
Calcium (Ca)	mg/100 g, dw	Tounsi et al. 2022: 129.16	1	129.16	
Phosphorus (P)	mg/100 g, dw	Tounsi et al. 2022: 73.86	1	73.86	
Iron (Fe)	mg/100 g, dw	Tounsi et al. 2022: 5.91	1	5.91	
Zinc (Zn)	mg/100 g, dw	Tounsi et al. 2022: 1.23	1	1.23	
Manganese (Mn)	mg/100 g, dw	Tounsi et al. 2022: 0.58	1	0.58	

Carob (pomace)					
Copper (Cu)	mg/100 g, dw	Tounsi et al. 2022: 0.26	1	0.26	
Total phenolic compounds	mg GAE/g, dw	Ozyurt et al. 2020: 148.93; Tounsi et al. 2022: 26.37; El Chami et al. 2025: 8.74 (5.05–12.7); Garau et al. 2025: 29.45 (10.4–48.5)	4	53.37	5.05 - 148.93
Total tannin content	mg GAE/g, dw	Garau et al. 2025: 17 (6–28)	1	17	6.00 - 28.00
Syringic acid	mg/g dw	Ozyurt et al. 2020		0.376	
Caffeic acid	mg/g dw	Ozyurt et al. 2020		0.034	
trans-Cinnamic acid	mg/g dw	Ozyurt et al. 2020		0.007	
Myricetin	mg/g dw	Ozyurt et al. 2020		0.008	
Naringin	mg/g dw	Ozyurt et al. 2020		0.001	
(-)-Epicatechin	mg/g dw	Ozyurt et al. 2020		0.0009	
Oleic acid	% of total fatty acids	Garau et al. 2025: 46.55 (32.3–60.8)	1	46.55	32.30 - 60.80
Palmitic acid	% of total fatty acids	Garau et al. 2025: 24.95 (13.3–36.6)	1	24.95	13.30 - 36.60
Stearic acid	% of total fatty acids	Garau et al. 2025: 3.95 (2.4–5.5)	1	3.95	2.40 - 5.50
Linoleic acid	% of total fatty acids	Garau et al. 2025: 13.8 (9.7–20.2)	1	13.8	9.70 - 20.20
Butyric acid	% of total fatty acids	Garau et al. 2025: 5.8 (1.8–15.8)	1	5.8	1.80 - 15.80
In vitro antioxidant assays	DPPH, ABTS, FRAP, CUPRAC	Garau et al. 2025 (evaluated qualitatively; assay values not directly comparable)			

Coffee (bean pulp)

Coffee (bean pulp)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g dw	Gil-Ramírez et al. 2024: 26.9; Machado et al. 2023: 31.23	2	29.06	26.90 – 31.23
Total proteins	g/100 g dw	Gil-Ramírez et al. 2024: 12.9; Machado et al. 2023: 10.23; Cañas et al. 2021: 9.2	3	10.78	9.20 – 12.90
Total amino acids	g/100 g dw	Gil-Ramírez et al. 2024: 2123.7	1	2123.7	
Total fat	g/100 g dw	Gil-Ramírez et al. 2024: 2.8; Machado et al. 2023: 1.7; Cañas et al. 2021: 2.6	3	2.37	1.70 – 2.80
Total ashes	g/100 g dw	Gil-Ramírez et al. 2024: 7.6; Machado et al. 2023: 10.72	2	9.16	7.60 – 10.72
Total dietary fiber	g/100 g dw	Gil-Ramírez et al. 2024: 49.8; Machado et al. 2023: 46.12; Cañas et al. 2021: 51.2	3	49.04	46.12 – 51.20
Insoluble dietary fiber	g/100 g dw	Gil-Ramírez et al. 2024: 38.6; Machado et al. 2023: 36.99; Cañas et al. 2021: 45.57	3	40.39	36.99 – 45.57
Soluble dietary fiber	g/100 g dw	Gil-Ramírez et al. 2024: 11.2; Machado et al. 2023: 9.13; Cañas et al. 2021: 5.63	3	8.65	5.63 – 11.20
Potassium (K)	mg/100 g dw	Gil-Ramírez et al. 2024: 2420	1	2420	
Sum of macroelements (K+Ca+Mg+P)	mg/100 g dw	Gil-Ramírez et al. 2024: 2870	1	2870	
Total phenolic compounds	mg/g dw	Gil-Ramírez et al. 2024: 356.4	1	356.4	

Coffee (bean pulp)					
(HPLC-DAD-ESI/MSn)					
Total phenolic compounds (Folin, eq. ác. clorogénico)	mg GAE/g dw	Gil-Ramírez et al. 2024: 356.4	1	356.4	
Total hydroxybenzoic acids	mg/g dw	Gil-Ramírez et al. 2024: 222.6	1	222.6	
Total hydroxycinnamic acids	mg/g dw	Gil-Ramírez et al. 2024: 110.8	1	110.8	
Total flavonoids (eq. catequina)	mg CE/g dw	Machado et al. 2023: 1.23	1	1.23	
4-CQA (ác. 4-cafeoilquinico)	mg/g dw	Gil-Ramírez et al. 2024: 0.85; Machado et al. 2023: 0.14	2	0.50	0.14 – 0.85
5-CQA (ác. 5-cafeoilquinico)	mg/g dw	Machado et al. 2023: 2.20	1	2.21	
3-CQA (ác. 3-cafeoilquinico)	mg/g dw	Machado et al. 2023: 6.54	1	0.065	
Caffeine	mg/100 g dw	Gil-Ramírez et al. 2024: 473.1; Machado et al. 2023: 850	2	661.55	473.10 – 850.00
In vitro antioxidant assays	ABTS, DPPH, FRAP	Gil-Ramírez et al. 2024; Machado et al. 2023 (evaluated qualitatively; assay values not directly comparable)			
Antidiabetic activity		Gil-Ramírez et al. 2024; Machado et al. 2023; Cañas et al. 2021 (evaluated qualitatively; assay values not directly comparable)			
Anticholesterolemic activity		Gil-Ramírez et al. 2024; Machado et al. 2023; Cañas et al. 2021 (evaluated qualitatively; assay values not directly comparable)			

Coffee (silverskin)

Coffee (silverskin)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total carbohydrates	g/100 g dw	Zoccatelli / Univ. Verona: 6.28; Bessada et al., 2018: 3.64 (0.28–7.00); Nzekoue et al., 2022: 19.50; Costa et al., 2018: 6.09	4	8.88	0.28 – 19.50
Total proteins	g/100 g dw	Zoccatelli / Univ. Verona: 18.88; Bessada et al., 2018: 20.67 (18.46–22.87); Nzekoue et al., 2022: 15.38; Gottstein et al., 2021: 22.20; Martuscelli et al., 2021: 18.67; Candela-Salvador et al., 2026 (Arabica): 13.98 (12.95–15.00); Candela-Salvador et al., 2026 (Canephora): 15.77; Behrouzian et al., 2016: 18.97; Costa et al., 2018: 19.74	9	18.25	12.95 – 22.87
Total fat	g/100 g dw	Zoccatelli / Univ. Verona: 3.32; Bessada et al., 2018: 2.41 (1.33–3.48); Nzekoue et al., 2022: 4.01; Gottstein et al., 2021: 1.50; Martuscelli et al., 2021: 2.38; Candela-Salvador et al., 2026 (Arabica): 2.01 (1.78–2.23); Candela-Salvador et al., 2026 (Canephora): 1.26; Behrouzian et al., 2016: 2.72; Costa et al., 2018: 2.54	9	2.46	1.26–4.01
Total ashes	g/100 g dw	Zoccatelli / Univ. Verona: 8.27; Bessada et al., 2018: 9.88 (8.18–11.58); Nzekoue et al., 2022: 5.31; Gottstein et al., 2021: 9.50; Martuscelli et al., 2021: 6.98; Candela-Salvador et al., 2026 (Arabica): 5.06 (4.45–5.66); Candela-Salvador et al., 2026 (Canephora): 4.86; Behrouzian et al., 2016: 5.73; Costa et al., 2018: 8.76	9	7.15	4.45–11.58
Total dietary fiber	g/100 g dw	Zoccatelli / Univ. Verona: 63.27; Bessada et al., 2018: 62.37 (58.30–66.44); Nzekoue et al., 2022: 55.80; Gottstein et al., 2021: 62.00; Martuscelli et al., 2021: 52.51; Candela-Salvador et al., 2026 (Arabica): 78.60 (76.72–80.48); Candela-Salvador et al., 2026	9	64.80	52.51–80.48

