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Expanded Results

Processed plant-based food rankings according to their lipotrope density

a. Rankings of lipotrope, *myo*-insoitol phosphate and total phenolic compound densities. Considering ranking for betaine, choline, methionine, magnesium, niacin, pantothenic acid and folate densities, boiled asparagus ranked first with a mean rank of 7.1/65 and carbonated orange juice ranked last with a mean rank of 61.4/65 (Supplementary Table 3). Ten boiled vegetables ranked among the first 13 processed plant-based foods (PBF) together with brewed ground coffee and toasted wheat germ. Except lime and orange juices, all processed fruits ranked low above mean rank of 44. Among processed cereals, refined products ranked the lowest. More generally, whatever the botanical origin, highly refined and/or processed products tended to rank low, even for vegetables.

These tendencies may be also observed when considering each lipotrope density (LD) ranking separately (Supplementary Tables 2, 3 and 4). Except betaine density, boiled vegetables tended to have high densities for all lipotropes. Processed cereals had high betaine density as well as processed legumes for choline, methionine, magnesium and folate densities. Due to their low caloric content (respectively 0.7 and 1.2 kcal/100 mL, Supplementary Table 1), brewed coffee and brewed tea ranked high for betaine, choline, magnesium, pantothenic acid and folate densities, often occupying first position. But while brewed ground coffee ranked first for niacin density, brewed tea ranked last with a 0-value density. Dry instant coffee also ranked quite high for betaine, choline, magnesium and niacin densities, but never before brewed coffee. Carbonated sodas were the only products that did not contain any of the B vitamins. Concerning potential available *myo*-inositol (PAI) density (data have been found for 21/65 products), orange juice, boiled green beans, brewed tea and lime juice ranked at least ~2-fold higher than other products while breads, dried and flaked coconut meat, and carbonated cola had a 0-value (Supplementary Table 4).

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When including PAI density to estimate mean ranking, boiled green beans, boiled cabbage and canned beetroot had all the highest rank (≤ 5.0) while carbonated cola and carbonated orange juice had the lowest (> 18.0) both being sugar-sweetened sodas; citrus fruit juices had a quite high mean ranking of 7.8-7.9/21 (Supplementary Table 4).

Concerning total phenolic compound (TPC) density, again, due to their very low caloric content, brewed coffee and tea had exceptionally high TPC densities of respectively 12638 and 8823 mg/100 kcal (Supplementary Table 5). Processed cereals and nuts had low densities with rankings beyond 25 and densities below 120 mg/100 kcal. Processed fruits were heterogeneously ranked within range 0 (carbonated orange juice) - 553 (prunes) mg/100 kcal. Apart from boiled carrot and sweet maize kernels, boiled vegetables had high TPC density above 196 mg/100 kcal while processed legumes ranked quite low with densities within the range 63-73 mg/100 kcal.

Concerning *myo*-inositol phosphates (IP), brewed coffee, spices and dried herbs, processed legumes, whole wheat bread, ready-to-eat breakfast cereals, oil-roasted cashew nut, brewed tea and dry-roasted pistachio nut had the highest density (> 40 mg/100 kcal) while processed vegetables, processed fruits and refined cereal products had the lowest (< 30 mg/100 kcal, Supplementary Table 4).

b. Rankings of lipotrope density sums. Coffee, either brewed or instant, had the highest of all total B vitamin densities (Supplementary Table 5), followed by most of processed vegetables, wholemeal processed cereals and peanut butter. When considering only processed PBF products for which PAI density could have been estimated, boiled cabbage ranked first and carbonated sodas last with a 0-value density (Supplementary Table 6). More generally, whole wheat bread, processed vegetables, brewed tea and citrus juices had high total B vitamin density.

Considering the sum of 7 lipotropes (that mainly reflected sum of betaine, choline, methionine and magnesium density due to the low density values for B vitamins), vegetables, brewed tea, brewed coffee, toasted wheat germ and cooked bulgur occupied first ranks

(Supplementary Table 5). Refined cereals and fruits tended to occupy last ranks. Ranking for the sum of 7 LD was also presented only for the products for which the PAI density could have been evaluated in order to allow comparing ranking before (total 7 LD, Supplementary Table 6) and after (total 8 LD, Supplementary Table 6) adding PAI density: canned beetroot, brewed tea, boiled green beans, canned common bean, boiled cabbage and whole wheat bread had then the highest densities.

Sum of the 4 main LD (acronym: BeChIMe density, *i.e.* sum of Betaine, Choline, *myo*-Inositol and Methionine) was also considered: while canned beetroot, boiled green beans, brewed tea, orange juice canned common bean, lime juice, boiled cabbage and whole wheat bread had the high densities (above 356.0 mg/100 kcal; Supplementary Table 6), highly processed and/or refined products had the lowest (below 89.0 mg/100 kcal; Supplementary Table 6).

Sum of 8 LD was finally considered: the range was very high between canned beetroot 817.2 mg/100 kcal) and carbonated cola (3.2 mg/100 kcal). Again, refined PBF products ranked low (Supplementary Table 6). In the end, concerning order of ranking, except lime, apple, grape and orange juices, catsup and wine, the other 15 products were ranked similarly before and after including PAI density. Except grape juice, all fruit juices and wine had higher ranking and total LD after including PAI density.

However, sum of 8 LD did not satisfactorily reflect the B-group vitamin densities. We therefore finally compared mean ranking of the 21 products based on ranks for either 7 or 8 LD (PAI included): except carbonated orange soda, all fruit products had better mean ranking after including PAI density while cereal products had all less well mean ranking; the order of ranking and mean rank were globally similar for other products before and after including PAI density (Supplementary Table 4).

Effect of processing without food group distinction

a. Effect of specific processes on main lipotrope densities and contents. Number of LD and lipotrope content on dwb that were decreased following specific processes (SP) were presented in

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Supplementary Tables 7, 8 and 9 for each lipotrope, TPC and IP density, PAI fraction being included (n = 8) or not (n = 7) depending on available literature data. Based on these ratios, the highest number of density or content decreases following SP (*i.e.* ≥5/7 or ≥6/8) were observed for white wheat flour, cooked white rice, cooked pasta, boiled common bean, pickles, boiled cabbage, oven-heated French fries, potato chips, catsup, canned condensed tomato soup, canned peach, canned pear, raisins (dried grape), prunes (dried plum) and carbonated orange soda. Except sauerkraut and wine and some other minor exceptions, decreased and increased densities were generally accompanied with respectively decreased and increased contents. Concerning sauerkraut, most of increased densities therefore resulted from lower caloric content upon cabbage fermentation, not from increased lipotrope contents that all decreased except that of niacin (Supplementary Table 8).