Coffee (silverskin)					
		(Canephora): 77.72; Behrouzian et al., 2016: 71.71; Costa et al., 2018: 59.22			
Insoluble dietary fiber	g/100 g dw	Zoccatelli / Univ. Verona: 47.35; Bessada et al., 2018: 52.64 (48.86–56.41); Gottstein et al., 2021: 53.20; Martuscelli et al., 2021: 50.25; Candela-Salvador et al., 2026 (Arabica): 60.63 (57.02–64.23); Candela-Salvador et al., 2026 (Canephora): 61.04; Behrouzian et al., 2016: 64.21; Costa et al., 2018: 51.55	8	55.11	47.35–64.23
Soluble dietary fiber	g/100 g dw	Zoccatelli / Univ. Verona: 15.82; Bessada et al., 2018: 9.49 (6.60–12.38); Gottstein et al., 2021: 8.80; Martuscelli et al., 2021: 8.08; Candela-Salvador et al., 2026 (Arabica): 16.41 (12.48–20.33); Candela-Salvador et al., 2026 (Canephora): 16.68; Behrouzian et al., 2016: 7.61; Costa et al., 2018: 7.66	8	11.32	6.60–20.33
Total phenolic compounds	mg GAE/g dw	Zoccatelli / Univ. Verona: 58.56; Bessada et al., 2018: 14.12 (5.80–22.44); Nzekoue et al., 2020: 3.16; Martuscelli et al., 2021: 5.95; Costa et al., 2018: 9.08	5	18.17	3.16–58.56
Total flavonoids	mg/g dw	Bessada et al., 2018: 3.85 (2.36–5.34); Costa et al., 2018: 5.41	2	4.63	2.36–5.41
Caffeine	mg/100 g dw	Zoccatelli / Univ. Verona: 2055.00; Bessada et al., 2018: 1048.31 (753.62–1342.99); Nzekoue et al., 2020: 154.28; Gottstein et al., 2021: 860.00; Martuscelli et al., 2021: 1794.90; Candela-Salvador et al., 2026 (Arabica): 430.83 (89.01–772.64); Candela-Salvador et al., 2026 (Canephora): 457.11; Costa et al., 2018: 1312.47	8	1014.11	89.01–2055.00
5-caffeoylquinic acid	mg/100 g dw	Zoccatelli / Univ. Verona: 699.00; Bessada et al., 2018: 459.18 (13.09–905.27); Nzekoue et al., 2020: 8.84; Candela-Salvador et al., 2026 (Arabica): 5.58 (2.23–8.93); Candela-Salvador et al., 2026 (Canephora): 2.40; Costa et al., 2018: 258.29	6	238.88	2.23–905.27
3-caffeoylquinic acid	mg/100 g dw	Zoccatelli / Univ. Verona: 2465.00; Nzekoue et al., 2020: 14.92; Candela-Salvador et al., 2026 (Arabica): 26.03 (1.76–50.30); Candela-Salvador et al., 2026 (Canephora): 0.91	4	626.72	0.91–2465.00
4-caffeoylquinic acid	mg/100 g dw	Zoccatelli / Univ. Verona: 723.00; Candela-Salvador et al., 2026 (Arabica): 5.73 (1.62–9.84); Candela-Salvador et al., 2026 (Canephora): 2.17	3	243.63	1.62–723.00
3,5-dicaffeoylquinic acid	mg/100 g dw	Nzekoue et al., 2020: 0.87	1	0.87	
3 and 4-feruloylquinic acid	mg/100 g dw	Zoccatelli / Univ. Verona: 488.00	1	488.00	
3,4-feruloyl caffeoylquinic acid	mg/100 g dw	Zoccatelli / Univ. Verona: 268.00	1	268.00	
Vitamin E	mg/100 g dw	Bessada et al., 2018: 11.48 (4.39–18.56); Costa et al., 2018: 4.38	2	7.93	4.38–18.56
Calcium	mg/100 g dw	Nzekoue et al., 2022: 1080.00; Martuscelli et al., 2021: 562.13; Candela-Salvador et al., 2026 (Arabica): 1421.65 (1121.83–1721.47); Candela-Salvador et al., 2026 (Canephora): 967.57; Costa et al., 2018: 613.19	5	928.91	562.13–1721.47
Potassium	mg/100 g dw	Nzekoue et al., 2022: 972.00; Martuscelli et al., 2021: 1501.75; Candela-Salvador et al., 2026 (Arabica): 1117.05 (702.98–1531.12); Candela-Salvador et al., 2026 (Canephora): 1839.96; Costa et al., 2018: 5225.75	5	2131.30	702.98–5225.75
Magnesium	mg/100 g dw	Nzekoue et al., 2022: 257.00; Martuscelli et al., 2021: 229.07; Candela-Salvador et al., 2026 (Arabica): 297.33 (223.31–371.34); Candela-Salvador et al., 2026 (Canephora): 533.47; Costa et al., 2018: 2102.06	5	683.79	223.31–2102.06
Iron	mg/100 g dw	Nzekoue et al., 2022: 23.80; Martuscelli et al., 2021: 21.85; Candela-Salvador et al., 2026 (Arabica): 20.10 (12.62–27.57); Candela-Salvador et al., 2026 (Canephora): 19.87; Costa et al., 2018: 43.89	5	25.90	12.62–43.89

Coffee (silverskin)					
Manganese	mg/100 g dw	Nzekoue et al., 2022: 4.67; Gottstein et al., 2021: 4.30; Martuscelli et al., 2021: 2.38	3	3.78	2.38–4.67
Phosphorus	mg/100 g dw	Martuscelli et al., 2021: 150.38; Candela-Salvador et al., 2026 (Arabica): 331.11 (107.66–554.55); Candela-Salvador et al., 2026 (Canephora): 554.39	3	345.29	107.66–554.55
Sodium	mg/100 g dw	Gottstein et al., 2021: 36.00; Martuscelli et al., 2021: 11.92; Candela-Salvador et al., 2026 (Arabica): 63.03 (56.63–69.43); Candela-Salvador et al., 2026 (Canephora): 47.07; Costa et al., 2018: 5.59	5	32.72	5.59–69.43
Copper	mg/100 g dw	Gottstein et al., 2021: 18.50; Martuscelli et al., 2021: 7.42	2	12.96	7.42–18.50
Chromium	mg/100 g dw	Gottstein et al., 2021: 0.29; Martuscelli et al., 2021: 0.57	2	0.43	0.29–0.57
Nickel	mg/100 g dw	Gottstein et al., 2021: 0.23; Martuscelli et al., 2021: 0.33	2	0.28	0.23–0.33
Zinc	mg/100 g dw	Gottstein et al., 2021: 3.30; Martuscelli et al., 2021: 1.86	2	2.58	1.86–3.30
Aluminum	mg/100 g dw	Gottstein et al., 2021: 15.50; Martuscelli et al., 2021: 23.01	2	19.25	15.50–23.01
Niacin	mg/100 g dw	Nzekoue et al., 2022: 0.33	1	0.33	
Nicotinamide	mg/100 g dw	Nzekoue et al., 2022: 0.080	1	0.080	
Nicotinic acid	mg/100 g dw	Nzekoue et al., 2022: 0.25	1	0.25	
Riboflavin	mg/100 g dw	Nzekoue et al., 2022: 0.022	1	0.022	
Acrylamide	µg/100 g dw	Gottstein et al., 2021: 16.10; Martuscelli et al., 2021: 74.06	2	45.08	16.10–74.06
HMF	mg/100 g dw	Bessada et al., 2018: 333.02 (312.19–353.84); Costa et al., 2018: 5.96	2	169.49	5.96–353.84
ABTS	mg TE/g dw	Zoccatelli / Univ. Verona: 195.96 (150.60–241.32); Martuscelli et al., 2021: 4.04; Candela-Salvador et al., 2026 (Arabica): 8.97 (6.27–11.66); Candela-Salvador et al., 2026 (Canephora): 6.69; Costa et al., 2018: 27.25	5	48.58	4.04–241.32
DPPH	mg TE/g dw	Zoccatelli / Univ. Verona: 158.64 (132.68–184.59); Candela-Salvador et al., 2026 (Arabica): 9.95 (8.53–11.36); Candela-Salvador et al., 2026 (Canephora): 10.77; Costa et al., 2018: 56.38	4	58.93	8.53–184.59
FRAP	mg TE/g dw	Zoccatelli / Univ. Verona: 171.24 (110.65–231.83); Candela-Salvador et al., 2026 (Arabica): 15.61 (10.19–21.03); Candela-Salvador et al., 2026 (Canephora): 11.71	3	66.19	10.19–231.83

Grape (pomace)

Grape (pomace)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g dw	Olt et al. 2023: 6.81	1	6.81	
Arabinose (free sugar)	g/100 g dw	grape pomace flour, own data + Lazăr et al. 2021: 2.1	1	2.1	
Fructose (free sugar)	g/100 g dw	grape pomace flour, own data + Lazăr et al. 2021: 1.8	1	1.8	
Soluble sugars (total)	g/100 g dw	Bravo & Saura-Calixto 1998: 3; Llobera & Cañellas 2007: 3.27	2	3.13	3.00 – 3.27
Total proteins	g/100 g dw	grape pomace flour, own data + Lazăr et al. 2021: 15.48; Bravo & Saura-Calixto 1998: 13 (12–14); Olt et al. 2023: 13.13; Llobera & Cañellas 2007: 12.2	4	13.45	12.00 – 15.48
Total fat	g/100 g dw	grape pomace flour, own data + Lazăr et al. 2021: 14.95; Bravo & Saura-Calixto 1998: 9.5 (7–12); Olt et al. 2023: 8.97; Llobera & Cañellas 2007: 13.53	4	11.74	7.00 – 14.95

Grape (pomace)					
Total ashes	g/100 g dw	grape pomace flour, own data + Lazăr et al. 2021: 6.51; Bravo & Saura-Calixto 1998: 7.5 (6–9); Olt et al. 2023: 7.27; Mildner-Szkudlarz et al. 2011: 6.4; Llobera & Cañellas 2007: 5.5	5	6.64	5.50 – 9.00
Total dietary fiber	g/100 g dw	grape pomace flour, own data + Lazăr et al. 2021: 54.4; Olt et al. 2023: 63.82; Zhang et al. 2017: 57.24; Mildner-Szkudlarz et al. 2011: 50.93; Llobera & Cañellas 2007: 74.5	5	60.18	50.93 – 74.50
Insoluble dietary fiber (IDF)	g/100 g dw	grape pomace flour, own data + Lazăr et al. 2021: 51.16; Zhang et al. 2017: 51.7; Mildner-Szkudlarz et al. 2011: 46.39; Llobera & Cañellas 2007: 63.7	4	53.24	46.39 – 63.70
Soluble dietary fiber (SDF)	g/100 g dw	grape pomace flour, own data + Lazăr et al. 2021: 6.24; Zhang et al. 2017: 5.54; Mildner-Szkudlarz et al. 2011: 4.53; Llobera & Cañellas 2007: 10.8	4	6.78	4.53 – 10.80
Klason lignin (IDF fraction)	g/100 g dw	Llobera & Cañellas 2007: 28.7	1	28.7	
Pectins (SDF fraction)	g/100 g dw	Llobera & Cañellas 2007: 6.2	1	6.2	
Neutral sugars (IDF fraction)	g/100 g dw	Llobera & Cañellas 2007		29.60	
Uronic acids (IDF fraction)	g/100 g dw	Llobera & Cañellas 2007		5.32	
Resistant protein (IDF fraction)	g/100 g dw	Llobera & Cañellas 2007		4.18	
Neutral sugars (SDF fraction)	g/100 g dw	Llobera & Cañellas 2007		4.60	
Uronic acids (SDF fraction)	g/100 g dw	Llobera & Cañellas 2007		6.21	
Total phenolic compounds	mg GAE/g dw	grape pomace flour, own data + Lazăr et al. 2021: 53.7; Bravo & Saura-Calixto 1998: 45 (40–50); Mildner-Szkudlarz et al. 2011: 58.95; Llobera & Cañellas 2007: 26.3	4	45.99	26.30 – 58.95
Total flavonols	mg CE/g dw	grape pomace flour, own data + Lazăr et al. 2021: 1461.5	1	1461.5	
Total flavonoids	mg QE/g dw	Bravo & Saura-Calixto 1998: 16.41 (6.9–25.91)	1	16.41	6.90 – 25.91
Total anthocyanins	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 976	1	976	
Condensed tannins (proanthocyanidins)	g/100 g dw	Bravo & Saura-Calixto 1998: 21.45 (16–26.9); Llobera & Cañellas 2007: 22.3	2	21.88	16.00 – 26.90
Gallic acid	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 40.1	1	40.1	
Protocatechuic acid	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 53.8	1	53.8	
Ellagic acid	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 32.2	1	32.2	
Tyrosol	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 74.3	1	74.3	
Catechin	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 795.5	1	795.5	
Epicatechin derivative	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 224.5	1	224.5	
Quercetin	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 56.3	1	56.3	
Apigenin	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 38.9	1	38.9	
Kaempferol	mg/g dw	grape pomace flour, own data + Lazăr et al. 2021: 39.1	1	39.1	
Palmitic acid (C16:0)	% of total fatty acids	grape pomace flour, own data + Lazăr et al. 2021: 10.21	1	10.21	

Grape (pomace)					
Palmitoleic acid (C16:1)	% of total fatty acids	grape pomace flour, own data + Lazăr et al. 2021: 0.39	1	0.39	
Stearic acid (C18:0)	% of total fatty acids	grape pomace flour, own data + Lazăr et al. 2021: 3.75	1	3.75	
Oleic acid (C18:1)	% of total fatty acids	Nakov et al. 2020		13.54	
Linolenic acid	% of total fatty acids	Nakov et al. 2020		66.18	
Linoleic acid	% of total fatty acids	Nakov et al. 2020		1.56	
SFA (saturated)	% of total fatty acids	Nakov et al. 2020		14.78	
MUFA (monounsaturated)	% of total fatty acids	Nakov et al. 2020		15.38	
PUFA (polyunsaturated)	% of total fatty acids	Nakov et al. 2020		68.81	
Conjugated linoleic acid (CLA)	% of total fatty acids	Nakov et al. 2020		0.22	
Omega-3	% of total fatty acids	Nakov et al. 2020		1.77	
Omega-6	% of total fatty acids	Nakov et al. 2020		66.84	

Grape (seed)

Grape (seed)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Elkatry et al. 2022: 31.68; Ivanov et al. 2025: 24.77 (22.45–27.09)	2	28.23	22.45 – 31.68
Total proteins	g/100 g, dw	Elkatry et al. 2022: 13.14; Ivanov et al. 2025: 16.07 (15.26–16.87)	2	14.6	13.14 – 16.87
Total fat	g/100 g, dw	Elkatry et al. 2022: 10.48; Ivanov et al. 2025: 16.12 (15.82–16.41)	2	13.3	10.48 – 16.41
Total ashes	g/100 g, dw	Elkatry et al. 2022: 3.54; Ivanov et al. 2025: 3.51 (3.42–3.61)	2	3.53	3.42 – 3.61
Total dietary fiber	g/100 g, dw	Elkatry et al. 2022: 34; Ivanov et al. 2025: 33.03 (32.05–34.02)	2	33.52	32.05 – 34.02
Insoluble dietary fiber	g/100 g, dw	Elkatry et al. 2022: 13.24	1	13.24	
Soluble dietary fiber	g/100 g, dw	Elkatry et al. 2022: 21.91	1	21.91	
Sodium (Na)	mg/100 g, dw	Ivanov et al. 2025: 15.79 (12.08–19.5)	1	15.79	12.08 – 19.50