Results by process and lipotrope were as follows:

Thermal treatments with water

Cooking/Boiling

Boiling concerned roasted buckwheat groats, white rice, pasta, common bean, asparagus, broccoli, cabbage, carrot and spinach (Supplementary Tables 7 and 8). For convenience, results for vegetables were averaged in Supplementary Table 8 (detailed variations by vegetable were indicated in footnote "[b]"). Betaine contents were all importantly decreased (≤-18%) following boiling, maximum being reached for broccoli (-91%). Except white rice (-94%), choline contents tended to increase following boiling for all other products (from +3% for cabbage to +84% for broccoli). Boiling tended to have no marked effect on methionine contents. However, concerning vegetables, the mean increase of +13% masked an important heterogeneity of variations from -29% (broccoli) to +115% (spinach). Concerning PAI content, it decreased by 81% for cabbage. Except cooked white rice, magnesium content decreased (≤-13%) for roasted buckwheat groats, pasta, common bean, broccoli and cabbage. Concerning B-group vitamins, except for broccoli (+17%), boiling globally decreased niacin and pantothenic acid contents (≤-15%) or led to no marked changes, *i.e.* between -10% and +10%. No clear tendency was observed for folate content that either increased up to +163% for broccoli or decreased up to -56% for cabbage.

Canning

Canning concerned common bean, beetroot, peach and pear (Supplementary Tables 7, 8 and 9). Betaine content increased upon canning within range +7% (peach) - +53% (beetroot). While canning increased choline content by ~38-39% for common bean and beetroot, it decreased that of peach and pear by ~70%. Canning decreased methionine and magnesium contents from -23% (beetroot) to -70% (peach magnesium content). Except niacin content of pear (+28%) and pantothenic acid content of beetroot (+38%), canning decreased all B vitamin content from -30% (common bean pantothenic acid content) to -95% (peach pantothenic acid content). Canning was especially drastic towards folate content (decreases ≤-52%).

Thermal treatments without water

Cereal toasting

Toasting concerned wheat germ and French/Vienna bread (Supplementary Table 7). Effect of toasting was quite heterogeneous: it tended to decreased niacin, pantothenic acid, folates (except for toasted wheat germ) and betaine (except for toasted French/Vienna bread) contents and tended to increased methionine and magnesium contents. It has no marked effect on choline content.

Potato baking

Potato baking had no effect on choline, magnesium, niacin and pantothenic acid contents, decreased betaine and methionine contents (respectively -84 and -12%) and increased folate content by 17% (Supplementary Table 8).

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Fruit drying

Fruit drying concerned grape and plum that were dried into respectively raisin and prune (Supplementary Table 9). Drying had either no effect or decreased (≤ -17%) lipotrope contents, maximum decrease being reached for folate content of plum (-85%) and PAI content of grape (-75%).

Refining processes

Refining processes was considered with a broad perspective and included all processes that involve ingredient losses, be bran and/or germ (wheat milling and rice polishing, *i.e.* cooked brown rice *vs* cooked white rice), lipid (soybean flour defatting) or fibre (potato processing into oven-heated French fries and chips, transformation of raw peanut into butter and of fruits into juices and carbonated soda) fraction (Supplementary Tables 7, 8 and 9). From USDA (United State Department of Agriculture) data[1], we thus calculated that oven-heated French fries and potato chips had respectively -25 and -52% less fibre contents, canned tomato sauce, paste, soup and catsup respectively -37, -22, -68 and -95% less fibre contents, peanut butter -22% less fibre content, apple, grape and orange juices respectively -95, -87 and -89% less fibre contents, and carbonated orange soda had -100% less fibre content as compared with corresponding raw products (results not shown).

Cereal milling and polishing

Milling concerned whole-grain wheat flour transformation into white flour, and brown rice polishing evaluated from cooked brown *vs* cooked white rice (Supplementary Table 7). As expected, milling importantly decreased all lipotrope contents of whole-grain wheat flour, maximum decrease being reached for betaine (-98%). Concerning brown rice, except pantothenic acid content that slightly increased (+14%), polishing importantly decreased other lipotrope contents, maximum decrease being reached for niacin (-78%).

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Soybean defatting

Apart from folate content (-20%), defatting soybean flour importantly increased all lipotrope contents, maximum increase being reached for pantothenic acid (+147%) (Supplementary Table 7).

Potato processing

Except pantothenic acid content of chips (+205%) and niacin content of oven-heated French fries (no change), potato processing into these 2 products decreased all other lipotrope contents (≤-11%), maximum being reached for betaine content of chips (-96%) (Supplementary Table 8).

Tomato processing

All tomato products processed from raw tomato had their methionine (≤-19%), magnesium (≤-21%) and folate (≤-70%) contents markedly decreased (Supplementary Table 8). Except catsup (-51%), betaine content increased for other 3 products (≥20%) up to +1790% for canned condensed tomato soup. Except canned tomato paste (+21%), choline content decreased for other 3 products (≤-19%) up to -62% for catsup. Tomato processing tended to decrease niacin and pantothenic acid contents except for canned tomato sauce pantothenic acid and canned tomato paste niacin contents. In the end, PAI contents were very highly reduced for both catsup and canned condensed tomato soup (≤-86%).

Interestingly, when considering all canned tomato processed products (*i.e.* catsup not included) and other previously mentioned canned products (commom bean, beetroot, peach and pear), canning always markedly increased betaine content from +7% for canned peach to +1790% for canned condensed tomato soup (median of +45%, result not shown).

Peanut butter

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Transformation of raw peanut into butter had heterogeneous effect on lipotrope content with maximum decrease for folate content (-67%) and maximum increase for betaine content (+27%) (Supplementary Table 7).

Fruit juices

Transformation of apple, grape and orange into juices importantly increased betaine content from +43% (apple) to +250% (grape) (Supplementary Table 9). Effect on other lipotrope contents was rather heterogeneous with both decreases (up to -100% for apple folate content) and increases (up to +90% for grape folate content). Concerning PAI, juicing increased its content by ~23% for all 3 fruits.