Grape (seed)					
Magnesium (Mg)	mg/100 g, dw	Ivanov et al. 2025: 143.26 (140.12–146.41)	1	143.26	140.12 – 146.41
Aluminium (Al)	mg/100 g, dw	Ivanov et al. 2025: 13.26 (11.2–15.32)	1	13.26	11.20 – 15.32
Phosphorus (P)	mg/100 g, dw	Ivanov et al. 2025: 343.57 (304.99–382.15)	1	343.57	304.99 – 382.15
Potassium (K)	mg/100 g, dw	Ivanov et al. 2025: 441.31 (371.83–510.8)	1	441.31	371.83 – 510.80
Calcium (Ca)	mg/100 g, dw	Ivanov et al. 2025: 186.63 (185.38–187.88)	1	186.63	185.38 – 187.88
Chromium (Cr)	mg/100 g, dw	Ivanov et al. 2025: 0.08 (0.07–0.09)	1	0.08	0.07 – 0.09
Iron (Fe)	mg/100 g, dw	Elkatry et al. 2022: 3.77; Ivanov et al. 2025: 11.97 (7.86–16.09)	2	7.87	3.77 – 16.09
Zinc (Zn)	mg/100 g, dw	Elkatry et al. 2022: 0.93; Ivanov et al. 2025: 1.59 (1.21–1.98)	2	1.26	0.93 – 1.98
Copper (Cu)	mg/100 g, dw	Ivanov et al. 2025: 1.49 (1.01–1.96)	1	1.49	1.01 – 1.97
Total phenolic compounds	mg GAE/ g	Elkatry et al. 2022: 45.6	1	45.6	45.60 – 45.60
Total flavonoids	mg QE/ g	Elkatry et al. 2022: 40.6	1	40.6	
p-Hydroxybenzoic acid	mg/g	Elkatry et al. 2022: 5.39	1	5.39	
Gallic acid	mg/g	Elkatry et al. 2022: 23.87	1	23.87	
Protocatechuic acid	mg/g	Elkatry et al. 2022: 17.45	1	17.45	
Caffeic acid	mg/g	Elkatry et al. 2022: 1.49	1	1.49	
Rutin	mg/g	Elkatry et al. 2022: 3.58	1	3.58	
Antioxidant – TEAC	TEAC	Elkatry et al. 2022: 134.2	1	134.2	

Olive (pomace)

Olive (pomace)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g dw	Carboni et al. 2025: 9.19; Simsek & Sufer, 2022: 0.58	2	4.88	0.58 - 9.19
Soluble sugars (total)	g/100 g dw	Nunes et al. 2018: 3	3	4.62	0.09 - 11.97
Total proteins	g/100 g dw	Carboni et al. 2025: 6.06; Ribeiro et al. 2021: 11.82; Simsek & Sufer, 2022: 13.34	5	9.49	5 - 13.34
Total fat	g/100 g dw	Carboni et al. 2025: 16.53; Ribeiro et al. 2021: 11.95; Simsek & Sufer, 2022: 17.54	5	15.18	4 - 21.34
Total ashes	g/100 g dw	Nunes et al. 2018: 2.5; Carboni et al. 2025: 5.08; Ribeiro et al. 2021: 3.19; Simsek & Sufer, 2022: 5.11	4	3.97	2.5 - 5.11
Total dietary fiber	g/100 g dw	Carboni et al. 2025: 63.14; Ribeiro et al. 2021: 62.06; Simsek & Sufer, 2022: 64.42	4	56.78	25 - 64.42
Insoluble dietary fiber	g/100 g dw	Ribeiro et al. 2021: 52.17; Simsek & Sufer, 2022: 55.92	3	51.95	34.93 - 60.54
Soluble dietary fiber	g/100 g dw	Ribeiro et al. 2021: 9.89; Simsek & Sufer, 2022: 8.5	3	10.57	8.21 - 18.42
Hemicellulose	g/100 g fiber dw	Nunes et al. 2018	1	19	18 - 20
Lignin	g/100 g fiber dw	Nunes et al. 2018	2	21.08	13 - 28.16
Pectins (uronic acids)	g/100 g fiber dw	Ribeiro et al. 2021	1	6.54	
Potassium (K)	mg/100 g dw	Ribeiro et al. 2021: 1756	2	1921.25	1250 - 2923

Olive (pomace)					
Calcium (Ca)	mg/100 g dw	Ribeiro et al. 2021: 165	2	174	149 - 217
Magnesium (Mg)	mg/100 g dw	Ribeiro et al. 2021: 50	2	96.25	50 - 157
Sodium (Na)	mg/100 g dw	Loschi et al. 2024.	1	5.5	4 - 7
Iron (Fe)	mg/100 g dw	Loschi et al. 2024.	1	9	7 - 11
Copper (Cu)	mg/100 g dw	Loschi et al. 2024.	1	1.68	1.55 - 1.81
Phosphorus (P)	mg/100 g dw	Ribeiro et al. 2021: 159	1	159	
Total phenolic compounds	mg GAE/g dw	Carboni et al. 2025: 23.65	5	23.91	12.96 - 65.87
Tocopherols (vitamin E)	mg/100 g dw	Loschi et al. 2024.	1	54.1	47.7 - 60.5
Antimicrobial activity	Antibacterial activity	Loschi et al. 2024 (evaluated qualitatively; assay values not directly comparable)			

Orange (peel)

Orange (peel)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	(1) Teixeira: 50.53; (3) Crizel: 68.04	2	59.28	50.53 - 68.04
Soluble sugars (total)	g/100 g, dw	(4) Şengül: 18.66	1	18.66	18.66
Total proteins	g/100 g, dw	(1) Teixeira: 6.32; (2) Reisi: 17.32; (3) Crizel: 8.5; (4) Şengül: 10.34	4	10.62	6.32 - 17.32
Total fat	g/100 g, dw	(1) Teixeira: 6.32; (2) Reisi: 9.98; (3) Crizel: 1.81	3	6.04	1.81 - 9.98
Total ashes	g/100 g, dw	(1) Teixeira: 3.75; (3) Crizel: 3.03; (4) Şengül: 4.8; (5) Kohli: 12.18	4	5.94	3.03 - 12.18
Total dietary fiber	g/100 g, dw	(1) Teixeira: 33.09; (3) Crizel: 63.7	2	48.4	33.09 - 63.70
Insoluble dietary fiber	g/100 g, dw	(1) Teixeira: 29.26; (3) Crizel: 48.2	2	38.73	29.26 - 48.20
Soluble dietary fiber	g/100 g, dw	(1) Teixeira: 4.13; (3) Crizel: 15.6	2	9.86	4.13 - 15.60
Cellulose	g/100 g, dw	(2) Reisi: 15.04	1	15.04	15.04
Hemicellulose	g/100 g, dw	(2) Reisi: 13.7	1	13.7	13.70
Lignin	g/100 g, dw	(2) Reisi: 6.8	1	6.8	6.80
Pectins	g/100 g, dw	(2) Reisi: 33; (6) Akhter: 21.63	2	27.31	21.63 - 33.00
Vitamin C (ascorbic acid)	mg/100 g, dw	(1) Teixeira: 801.89; (4) Şengül: 524.8	2	663.35	524.80 - 801.89
Total carotenoids	mg/100 g, dw	(1) Teixeira 2020; (2) Reisi 2026; (3) Crizel		146.23	1.21 – 430.00
Antidiabetic activity		Teixeira 2020; Reisi 2026 (evaluated qualitatively; assay values not directly comparable)			

Sour cherry (pomace)

Sour cherry (pomace)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range

Sour cherry (pomace)					
Total available carbohydrates	g/100 g dw	pressed/freeze-dried pomace: 55.62 (51.12–60.13); Górnas et al. 2016: 42.5; Cucuiet/Paucean et al. 2026: 69.3	4	55.81	42.50 – 69.30
Total proteins	g/100 g dw	pressed/freeze-dried pomace: 10.9 (10.52–11.28); Górnas et al. 2016: 9.05; Cucuiet/Paucean et al. 2026: 10.83; Juriené et al. 2024: 13.95	4	11.18	9.05 – 13.95
Total fat	g/100 g dw	pressed/freeze-dried pomace: 1.58 (1.22–1.95); Górnas et al. 2016: 8.21; Cucuiet/Paucean et al. 2026: 2.76; Juriené et al. 2024: 7.79	4	5.09	1.22 – 8.21
Total ashes	g/100 g dw	pressed/freeze-dried pomace: 9.02; Górnas et al. 2016: 11.19; Cucuiet/Paucean et al. 2026: 5.41; Juriené et al. 2024: 1.88	4	6.88	1.88 – 11.19
Total dietary fiber	g/100 g dw	pressed/freeze-dried pomace: 23.14 (20.49–25.79); Górnas et al. 2016: 29.05; Cucuiet/Paucean et al. 2026: 11.7; Kosmala et al. 2009: 42	5	26.47	11.70 – 79.84
Cellulose	g/100 g dw	Kosmala et al. 2009: 11	1	11	
Hemicellulose	g/100 g dw	Kosmala et al. 2009: 24.5	1	24.5	
Pectins	g/100 g dw	Kosmala et al. 2009: 24.7	1	24.7	
Potassium (K)	mg/100 g, dw	Cucuiet/Paucean et al. 2026: 1678.31	1	1678.31	
Calcium (Ca)	mg/100 g, dw	Cucuiet/Paucean et al. 2026: 253.45	1	253.45	
Magnesium (Mg)	mg/100 g, dw	Cucuiet/Paucean et al. 2026: 66.95	1	66.95	
Total phenolics	mg GAE/g, dw	Miljana Djordjević & Marijana Djordjević (unpublished)	1	37.49	35.80 - 39.18
Total carotenoids	mg/100 g dw	Juriené et al. 2024: 2026.33	1	2026.33	

Artichoke (bracts)

Artichoke (bracts)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100, dw	Amara, Khwaldia et al. 2026: 24.15; Melini et al. 2025: 36.54 (36.69–36.39); Eman et al. 2018: 22.71	3	27.8	22.71 – 36.69
Total proteins	g/100, dw	Melini et al. 2025: 15.43; Ammar et al. 2024: 20.47; Eman et al. 2018: 15.71; Ruiz-Cano et al. 2014: 12	4	15.9	12.00 – 20.47
Total fat	g/100, dw	Amara, Khwaldia et al. 2026: 1.29; Melini et al. 2025: 0.77; Ammar et al. 2024: 0.47; Eman et al. 2018: 1.78; Ruiz-Cano et al. 2014: 2.5	5	1.36	0.47 – 2.50
Total ashes	g/100, dw	Amara, Khwaldia et al. 2026: 7.23; Melini et al. 2025: 7.12; Ammar et al. 2024: 9.36; Eman et al. 2018: 7.33; Ruiz-Cano et al. 2014: 6.1	5	7.43	6.10 – 9.36
Total dietary fiber	g/100, dw	Amara, Khwaldia et al. 2026: 64.56; Melini et al. 2025: 39.69; Quintero Ruiz et al. 2021: 57.8 (55.25–60.35); Ruiz-Cano et al. 2014: 66	4	57.01	39.69 – 66.00
Insoluble dietary fiber	g/100, dw	Quintero Ruiz et al. 2021: 39.34 (33.24–45.45)	1	39.34	33.24 – 45.45
Soluble dietary fiber	g/100, dw	Melini et al. 2025: 6.41; Quintero Ruiz et al. 2021: 18.27 (9.79–26.76)	2	12.34	6.41 – 26.76
Cellulose	g/100, dw	Amara, Khwaldia et al. 2026: 31.09; Eman et al. 2018: 25.42	2	28.26	25.42 – 31.09
Hemicellulose	g/100, dw	Amara, Khwaldia et al. 2026: 15.13; Eman et al. 2018: 15.67	2	15.4	15.13 – 15.67
Lignin	g/100, dw	Amara, Khwaldia et al. 2026: 18.34; Eman et al. 2018: 5.27	2	11.8	5.27 – 18.34
Inulin	g/100, dw	Eman et al. 2018: 6.58; Ruiz-Cano et al. 2014: 10	2	8.29	6.58 – 10.00
Potassium (K)	mg/100g, dw	Eman et al. 2018: 3089.12	1	3089.12	

Artichoke (bracts)					
Calcium (Ca)	mg/100g, dw	Eman et al. 2018: 73.66	1	73.66	
Sodium (Na)	mg/100g, dw	Eman et al. 2018: 54.17	1	54.17	
Magnesium (Mg)	mg/100g, dw	Eman et al. 2018: 47.67	1	47.67	
Iron (Fe)	mg/100g, dw	Eman et al. 2018: 14.95	1	14.95	
Zinc (Zn)	mg/100g, dw	Eman et al. 2018: 3.03	1	3.03	
Copper (Cu)	mg/100g, dw	Eman et al. 2018: 1.39	1	1.39	
Manganese (Mn)	mg/100g, dw	Eman et al. 2018: 0.63	1	0.63	
Total phenolic compounds	mg GAE/g, dw	Amara, Khwaldia et al. 2026: 4.5; Melini et al. 2025: 7.09; Ammar et al. 2024: 7.84	3	6.47	4.50 – 7.84
Total flavonoids	mg CE/g, dw	Amara, Khwaldia et al. 2026: 2.1; Ammar et al. 2024: 1.87	2	1.99	1.87 – 2.10
In vitro antioxidants activity	DPPH, FRAP, ABTS	Amara, Khwaldia et al. 2026 (evaluated qualitatively; assay values not directly comparable)			
Antimicrobial activity	Antibacterial activity	Amara, Khwaldia et al. 2026: 1	1	1	

Pea (pods)

Pea (pods)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100, dw	Ramirez et al. 2021: 10.08; Amara, Khwaldia et al. 2026: 34.61	2	22.34	10.08 – 34.61
Soluble sugars (total)	g/100, dw	Amara, Khwaldia et al. 2026: 20.57	1	20.57	
Starch	g/100, dw	Ramirez et al. 2021: 11.7; Ben Said et al. 2025: 8.76	2	10.23	8.76 – 11.70
Total proteins	g/100, dw	Ramirez et al. 2021: 13.26; Ben Said et al. 2025: 12.13; Nasir et al. 2023: 14.19	3	13.19	12.13 – 14.19
Total fat	g/100, dw	Ramirez et al. 2021: 0.64; Amara, Khwaldia et al. 2026: 0.91; Ben Said et al. 2025: 1.48	3	1.01	0.64 – 1.48
Total ashes	g/100, dw	Ramirez et al. 2021: 2.81; Amara, Khwaldia et al. 2026: 5.35; Ben Said et al. 2025: 3.98; Nasir et al. 2023: 5.55	4	4.42	2.81 – 5.55
Total dietary fiber	g/100, dw	Ramirez et al. 2021: 67.01; Amara, Khwaldia et al. 2026: 46.69; Nasir et al. 2023: 37.67	3	50.46	37.67 – 67.01
Insoluble dietary fiber	g/100, dw	Ramirez et al. 2021: 60.17; Amara, Khwaldia et al. 2026: 46.69; Ben Said et al. 2025: 37.45	3	48.1	37.45 – 60.17
Soluble dietary fiber	g/100, dw	Ramirez et al. 2021: 6.84	1	6.84	
Cellulose	g/100, dw	Amara, Khwaldia et al. 2026: 20.39; Ben Said et al. 2025: 18.08	2	19.23	18.08 – 20.39
Hemicellulose	g/100, dw	Amara, Khwaldia et al. 2026: 15.81; Ben Said et al. 2025: 16.86	2	16.34	15.81 – 16.86
Lignin	g/100, dw	Amara, Khwaldia et al. 2026: 10.49; Ben Said et al. 2025: 2.51	2	6.5	2.51 – 10.49
Total α-galactosides	g/100, dw	Ben Said et al. 2025: 0.73	1	0.73	
Total phenolic compounds	mg GAE/g, dw	Ramirez et al. 2021: 5.41; Amara, Khwaldia et al. 2026: 7.1; Ben Said et al. 2025: 3.77	3	5.43	3.77 – 7.10
Total flavonoids	mg QE/g, dw	Amara, Khwaldia et al. 2026: 1.6	1	1.6	
Phytic acid	g/100, dw	Ben Said et al. 2025: 0.14	1	0.14	
In vitro antioxidants activity	DPPH, ABTS, FRAP	Ben Said et al. 2025 (evaluated qualitatively; assay values not directly comparable)			