Carbonated orange soda

Transformation of orange into carbonated soda was the most drastic refining process with total disappearance of B-group vitamins and methionine, and decreases ≤-67% for other lipotrope contents, PAI included (Supplementary Table 9).

Fermentations

Fermentation concerned different food groups such as cereals (barley malted into beer, whole-grain wheat and white wheat flours into breads), vegetable (cabbage into sauerkraut and cucumber into pickles), and fruit (grape into wine):

Fermented beverages

Barley malted flour fermentation importantly increased choline (+215%) and folate (+122%) contents with almost no effect on magnesium, niacin and pantothenic acid contents (Supplementary Table 7). Considering sum of lipotropes, they were all markedly increased by 54% for sum of betaine-choline-methionine contents (means), 40% for sum of B vitamin contents (means) and 39%

for sum of 7 lipotrope contents (means) (results not shown). Concerning fermentation of grape into wine, it increased betaine, choline, magnesium, niacin and pantothenic acid contents with marked effect for betaine (+1697%) and magnesium (+130%) (Supplementary Table 9). As for beer, methionine almost completely disappeared (-94%). Conversely, PAI content increased by +573%.

Bread baking

Baking increased betaine, choline and folate contents (up to +2516% for white wheat bread betaine content) (Supplementary Table 7). Concerning other lipotropes, except magnesium for white bread (+44%) and pantothenic acid for whole wheat bread (-21%), baking had no marked effect on their contents.

Cabbage fermentation

Fermentation of cabbage into sauerkraut decreased all lipotrope contents (≤ -17%) except that of niacin (+24%) (Supplementary Table 8).

Pickling

Pickles had all their lipotrope contents reduced from -64% for magnesium to -100% for betaine (Supplementary Table 8).

Other specific processes

Nixtamalization

Nixtamalisation (soaking and cooking in alkaline solution, generally limewater) of whole-grain cornmeal markedly decreased betaine and choline contents (≤ -81%) (Supplementary Table 7). Except pantothenic acid content (+53%), nixtamalization had no marked effect on other lipotrope contents.

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Soybean processing

Transformation of raw soybean seed into tofu and milk importantly increased betaine (means of +607%) and choline (means of +54%) contents (Supplementary Table 8). Concerning magnesium and B vitamins, tofu and soybean milk had their magnesium and folate contents both decreased while niacin content increased by ~+33% (means).

b. Effect of processes on total phenolic compound densities and contents. Overall un-specific processing (OP) increased TPC mean rank by +12% ($p < 0.05$; +11.7 ranks) emphasizing a reduced TPC density (see Table 1, left-hand part, main manuscript). Total phenolic compound contents were available for 27 pairs of raw *vs* processed products (Supplementary Tables 7, 8 and 9). All pairs were first considered as a whole: processing increased mean rank of TPC density by +18% ($p < 0.05$, +9.6 ranks; Table 1, right-hand part, main manuscript). When clustering raw and processed products within Thermal, Fermentative and Refining processes, there was no significant effect on TPC densities, limit of significance being reached for TPC density for thermal treatment with water ($p = 0.074$, Table 4 in main manuscript).

More specifically, processing lead to decreased TPC density in 21 products (*i.e.* 78%) which corresponded to a median change of -44% ($p < 0.05$, Table 4 in main manuscript). Except wine, fermentation tended to increase TPC densities (median of +81%, Table 4 in main manuscript). Except asparagus (increased density of +60%, result not shown), boiling, canning and drying importantly reduced TPC densities as for transformation of fruits into juices (Supplementary Tables 7-9). Conversely, transformation of tomato into canned sauce and canned condensed soup increased TPC density while catsup had its density severely reduced.

On dwb, thermal treatments and refining reduced TPC contents (medians of respectively -46 and -50%; Table 4 in main manuscript) while fermentations increased it (median of +83%; Table 4 in main manuscript); and processing globally decreased TPC content (median of -41%; Table 4 in main manuscript).

Adding now TPC density to those of the 8 LD, OP and SP increased by respectively +26 and +31% mean ranks of 8 lipotropes +TPC densities ($p < 0.05$, Table 1, respectively left- and right-hand parts).

c. Effect of processes on *myo*-inositol phosphate densities and contents. Overall un-specific processing (OP) increased mean IP density rank by +6% for IP (+4.3 ranks) but effect was not significant (Table 1, left-hand part, in main manuscript). *Myo*-inositol phosphate contents were available for 16 pairs of raw *vs* processed products (Supplementary Tables 7 and 8). All pairs were first considered as a whole: processing increased mean rank of IP density by +4% (NS; Table 1, right-hand part, in main manuscript). When clustering processes within Thermal, Fermentative and Refining processes, there was no significant effect on IP densities (Table 4 in main manuscript).

Since IP content of orange soda was 0, decrease was 100% although initial IP content of orange was not available. Including orange soda, processing lead to decreased IP density for 11 products (*i.e.* 11/17 = 65%), *i.e.* baking, nixtamalization, milling, common bean boiling and canning, soybean processing into tofu and milk, beetroot canning, potato chips processing and orange soda production (Supplementary Tables 7 and 8). However, when considering extent of these decreases, effect was not marked (median = -7%, Table 4 in main manuscript).

On dwb, thermal treatments had no marked effect on IP content (median = -5%, Table 4 in main manuscript). However, while refining tended to increase IP content (median = +32%, Table 4 in main manuscript), fermentative treatments tended to decreased it (median = -27%, Table 4 in main manuscript).

Effect of processing by food group

a. Effect of overall un-specific processing on total phenolic compound density

Concerning TPC density, OP increased mean rank of other food groups as follows: L (+50%, NS) > F (+39%, $p < 0.05$) > N (+24%, NS) > V (+3%, NS) (Table 5 in main manuscript). Processed C group had better mean ranking than raw C group, but effect was not significant. Finally, when considering sum of 8 lipotrope +TPC densities, processing increased mean ranking as follows: F (+39%, $p < 0.05$) > C (+34%, NS) > V (+18%, NS).

b. Effect of processing on cereal and legume *myo*-inositol phosphate density profiles. Processed cereal products had clearly mean different IP density percentage profile than raw cereal products (Supplementary Table 10). Percentage of IP6 (phytate) decreased 2-fold from around 61 to 35% while those of IP5-IP2 increased in a range of 2-4 folds (notably, IP4-IP1 were all within range 10.6-13.8%). These percentages were probably slightly overestimated since no mean value could have been calculated for free *myo*-inositol in processed products due to lack of data. Concerning legumes, data were still scarcer than for cereals; however, if we considered only common bean for which a high number of data has been collected [2], boiling and canning led to IP6 percentage decrease at the advantage of IP5-IP3 (no data were found for IP2-IP1): IP6 decreased from 76 to 70% and IP5 increased of ~7%, IP4 of 4% and IP3 of 0.5%. Changes nevertheless remained less important than for processed cereal products reflecting a less marked IP6 degradation.