Pea (pods)					
Antimicrobial activity	Antibacterial activity	Amara, Khwaldia et al. 2026: 1	1	1	

Carrot (pomace)

Carrot (pomace)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100, dw	Akter et al. 2024: 23.8; Luca et al. 2022: 55.44 (48.92–61.95)	2	39.62	23.80 – 61.95
Starch	g/100, dw	Nawirska-Olszańska & Oziembłowski 2025: 1.43	1	1.43	
Total proteins	g/100, dw	Akter et al. 2024: 12.94; Luca et al. 2022: 8.41 (7.22–9.61)	2	10.68	7.22 – 12.94
Total fat	g/100, dw	Luca et al. 2022: 0.96 (0.74–1.19)	1	0.96	0.74 – 1.19
Total ashes	g/100, dw	Luca et al. 2022: 5.87 (5.56–6.19)	1	5.87	5.56 – 6.19
Total dietary fiber	g/100, dw	Luca et al. 2022: 28.08 (21.11–35.04)	1	28.08	21.11 – 35.04
Soluble sugars – glucose	g/100, dw	Nawirska-Olszańska & Oziembłowski 2025: 0.59	1	0.59	
Soluble sugars – fructose	g/100, dw	Nawirska-Olszańska & Oziembłowski 2025: 0.55	1	0.55	
Cellulose	g/100, dw	Nawirska-Olszańska & Oziembłowski 2025: 28	1	28	
Hemicellulose	g/100, dw	Nawirska-Olszańska & Oziembłowski 2025: 6.66	1	6.66	
Lignin	g/100, dw	Nawirska-Olszańska & Oziembłowski 2025: 17.5	1	17.5	
Pectins	g/100, dw	Nawirska-Olszańska & Oziembłowski 2025: 2.1	1	2.1	
Potassium (K)	mg/100, dw	Akter et al. 2024: 0.35	1	0.35	
Sodium (Na)	mg/100, dw	Akter et al. 2024: 0.18	1	0.18	
Calcium (Ca)	mg/100, dw	Akter et al. 2024: 0.05	1	0.05	
Magnesium (Mg)	mg/100, dw	Akter et al. 2024: 0.06	1	0.06	
Total phenolic compounds	mg GAE/g, dw	Akter et al. 2024: 0.68; Sabahi et al. 2024: 85	2	42.84	0.68 – 85.00
Total flavonoids	mg QE/g, dw	Akter et al. 2024: 0.37	1	0.37	
Ascorbic acid (vitamin C)	mg/100, dw	Akter et al. 2024: 13.68	1	13.68	
β-carotene	mg/100, dw	Akter et al. 2024: 1.14	1	1.14	
Antimicrobial activity	Antibacterial activity	Sabahi et al. 2024: 1	1	1	

Beans (pods)

Beans (pods)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100, dw	Smeriglio et al. 2025: 48.29; Martínez-Castaño et al. 2020: 15.65; Vlasova et al. 2025: 28.07	3	30.67	15.65 – 48.29
Total proteins	g/100, dw	Smeriglio et al. 2025: 2.61; Martínez-Castaño et al. 2020: 2.42; Vlasova et al. 2025: 15.81; Amara – Khwaldia et al. 2026: 3.19	4	6.01	2.42 – 15.81
Total fat	g/100, dw	Smeriglio et al. 2025: 2.04; Martínez-Castaño et al. 2020: 0.58; Vlasova et al. 2025: 0.77; Amara – Khwaldia et al. 2026: 1.14	4	1.13	0.58 – 2.04
Total ashes	g/100, dw	Smeriglio et al. 2025: 5.32; Martínez-Castaño et al. 2020: 6.65; Vlasova et al. 2025: 7.28; Amara – Khwaldia et al. 2026: 7.75	4	6.75	5.32 – 7.75
Total dietary fiber	g/100, dw	Smeriglio et al. 2025: 41.21; Martínez-Castaño et al. 2020: 66.93; Vlasova et al. 2025: 45.33	3	51.16	41.21 – 66.93
Insoluble dietary fiber	g/100, dw	Martínez-Castaño et al. 2020: 59.97; Vlasova et al. 2025: 36	2	47.99	36.00 – 59.97
Soluble dietary fiber	g/100, dw	Martínez-Castaño et al. 2020: 6.96; Vlasova et al. 2025: 9.33	2	8.15	6.96 – 9.33

Beans (pods)					
Soluble sugars (total)	g/100, dw	Smeriglio et al. 2025: 48.29; Karavidas et al. 2023: 3.62 (3.48–3.76); Amara – Khwaldia et al. 2026: 26.82	3	26.25	3.48 – 48.29
Soluble sugars – glucose	g/100, dw	Smeriglio et al. 2025: 48.29; Karavidas et al. 2023: 3.62 (3.48–3.76); Amara – Khwaldia et al. 2026: 26.82	3	26.25	3.48 – 48.29
Soluble sugars – fructose	g/100, dw	Smeriglio et al. 2025: 48.29; Karavidas et al. 2023: 3.62 (3.48–3.76); Amara – Khwaldia et al. 2026: 26.82	3	26.25	3.48 – 48.29
Soluble sugars – sucrose	g/100, dw	Smeriglio et al. 2025: 48.29; Karavidas et al. 2023: 3.62 (3.48–3.76); Amara – Khwaldia et al. 2026: 26.82	3	26.25	3.48 – 48.29
Starch	g/100, dw	Karavidas et al. 2023: 8.05 (7.9–8.2)	1	8.05	7.90 – 8.20
Cellulose	g/100, dw	Amara – Khwaldia et al. 2026: 21.17	1	21.17	
Hemicellulose	g/100, dw	Amara – Khwaldia et al. 2026: 19.26	1	19.26	
Lignin	g/100, dw	Amara – Khwaldia et al. 2026: 6.39	1	6.39	
Potassium (K)	mg/100, dw	Vlasova et al. 2025: 3.06	1	3.06	
Phosphorus (P)	mg/100, dw	Vlasova et al. 2025: 0.3	1	0.3	
Calcium (Ca)	mg/100, dw	Vlasova et al. 2025: 0.27	1	0.27	
Sodium (Na)	mg/100, dw	Vlasova et al. 2025: 0.06	1	0.06	
Magnesium (Mg)	mg/100, dw	Vlasova et al. 2025: 0.19	1	0.19	
Total phenolic compounds	mg GAE/g, dw	Martínez-Castaño et al. 2020: 15.2 (3.77–26.62); Karavidas et al. 2023: 7.54 (6.84–8.25); Amara – Khwaldia et al. 2026: 26.9	3	16.55	3.77 – 26.90
Total flavonoids	mg QE/g, dw	Karavidas et al. 2023: 11.41 (8.89–13.94); Amara – Khwaldia et al. 2026: 3.3	2	7.36	3.30 – 13.94
Antimicrobial activity	Antibacterial activity	Amara – Khwaldia et al. 2026: 1	1	1	

Garlic (husk)

Garlic (husk)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100, dw	Hitlamani et al. 2024: 6.75; Heredia Martín et al. 2026: 47.65 (45.1–50.2); Bampidis et al. 2005: 18.7	3	24.37	6.75 – 50.20
Soluble sugars	g/100, dw	Hitlamani et al. 2024: 1.41	1	1.41	
Total proteins	g/100, dw	Hitlamani et al. 2024: 2.71; Heredia Martín et al. 2026: 4.75 (2.7–6.8); Bampidis et al. 2005: 14.27	3	7.24	2.70 – 14.27
Total fat	g/100, dw	Hitlamani et al. 2024: 0.56 (0.23–0.89); Heredia Martín et al. 2026: 1.55 (1.3–1.8); Bampidis et al. 2005: 4.58	3	2.23	0.23 – 4.58
Total ashes	g/100, dw	Hitlamani et al. 2024: 7.64; Heredia Martín et al. 2026: 9.45 (4.5–14.4); Bampidis et al. 2005: 6.1	3	7.73	4.50 – 14.40
Total dietary fiber	g/100, dwf	Hitlamani et al. 2024: 64.37; Bampidis et al. 2005: 63.62	2	63.99	63.62 – 64.37
Insoluble dietary fiber	g/100, dw	Hitlamani et al. 2024: 60.35	1	60.35	
Soluble dietary fiber	g/100, dw	Hitlamani et al. 2024: 4.31	1	4.31	
Cellulose	g/100, dw	Reddy & Rhim 2014: 41.7; Heredia Martín et al. 2026: 31.85 (24.5–39.2)	2	36.78	24.50 – 41.70
Hemicellulose	g/100, dw	Heredia Martín et al. 2026: 35.15 (29.8–40.5)	1	35.15	29.80 – 40.50
Lignin	g/100, dw	Reddy & Rhim 2014: 34.5; Heredia Martín et al. 2026: 2.94 (2.06–3.82)	2	18.72	2.06 – 34.50
Pectins	g/100, dw	Heredia Martín et al. 2026: 6.1 (1.5–10.7)	1	6.1	1.50 – 10.70
Total phenolic compounds	mg GAE/g, dw	Hitlamani et al. 2024: 7.77 (0.52–15.03); Heredia Martín et al. 2026: 15.44 (8.21–22.67)	2	11.61	0.52 – 22.67
Total flavonoids	mg QE/g, dw	Kallel & Ellouz Chaabouni 2014: 0.62	1	0.62	
Antimicrobial activity	Antibacterial activity	Kallel & Ellouz Chaabouni 2014: 1	1	1	

Potato (peel)

Potato (peel)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100, dw	Javed et al. 2019: 52.75; Çağlar, Seçilmiş & Demirci, 2025: 49.51	2	51.13	49.51 – 52.75
Total proteins	g/100, dw	Javed et al. 2019: 8.75; Dessi, Fais & Sarais, 2025: 21.95 (12.1–31.8); Çağlar, Seçilmiş & Demirci, 2025: 10.96	3	13.89	8.75 – 31.80
Total fat	g/100, dw	Javed et al. 2019: 1.25; Dessi, Fais & Sarais, 2025: 1 (0.7–1.3); Çağlar, Seçilmiş & Demirci, 2025: 0.98	3	1.08	0.70 – 1.30
Total ashes	g/100, dw	Javed et al. 2019: 6.25; Çağlar, Seçilmiş & Demirci, 2025: 9.17	2	7.71	6.25 – 9.17
Total dietary fiber	g/100, dw	Javed et al. 2019: 12.5; Çağlar, Seçilmiş & Demirci, 2025: 29.47	2	20.98	12.50 – 29.47
Starch	g/100, dw	Javed et al. 2019: 39	1	39	
Potassium (K)	mg/100g, dw	Dessi, Fais & Sarais, 2025: 1887.5 (1399.6–2375.4); Çağlar, Seçilmiş & Demirci, 2025: 4653	2	3270.25	1399.60 – 4653.00
Calcium (Ca)	mg/100g, dw	Dessi, Fais & Sarais, 2025: 516.7 (370.2–663.2)	1	516.7	370.20 – 663.20
Magnesium (Mg)	mg/100g, dw	Dessi, Fais & Sarais, 2025: 162.95 (141.4–184.5); Çağlar, Seçilmiş & Demirci, 2025: 188.5	2	175.72	141.40 – 188.50
Sodium (Na)	mg/100g, dw	Dessi, Fais & Sarais, 2025: 58.25 (23.5–93); Çağlar, Seçilmiş & Demirci, 2025: 7.5	2	32.88	7.50 – 93.00
Iron (Fe)	mg/100g, dw	Dessi, Fais & Sarais, 2025: 41.95 (12.6–71.3); Çağlar, Seçilmiş & Demirci, 2025: 17.75	2	29.85	12.60 – 71.30
Zinc (Zn)	mg/100g, dw	Dessi, Fais & Sarais, 2025: 2.65 (1.6–3.7); Çağlar, Seçilmiş & Demirci, 2025: 3.75	2	3.2	1.60 – 3.75
Total phenolic compounds	mg GAE/g, dw	Javed et al. 2019: 30.75 (3.01–58.5); Dessi, Fais & Sarais, 2025: 16.75 (6.51–27); Çağlar, Seçilmiş & Demirci, 2025: 8.37	3	18.63	3.01 – 58.50
Chlorogenic acid (CGA)	mg/g, dw	Dessi, Fais & Sarais, 2025: 5.85 (1.18–10.53)	1	5.85	1.18 – 10.53
Caffeic acid	mg/g, dw	Dessi, Fais & Sarais, 2025: 0.12 (0.03–0.21)	1	0.12	0.031 – 0.210
Anthocyanins (individual compounds)	mg/g, dw	Dessi, Fais & Sarais, 2025: 3.65 (0.03–7.27)	1	3.65	0.03 – 7.27

Tomato (pomace)

Tomato (pomace)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Nakov: 57.42; García-Herrera et al. 2010: 11.66 (9.67–13.66); Marcos et al. 2019: 12.1 (10.8–13.4); Becze et al. 2025: 87.27 (69.18–105.36); Robles-Ramírez et al. 2016: 1.22 (1.21–1.23); Marcos del Valle et al. 2006: 14.35 (13.14–15.56)	4	20.6	1.21 – 57.42
Total proteins	g/100 g, dw	Nakov: 20.73; García-Herrera et al. 2010: 6.45 (5.79–7.11); Marcos et al. 2019: 16.15 (15–17.3); Becze et al. 2025: 22.56 (18.52–26.6); Robles-Ramírez et al. 2016: 18.1 (18.02–18.18); Marcos del Valle et al. 2006: 16.36 (15.32–17.4)	6	17.09	5.79 – 26.60
Total fat	g/100 g, dw	Nakov: 16.14; Marcos et al. 2019: 8.54 (6.97–10.1); Becze et al. 2025: 6.12 (4.48–7.75); Brighina et al. 2024: 12.3 (11.64–12.96); Robles-Ramírez et al. 2016: 8.26 (8.2–8.32); Marcos del Valle et al. 2006: 11.29 (10.91–11.68)	6	10.64	4.48 – 20.00
Total ashes	g/100 g, dw	Nakov: 5.45; García-Herrera et al. 2010: 1.61 (0.97–2.24); Becze et al. 2025: 2.53 (2.25–2.81); Robles-Ramírez et al. 2016: 4.56 (4.47–4.65); Marcos del Valle et al. 2006: 3.85 (3.46–4.25)	4	3.54	0.97 – 5.45
Total dietary fiber	g/100 g, dw	Nakov: 36.62; García-Herrera et al. 2010: 81.4 (77.06–85.75); Marcos et al. 2019: 49.6 (40.8–58.4); Becze et al. 2025: 33.3 (1.01–65.6); Brighina et al. 2024: 52.3 (51.65–52.95); Robles-Ramírez et al. 2016: 63.71 (63.55–63.87); Marcos del Valle et al. 2006: 51.33 (49.63–53.02)	6	53.61	25.04 – 85.75