Expanded Discussion

Lipotrope density of processed plant-based foods

First, mean ranking of processed PBF for 7 or 8 LD showed that minimally refined and/or whole-grain PBF products (*e.g.* canned beetroot, boiled cabbage, boiled green beans, whole wheat bread, cooked bulgur, canned common bean and orange juice) and citrus juices tended to have higher LD and lipotropic capacity (LC) than energy-dense and/or highly refined PBF products and non-citrus fruit juices (*e.g.* potato chips and oven-heated French fries, catsup, dried flaked coconut meat, carbonated sodas, white wheat breads, dry-roasted pistachio nut and grape juice). Such a dichotomy was confirmed by multivariate analyses, *i.e.* PCA and HC. Some exceptions were grape and apple juice, wines and raisins that had relatively low LD. Indeed, raw apple and grape have initially very low LD with LC of respectively 14 and 7%.[2] In addition, except betaine density, boiled vegetables exhibited high LD as it was the case for their raw counterparts.[2] Therefore, among processed PBF, boiled vegetables remain high sources of lipotropes relative to calories supplied despite lipotrope losses upon boiling (see below). The low caloric content of processed vegetables explains why they exhibited higher choline, methionine and magnesium densities than other recognized plant sources for these compounds like cereals and legumes.

Brewed beverages that are tea and coffee also exhibited a high mean ranking. However, despite relatively high lipotrope contents, notably relative to dry matter, this has to be attributed first to their very low caloric content of ~1 kcal/100 mL. In the end, the generally low ranking of processed fruit and nut products deserves more precise explanations. For nut products, despite an initial mean high lipotrope content of ~417 mg/100 g of food (PAI content excluded, calculated from Table 1 in Supplementary Materials, n = 5 products), their very high mean caloric content of ~600 kcal/100 g (calculated from Table 1, Supplementary Materials), notably as a result of a mean high lipid content (~50 g/100 g)[1], importantly accounted for their low LD. Concerning fruits, they are dried fruits, canned pear and peach, fruit juices and wines with a mean caloric content of 137 kcal/100 g (calculated from Table 1 in Supplementary Materials, n = 14 products) that result from higher sugar content (means of ~29 g/100 g) than raw fruits (~9 g/100 g)[1] and processed vegetables (11 g/100 g), especially boiled vegetables (5 g/100 g)[1]; but also due to the high alcohol content of wine (around 10.5 g/100 g).[1] Thus, their relatively low mean LD results from both the initial low lipotrope content of raw fruits (~91 mg/100 g of food)[2] and a high energy content. However, daily consumption of dried fruits, processed nuts and seeds is generally quite low as illustrated with the standard French diet, *i.e.* 2.7 g.[3] Thus, a serving size-based expression would be therefore more appropriate for such products that may supply relevant amounts of lipotropes without too much calories when consumed moderately (means for dried fruit content is ~100 mg lipotropes/100 g of food, n = 5 dried fruits; calculated from Table 1 in Supplementary Materials).

Among processed fruits, citrus juices (*i.e.* derived from lime and orange) have to be considered apart, their high PAI density accounting for their relatively good mean ranking. Boiled green beans and canned common bean had also a high PAI density. These values were not surprising as regards with the high free *myo*-inositol (means of 21.7 mg/100 g of food[4-6]) and galactinol (means of 45.3 mg/100 g of food[4,7]) contents found in dry mature common bean seed, and with the initial high free *myo*-inositol contents of citrus fruits (range of 0.7 - 6.7% total sugars), derived juices having generally contents above 1 g/L[8,9].

Otherwise, some processed PBF were characterized by a high betaine density: they are canned beetroot, toasted wheat germ, boiled spinach, brewed tea and cooked bulgur, and to a lesser extent baked sweet potato, brewed coffee and several cereal products like breads, boiled pasta, ready-to-eat breakfast cereals and beer. Low caloric content accounted for the high but un-realistic betaine density of brewed tea, notably as regards with its daily consumption. Indeed, to reach a density of 143.4 mg/100 kcal would mean to consume ~8.3 L of tea; now, considering the French population (aged 18-79), daily tea consumption does not exceed 130 mL[10], which corresponds to 2.2 mg of betaine. The same is true for brewed coffee. Ideally, as for dried fruits, nuts and seeds, the lipotrope content of tea and coffee should be therefore expressed on a serving size-basis. For this reason, both beverages have been removed from statistical analyses to study effect of processing. Other products are derived from *Gramineae* (cereals) and *Chenopodiaceae* (beetroot and spinach) families known as betaine accumulators, notably in response to salt-, water- and temperature-stressed environments[11-17], betaine being both an osmolyte regulating osmotic pressure within plant cells[18] and a thermoprotectant for the plant.[19] Among processed cereals, toasted wheat germ had the highest betaine density. Wheat germ is indeed known to concentrate a high phytonutrient density[20], notably betaine.[21] The high ranking of pasta, breads and breakfast cereals for betaine density agrees with results of Bruce *et al.* who observed high betaine contents in these processed cereal products, notably for whole-grain products.[22] The 2-fold higher betaine content of whole wheat bread compared to white wheat bread (61 *vs* 30 mg/100 g; Supplementary Table 1) was also reported by Bruce *et al.* on 5 whole-grain (means of 73 mg/100 g) and 6 white (means of 41 mg/100 g) breads.[22]

Effect of processing on lipotropic micronutrient densities and contents

Magnesium

Magnesium is a mineral and as such cannot be synthesized upon processing unless adding ingredients. Losses were therefore expected in most cases, notably for thermal treatments and refining, or at least no change. Indeed, OP and SP significantly decreased magnesium density and median for density changes was -18% for the 41 pairs of raw *vs* processed products.

Concerning thermal treatments, as expected, dry treatments (baking, drying and toasting) had no effect on magnesium content. The apparent increased content in wheat germ upon toasting may be only due to magnesium content variability of initial wheat germ, coming from wheat variety, growing location and/or degree of refining. Again, as expected, in presence of water, thermal treatments led to magnesium losses resulting from release into boiling water; losses were higher following canning than boiling. Since magnesium is concentrated within bran fraction of cereals, the increased content in white rice following cooking was also a result of content variability of the initial white rice (*e.g.* due to different degree of polishing). More specifically, magnesium losses in cooked pasta (-19%) was closed to the 10-12% losses reported in various cooked pasta products.[23] As calculated in this study for boiled common bean, magnesium losses upon boiling have also been observed for legumes like cowpea, horse gram, moth bean, mung bean and soybean seeds.[24] Concerning vegetables, magnesium losses upon boiling were also reported, as for leafy vegetables (*i.e.* spinach, Chinese cabbage and cabbage) that registered ~40-50% magnesium losses[25] and for boiled broccoli, cauliflower and red potato.[26] Upon canning, our calculated magnesium losses were of -23, -26, -70 and -52% for respectively beetroot, common bean, peach and pear, and were higher than those reported for canned asparagus (-9%), whole peeled tomato (-4%), mushrooms (-23%) and lentils (no losses)[27] and closer to those found for leafy vegetables (~40-50%)[25], suggesting a possible PBF matrix and/or canning condition-depending effect.

Refining processes also generally led to decreased magnesium contents, but to an extent higher than boiling and canning (median = -33% *vs* -19%). Increased contents in grape and orange juice probably resulted from magnesium concentration into juices upon process. For apple juice, the reduced content may derive from comparison with raw apple with skin or from juice type variability: thus, by taking as raw product apple without skin, magnesium reduction was only -17%; and by taking apple juice from concentrate instead of pure juice, magnesium content increased by +18%.[1] As expected, magnesium being mainly concentrated in cereal bran fraction, refining lead to 84 and 76% magnesium losses for respectively wheat flour (whole-grain *vs* white) and rice (cooked brown *vs* cooked white) in agreement with previously reported value of -83% for white flour.[28]

Concerning fermentation, the increased magnesium contents in wine (+130%) and white wheat bread (+44%) suggested magnesium supply by microflora. Indeed, baker's yeast contains 98 mg magnesium/100 g.[1] Based on the same calculations that those realized for betaine and choline, we roughly estimated that yeast may enriched initial white wheat flour by +84% which supports the hypothesis of magnesium supply by microflora during white bread baking. The enrichment for whole wheat bread was of only +14% which was not so distinct from the -10% calculated held account natural magnesium content variability of initial whole-grain wheat flour. Besides the role of yeast, the 130% increase in wine may also be due to magnesium content variability of grape and wine. For example, based on the mean magnesium content of the 9 wine types given by USDA[1] and on 7 mg/100 g magnesium content of grape (Supplementary Table 1), the increase fall down to +114%; and based on Afssa-Ciqual data from 10 wine types and 2 grape varieties (white and black)[29], the calculated increase was only +56%. Finally, as observed for grape juice (+75%), concentration of magnesium into juice may also accounted for high increase content in wine.

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B-group vitamins

All B-group vitamins considered in this study are hydrosoluble and may be degraded by increased temperatures. They all include both bound and free fractions within food matrix[30-32]. These properties are essential in the attempt to understand the different changes calculated:

Niacin (vitamin B3)

Of the 3 B-group vitamin densities for processed PBF, niacin had the highest values within range of 0 (sodas) - 10.81 (dry instant coffee) mg/100 kcal (brewed coffee excluded). Overall (OP) and specific (SP) processing decreased niacin density, effect being significant only for SP. Based on the 41 pairs of raw *vs* processed products, range of medians found for both density and content changes suggested that niacin would be apparently the least affected of all B-group vitamin (*e.g.* concerning content changes, medians = -13% *vs* -25% for pantothenic acid and *vs* -33% for folates, Table 4 in main manuscript). Among treatments, always based on medians, refining (-20%) and thermal (-25%) treatments would be largely more damaging than fermentations (+6%).

Concerning thermal treatments, those without water appeared less drastic (median = -10%) compared to canning and boiling (median = -31%). Changes observed for toasted, baked and dried products support sensitivity of niacin to enhanced temperatures. The absence of effect in baked potato remains however unexplained. For boiling, niacin vegetables losses were heterogeneous with almost no effect for asparagus, cabbage and carrot. Losses upon canning for beetroot and common bean were supported by important losses observed in canned tomato sauce, paste and condensed soup. However, increased content in canned pear may be due that this USDA food item includes both solids and liquid[1] contrary to other drained canned products: thus, in canned pear, bound niacin might have been freed and released in liquids without being drained thus increasing its content. Thus, an initial bound niacin fraction may have escaped analysis. Indeed, although the microbial analysis (AOAC method 944.13) used by USDA[1] was the official method for determining niacin in foods, its selectivity towards “complex samples where the matrices components could interfere with the growth of the *Lactobacillus plantarum*” have been reported to be limited compared *e.g.* to premixes[33].

From USDA data as well, losses have been also calculated for cooked and canned green peas, beans, tomatoes, spinach and peaches.[34] And niacin retention was shown to be almost 2-fold higher in steamed than in boiled blackeyed peas.[35] Otherwise, our 30% niacin loss for common bean upon boiling was closed to the 35% reported for pea.[36] In cooked pasta, our 44% losses were closed to the 35-42% range observed for various cooked pasta products (*i.e.* spaghetti, noodles and macaroni).[37] Otherwise, differently to our values of -49 and +8% niacin content changes for respectively boiled broccoli and carrot, losses of ~22% has been reported for broccoli and of almost 100% for carrot upon blanching[38]; however, more generally, same authors reported losses of around 30 and 40% for respectively root and leafy vegetables.[38] Others have calculated a 9% niacin content loss for boiled peeled carrots, a value more similar to ours.[36] Discrepancies between vegetable families are not unexpected since several factors may vary as boiling time, variety, bound niacin percentage compared to free fraction, food structure and/or peeling or not.