Tomato (pomace)					
Insoluble dietary fiber	g/100 g, dw	Nakov: 32; García-Herrera et al. 2010: 76.23 (72.61–79.85); Brighina et al. 2024: 47 (46.42–47.58)	3	51.74	32.00 – 79.85
Soluble dietary fiber	g/100 g, dw	Nakov: 4.62; García-Herrera et al. 2010: 6.51 (4.46–8.56); Brighina et al. 2024: 5.3 (4.8–5.8)	3	5.48	4.46 – 8.56
Soluble sugars (total)	g/100 g, dw	Nakov: 48.97; García-Herrera et al. 2010: 0.47 (0.26–0.68); Becze et al. 2025: 17.21 (13.02–21.39)	4	19.65	0.26 – 48.97
Starch	g/100 g, dw	García-Herrera et al. 2010: 0.73 (0.42–1.05)	1	0.73	0.42 – 1.05
Lignin (Acid Detergent Lignin)	g/100 g, dw	Marcos et al. 2019: 24.95 (22.9–27)	1	24.95	22.90 – 27.00
Total phenolic compounds	mg GAE/g, dw	Nakov: 121.14; Marcos et al. 2019: 300 (260–340); Becze et al. 2025: 379045.95 (327860.7–430231.2); Robles-Ramírez et al. 2016: 25.44 (3.19–47.69)	4	161.96	3.19 – 340.00
Total flavonoids	mg QE/g, dw	Kaboré et al. 2022	1	76.62	13.35 – 139.89
Vitamin C	mg EAA/100 g, dw	Kaboré et al. 2022	1	27.82	
Total carotenoids	mg/100 g, dw	Becze et al. 2025: 333 (202–464); Brighina et al. 2024: 3.09 (2.61–3.57); Robles-Ramírez et al. 2016: 15.4 (1.33–29.47)	3	117.16	1.33 – 464.00
β-carotene	mg/100 g, dw	Becze et al. 2025: 0.28 (0.23–0.34)	2	10.13	0.23 – 32.45
Lycopene	mg/100 g, dw	Becze et al. 2025: 0.68 (0.55–0.81); Robles-Ramírez et al. 2016: 5.25 (0.33–10.18)	3	20.25	0.33 – 105.00
Anthocyanins	mg/100 g, dw	Kaboré et al. 2022	1	601.5	420.00 – 783.00
Antioxidant activity – capacity	ABTS, DPPH, FRAP	Becze et al. 2025: 32.5 (28–37)	1	32.5	28.00 – 37.00

Tomato (pomace, peel)

Tomato (pomace, peel)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total proteins	g/100 g, dw	Navarro-González et al. 2011: 14.11 (14.06–14.15); Del Valle 2004: 10.54 (8.96–12.13)	2	11.55	8.96 – 14.15
Total fat	g/100 g, dw	Navarro-González et al. 2011: 6.37 (6.24–6.51); Del Valle 2004: 5.99 (3.73–8.25)	2	5.99	3.73–8.25
Total ashes	g/100 g, dw	Navarro-González et al. 2011: 3.19 (3.17–3.21); Del Valle 2004: 2.82 (2.66–2.98)	2	2.93	2.66 – 3.21
Total dietary fiber	g/100 g, dw	Navarro-González et al. 2011: 89.25 (88.58–89.91); Del Valle 2004: 89.17 (88.14–90.2)	2	89.17	88.14–90.2
Insoluble dietary fiber	g/100 g, dw	Navarro-González et al. 2011: 76.17 (75.37–76.97); Del Valle 2004: 80.87 (80.09–81.65)	2	78.45	75.37 – 81.65
Soluble dietary fiber	g/100 g, dw	Navarro-González et al. 2011: 15.2 (14.77–15.62); Del Valle 2004: 8.82 (8.55–9.1)	2	12.08	8.55 – 15.62
Uronic acid	g/100 g, dw	Navarro-González et al. 2011: 2.23; Del Valle 2004: 10.98 (10.75–11.22)	1	6.71	2.23 – 11.22
Calcium	mg/100 g, dw	Navarro-González et al. (2011)	1	29.97	14.11–45.84
Magnesium	mg/100 g, dw	Navarro-González et al. (2011)	1	166.86	145.51–188.21
Sodium	mg/100 g, dw	Navarro-González et al. (2011)	1	83.07	80.16–85.99
Potassium	mg/100 g, dw	Navarro-González et al. (2011)	1	1193.13	1093.86–1292.40
Iron	mg/100 g, dw	Navarro-González et al. (2011)	1	2.37	1.78–2.96
Zinc	mg/100 g, dw	Navarro-González et al. (2011)	1	0.56	0.21–0.91

Tomato (pomace, peel)					
Total phenolic compounds	mg GAE/g, dw	Navarro-González et al. 2011: 28.76; Kaboré et al. 2022: 213.03	2	177.2	28.762-325.64
Chlorogenic acid derivatives	mg/100g, dw	Navarro-González et al. (2011)	1	8.14	1.76–14.52
p-Coumaric acid	mg/100g, dw	Navarro-González et al. (2011)	1	1.80	0.08–2.82
p-Coumaric acid derivatives	mg/100g, dw	Navarro-González et al. (2011)	1	6.29	1.77–10.82
Quercetin	mg/100g, dw	Navarro-González et al. (2011)	1	0.99	0.53–1.45
Rutin	mg/100g, dw	Navarro-González et al. (2011)	1	27.42	11.35–43.49
Rutin derivatives	mg/100g, dw	Navarro-González et al. (2011)	1	7.73	3.82–11.64
Naringenin	mg/100g, dw	Navarro-González et al. (2011)	1	19.15	7.79–30.50
Antioxidant in vitro activity	TEAC, DPPH, FRAP	Navarro-González et al. 2011: 2.09 (0.05–4.14)	1	2.09	0.05 – 4.14

Tomato (pomace, seeds)

Tomato (pomace, seeds)					
Parameter	Unit	Per-source values (citation: value; range if reported)	n	Mean	Range
Total available carbohydrates	g/100 g, dw	Del Valle, 2007: 11.38 (8.68–14.07)	1	11.38	8.68-14.07
Total proteins	g/100 g, dw	Del Valle, 2007: 24.76 (22.87–26.65)	1	24.76	22.87-26.65
Total fat	g/100 g, dw	Del Valle, 2007: 21.87 (21–22.74)	1	21.87	21-22.74
Total ashes	g/100 g, dw	Del Valle, 2007: 4.79 (4.51–5.06)	1	4.79	4.51-5.06
Total dietary fiber	g/100 g, dw	Del Valle, 2007: 45.33 (43.27–47.38)	1	45.33	43.27-47.38
Total phenolic compounds	mg GAE/g, dw	Kaboré et al. 2022: 100.98 (76.89–125.08)	1	1.01	7.69–12.51
Total flavonoids	mg QE/g, dw	Kaboré et al. 2022: 13.35	1	1.33	
Vitamin C	mg EAA/100 g, dw	Kaboré et al. 2022: 9.63 (8.85–10.42)	1	9.63	8.85–10.42
β-carotene	mg/100 g, dw	Kaboré et al. 2022: 0.8 (0.75–0.85)	1	0.80	0.75–0.85
Lycopene	mg/100 g, dw	Kaboré et al. 2022: 20.35 (14.2–26.5)	1	20.35	14.20–26.50
Anthocyanins	mg/100 g, dw	Kaboré et al. 2022: 62 (41–83)	1	62.00	41.00–83.00
Antioxidant activity – capacity	ABTS, DPPH, FRAP	Kaboré et al. 2022: 38.51	1		