Concerning refining processes, removal of bran fraction upon milling, either in rice (cooked brown *vs* white/polished) or in wheat (wholegrain *vs* white wheat flours) has lead to niacin losses of respectively 78 and 80%. Similarly, 70% niacin loss has been reported in wholemeal wheat *vs* white flour[28] and 80% in wheat grain *vs* white flour.[39] Transformation of fruits into juices was less damaging for niacin with +31% and +71% increase for respectively apple and grape juices (only orange juice was affected, *i.e.* -32%), probably because juicing essentially leads to fibre fraction removal as it can be estimated from USDA data for fruits and corresponding juices[1], hydrosoluble niacin being very likely to be finally extracted from fruit and concentrated within juice. As for baked potato (+10%), the 0-value (or absence of effect) calculated for oven-heated French fries was more surprising due to degradability of niacin against high temperature which is the case for this product cooked in oven. French fries are generally cooked with refined industrial oil devoided of niacin[1] as illustrated by their 13% fat content (dwb) compared to the 0.4% for raw potato with skin[1]. Thus, oil could not have contributed to counteract niacin losses *via* heating. From USDA data for niacin contents of raw and baked white and red potato with skin, increased niacin contents of respectively +7 and +13% were also calculated confirming the non-degradability of niacin following oven cooking.[1]

Concerning fermentations, effects were quite heterogeneous with no change, (breads and beer), increased content (sauerkraut and wine) and drastic reduction in pickles. However, increased niacin content upon fermentation is not unusual. For example, increased niacin contents of 22 to 30% according to temperature used have been measured in *rabadi*, a traditional fermented product from pearl millet[40]; and niacin content dramatically increased following *tempeh* fermentation of cowpeas and soybeans upon 65 hours.[41] Others reported an average +221% increased niacin content upon white wheat flour baking.[39] Increased in other B-group vitamin contents were reported as well, *e.g.* for thiamine (vitamin B1) and riboflavine (vitamin B2) in *idli* - a product prepared from fermented milled rice and dehusked black gram[42] -, in traditional fermented cereals[43] and in breads.[44] Release of free niacin from bound fraction by microflora and modification of fibre interactions with vitamins are among mechanisms involved.[43]

Pantothenic acid (vitamin B5)

Pantothenic acid densities were intermediary between that of niacin and folates within range of 0 (sodas) to 3.026 (boiled cauliflower) mg/100 kcal. Overall (OP) and specific (SP) processing significantly decreased pantothenic acid density (median for global content change = -25%, Table 4 in main manuscript) in a range intermediate between those of niacin and folates. Among treatments, thermal processes tended to be the most drastic with a median at -28% *vs* -15% (refining) and *vs* -17% (fermentation).

Concerning thermal treatments without water, profile of content changes was similar to that of niacin but changes were more drastic emphasizing sensitivity to increased temperature more marked for pantothenic acid. As for niacin baked potato had its pantothenic acid content almost not affected. And also as niacin, pantothenic acid appears prone to be released in water as seen from boiled and canned products except for cooked roasted buckwheat groats (+9%), canned beetroot (+38%) and boiled broccoli (+17%); but increases were moderate and may simply result from raw product pantothenic acid content variability or release of free pantothenic acid from a bound fraction that would have initially escaped microbial analysis (AOAC method 945.74 or 992.07 was used by USDA[1]). Changes in pantothenic acid content for boiled vegetables were in a range similar to those reported for root and leafy vegetables, *i.e.* around 30%.[38] Losses of 33, 1 and 41, and 23% have been reported for boiled legume products, *i.e.* respectively cow peas, green and red lentils, and green/yellow peas[45], values not too remote from ours (-25% for boiled common bean). Pantothenic acid losses were also observed following blackeyed peas boiling.[35] In pasta, loss of 38% was calculated, which is within the range of 27-44% reported for various cooked pasta products (*i.e.* spaghetti, noodles and macaroni).[37]

Concerning refining, whole-grain wheat flour had lost 75% pantothenic acid, a value higher than that previously estimated from wheat grain and white flour, *i.e.* 57%.[39] Contrary to wheat flour, cooked white rice had slightly higher pantothenic acid content than cooked brown rice (+14%). As regards with the reported 26% lower pantothenic acid determination in ready-to-eat white rice compared to ready-to-eat brown rice - with radioimmunoassay procedure including enzyme-digestion step to free bound fraction[31], one explanation for USDA data might be under-estimation of real pantothenic acid content of cooked brown rice by the microbiological AOAC method (see niacin).[1] Otherwise, we have no explanation for the very high pantothenic acid content in potato chips given by USDA database (4.35 mg/100 g of food) and that gave a +205% increased content compared to raw potato (0.29 mg/100 g of food).[1] Fruit juicing modified pantothenic acid contents similarly to what occurred for niacin contents but to lesser degree.

Concerning fermentations, contrary to niacin, pantothenic acid content did not really tended to be increased (median = -17%). Increased content in white bread (+14%) may be due to supply by baker's yeast that may contain up to 11.3 mg pantothenic acid/100 g[1] and agreed with a previously reported value of +18%.[39] Increased contents were also reported during *tempeh* fermentation of cowpeas and soybeans[41] and upon a 96 h-lactic acid fermentation of cornmeal.[46] As for niacin (+30%), wine had higher pantothenic acid content than grape (+12%) that may result from the yeast type used.

Finally, some of our calculated pantothenic acid density values can be compared to those of 57 PBF in a ready-to-eat state given by Walsh *et al*.[31] Ten of our processed PBF selected from the USDA Choline & Betaine database[47] were common with their products. While closed density values were found for baked potato (0.44 *vs* 0.44 mg/100 kcal), orange juice (0.40 *vs* 0.39), cooked white rice (0.24 *vs* 0.31), cooked pasta (0.08 *vs* 0.08) and ready-to-eat breakfast cereals (0.12 *vs* 0.16 for 12 *vs* 22 brands), important differences were found for other products, *i.e.* 0.94 *vs* 0.18 mg/100 kcal for canned tomato paste, 0.32 *vs* 0.67 for wheat germ, 0.28 *vs* 1.00 for canned tomato sauce, 0.12 *vs* 0.80 for potato chips and 0.03 *vs* 0.37 for pickles. However, variability in density values may be due to variability in water contents for canned tomato pastes and sauces, in extraction process for wheat germs, and in caloric content for potato chips depending on fat content.

Folates (vitamin B9)

Folate densities in processed PBF were the lowest of all B-group vitamin densities within range of 0 (sodas, apple juice, tomato soup and dry instant coffee) - 0.747 (boiled asparagus) mg/100 kcal. Overall (OP) and specific (SP) processing significantly decreased folate density that appeared as the most affected of all B-group vitamins (median for global content change = -33%, Table 4 in main manuscript). Among treatments, refining processes tended to be the most drastic with a median at -54% *vs* -21% (thermal treatments) and *vs* -1% (fermentation). As for other B-group vitamins, median for content changes upon thermal treatments was between -20 and -30% (see Table 4 in main manuscript).

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Evolution of folate content upon thermal treatments appeared quite heterogeneous. The only constant result was that canning was drastic towards folate content (losses > -50%). This was confirmed when looking at canned tomato products (losses ≥ -70%). Otherwise, as for other B-group vitamins, drying led to folate losses for both grape and plum. Important degradation of B-group vitamins following fruit drying while baking potato has no effect remains unclear. Indeed, literature data reported oxidation of folates upon intense heating without water (140°C in thermostated oil bath) as shown with broccoli[48] and leaching of folates into water following broccoli, spinach, asparagus and cabbage boiling.[49-51] Our data showed increased folate content in boiled asparagus (+163%) and broccoli (+26%) which was quite unlikely and may be based on that raw and boiled products given by USDA databases have different origin. However, increased folate contents or no change were reported following carrot, broccoli and tomato blanching (10 min in boiling water, *i.e.* 100°C).[48] In these studies, raw and boiled vegetables generally came from similar source making comparisons probably more relevant. However, our estimated folate losses for other vegetables were in a range roughly similar to that reported for root (-50%) and leafy (-20 to -40%) vegetables.[38] As for boiled common beans (-14% losses), folate losses were also observed following boiling of a legume product that is blackeyed peas.[35] In pasta, higher range (21-23%) than ours (-10%) have been reported for cooked pasta products (*i.e.* spaghetti, noodles and macaroni).[37]

Except grape (+90%) and orange (+10%) juices, refining importantly decreased all folate contents (median = -54%) more than for niacin and pantothenic acid: whether it means that bound fraction of folate was more easily converted to free folate remains to be determined. Our wheat flour folate content change upon milling value was 2-fold less than previously reported values of -61%[28] and -77%.[39] Similarly to what occurred with niacin and pantothenic acid, orange juice differed from grape and apple juices as regards with folate evolution from raw fruits into juices, *i.e.* no marked change. More generally, except betaine, lipotrope changes for fruit juices were never homogeneous: probably this resulted from the combined effect of very different conditions of juice processing and raw product variability.

Upon fermentation, the 3 cereal products had their folate content increased (*e.g.* +63% for whole wheat bread and +19% for white wheat bread). Based on folate content of baker's yeast (2.34 mg/100 g, USDA[1] and on a common bread recipe, we evaluated a possible potential increase in folate by more than 100% for white wheat flour upon baking considering no heat destruction (and ~+80% for whole wheat bread). Increased folate content was also previously reported for white bread (~+260%).[39] Otherwise, literature showed that folate content may be increased upon fermentation of germinated rye[52] and cornmeal.[46] Folate increase has probably to be ascribed to folate synthesis by baker's yeast as reported with baked and sourdough rye and wheat breads.[53] *Saccharomices cerevisiae* would mostly contribute to newly formed folates.[53] Decreased folate contents in sauerkraut and pickles emphasized that B-group vitamins appear sensitive to acidic fermentations.

Effect of processing on density of other potentially lipotropic compound

Plant-based foods may contain an important package of lipotropic compounds.[54] Among them, based on availability of literature data, we have selected TPC, then IP since being able to release free *myo*-inositol. Then, we have considered acetate and resistant starch, two compounds that have lipotropic effect in animal models of fatty liver[54] and whose concentration may be increased upon processing.

a. Total phenolic compounds. Total phenolic compounds correspond to the easily extractable polyphenol fraction that is analysed by the colorimetric Folin-Ciocalteu's method. This fraction, although below the real fraction released within small intestine as shown with cereal products[55], appears the most nutritionally relevant since potentially readily available for absorption.[2,54] The 4 classes of polyphenols contained in this fraction, *i.e.* phenolic acids, flavonoids, lignans and stilbenes, were all reported to be lipotropic in animal models.[54]

Overall (OP) and specific (SP) processes significantly decreased TPC density. However, when considering process types and food groups, fermentation tended to increase TPC content (median = +83%) contrary to thermal (-46%) and refining (-50%) treatments.

Considering thermal treatments, again, unexpected severity of drying was confirmed. In presence of water, thermal treatments (cooking/boiling, canning and blanching) would increase polyphenols extractability.[34] Polyphenols may be also oxidized during storage, appear sensitive to increased temperature and are susceptible to be partly released and leached into water upon boiling and canning as it has been recently reviewed for various canned fruits and vegetables.[34] Except boiled asparagus and canned beetroot, our data would tend to confirm these conclusions. Concerning beetroot, Jiratanan *et al.* showed an increased TPC content (fresh weight-basis) upon a long canning time of 45 min and high temperature of 125°C.[56] However, they also reported significant decrease of TPC content for green beans in the same conditions.[56] A 38-44% TPC content decrease was reported for peeled canned peach on a fresh weight-basis[57] while we calculated a TPC content reduction by -86% on dwb and -75% on fresh weight-basis. Our decreased TPC contents upon common bean boiling or canning are in agreement with previously reported data for boiled[58,59] or boiled/drained[60] common beans, and for boiled or pressure boiled peas, chickpea and lentil.[61] Heat treatments without water in the range 40-100 °C for 30 min was otherwise shown to reduce TPC content of fermented black soybeans by ~-40%.[62] Finally, if thermal treatments in presence of water may enhance polyphenol extractability, and therefore increase TPC content, a significant fraction appears released into cooking water.

Except peanut butter and canned tomato paste, refining processes decreased TPC densities; probably resulting from fibre losses, polyphenols being generally associated to PBF fibre fraction.[63,64]

Fermented cereal products that are beer and whole wheat bread had largely higher TPC content than raw products. Significant increased TPC contents have also been reported for fermented cereals or pseudo-cereals like buckwheat, barley, wheat and rye, either with

Lactobacillus rhamnosus or *Saccharomyces cerevisiae*.[65] Total phenolic compound content was however slightly reduced in wines by 6% following grape fermentation. Reduction in TPC content was reported in fermented pearled millet[66], tea[67] and ground dehulled black-gram.[68] Effect of fermentation therefore appears ambivalent by being able to release polyphenols from the bound fraction but also to degrade them. Thus, the balance between release of free polyphenols from bound fraction and their microbial degradation would be either positive or negative, probably depending on food matrix.

b. *Myo*-inositol phosphates. *Myo*-inositol phosphate (IP) fraction was also analyzed since potentially able to supply free *myo*-inositol within organism *via* dephosphorylation by phytase of either botanical or human origin[69-71]. Concerning phytic acid (IP6), its lipotropic effect was clearly shown in rats.[72] In human nutrition, phytic acid may be degraded into lower IP and free *myo*-inositol during processing[73] and possibly during digestion due to intestinal phytases.[71] Nevertheless, human phytases have a limited ability to degrade *myo*-inositol phosphates compared to rats[70] and IP degraded within small intestine does not apparently reach the level of free *myo*-inositol.[74] The potential lipotropic effect of IP in humans therefore remains to be demonstrated but there is undoubtedly potentiality for free *myo*-inositol small fraction being released within small intestine and possibly greater fraction within colon.

Overall (OP) and specific (SP) processing tended to decreased IP density but effects were not significant. For SP, the median of -7% for all 17 paired products masked the high heterogeneity of content changes.

Thus, canning of legumes and vegetables reduced IP contents by 7% for common bean and by 21% for beetroot, probably as a result of IP dephosphorylation as shown in different bean varieties.[75] Indeed, IP profiles of raw and cooked common beans clearly showed that IP6 is degraded into lower IP, especially IP5 and IP4, upon boiling and canning (Table 5). Phytic acid content of pea, chickpea and lentil was also shown to be significantly reduced upon normal or pressure boiling.[61] Concerning refining, except white wheat flour and orange soda, calculated increased IP contents remain unclear and quite difficult to explain. Baking wheat flours decreased IP content reflecting a degradation of phytic acid/IP6 into lower IP and free *myo*-inositol by both endogenous and microbial phytases.[71] Indeed, phytate (IP6) dephosphorylation/degradation has been reported in sourdough bread[76], in fermented bread dough made of whole-grain wheat flour and wheat bran for which a 62% IP6 degradation was observed while IP1 increased from 0 to 25% of total inositol[77] and in *idli*, a fermented product prepared from milled rice and dehulled black gram.[42] Our results also showed that breads had largely lower IP6 percentage than raw wheat flour.

From our nutritional perspective, *i.e.* the lipotrope potential of PBF, the transformation of phytate into free *myo*-inositol might be a technological objective, especially for grain-type food products generally rich in IP such as whole-grain cereals, legumes, nuts and seeds as it has been demonstrated for whole barley kernels submitted to hydrothermal processes.[73]

c. Acetate in fermented plant-based foods. The lipotropic effect of acetate has been recently demonstrated in high-fat-fed mice.[78] Mechanisms would be notably an increased expression of genes involved in fatty acid oxidation and thermogenesis-related proteins.[78] Interestingly, some processed PBF contain acetic acid as observed in red/white wine[5], pickles[79], fruit juices (volatile compound)[80], roasted coffee[81] and tea.[82] The issue would be whether daily acetate consumption in humans would be high enough to allow relevant contribution to the overall lipotropic effect. For example, 174-178 mg acetate/100 g (dwb) was reported in roasted coffee extracts for robusta.[81] Brewed coffee is around 99.4% water[1], that corresponds to ~1.04-1.07 mg acetate/100 mL of coffee. Based on a daily consumption of 178 mL (USDA serving size)[1], acetate daily consumption *via* brewed coffee would be of ~1.9 mg. In the study of Kondo *et al.* 0.3 and 1.5% acetate solution (10 mL/kg body weight)[78] were used, that would correspond to ~0.25 mL solution for a mice that weights 25 g, *i.e.* 0.0038 mL acetate with a 1.5% solution. It would be therefore particularly interesting to evaluate daily human consumption in acetate, notably in high coffee drinkers. On a body weight-basis, this would apparently exceed effective doses used in mice by Kondo *et al*.[78] In addition, fibre produces acetate within colon upon fermentation and might also indirectly add to its lipotropic effect.

d. Resistant starch in processed starchy plant-based foods. Resistant starch is the starch fraction that resists small intestine digestion to be fermented within colon.[83] It has been shown to exert lipotropic effect, *i.e.* reduced hepatic triglyceride content, in normal[84] and hypercholesterolemic[85] rats. In addition to yield acetate, some processes may also increase resistant starch content of starchy PBF, *i.e.* mainly cereals and legumes, notably by favouring starch retrogradation during and/or following thermal treatments. For example, resistant starch content in *adzuki* bean increased from 0.53 to 2.90 g/100 g (dwb) following 90 min boiling.[86] The lack of literature data did not allow us including resistant starch content of PBF in our calculations, notably for the LC. Resistant starch content of several processed PBF has been however estimated from ileostomy models, intubated healthy subjects and *via* H_2 breath test. Data showed that range varied from 0.8% starch malabsorbed for bread to 55.7% for pearled barley; and intermediate values were obtained for corn flakes (3.1-5.0% of starch), baked beans (5.7% of starch), cooked and cooled potatoes (11.9% of starch) and lentils (21% of starch).[83] Daily RS consumption has been estimated to be within the range 8-40 g for a Westernised diet.[87] One may therefore reasonably hypothesize that it contributes to the overall lipotropic effect of PBF in humans and once more data will be available, calculations for the LC should include it.

Electronic Supplementary Material (ESI) for Food & Function

Abbreviations

BeChIMe: sum of Betaine, Choline, *myo*-Inositol and Methionine

dwb: dry weight basis

IP: *myo*-Inositol Phosphate

IP6: Phytate or *myo*-Inositol Hexakisphosphate

LC: Lipotrope Capacity

LD: Lipotrope Density

OP: Overall un-specific Processing

PBF: Plant-Based Foods

PAI: Potentially Available *myo*-Inositol (included *myo*-inositol moieties derived from soluble free *myo*-inositol and glycosylated *myo*-inositol)

SP: Specific Processes

TPC: Total Phenolic Compounds

USDA: United State Department of Agriculture

Electronic Supplementary Information

Expanded bibliographic references

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Electronic Supplementary Information

Supplementary Tables

Table 1 Lipotrope, extractable polyphenol, energy and water contents of the 132 plant-based food products selected from choline and betaine databases[a]

Product description by food category	USDA NDB No[b]	Food code	Betaine-choline-inositol-methionine-magnesium (mg/100 g fw)[c]					B-vitamins (mg/100 g fw)			Total Phenolic Compounds (mg/100 g fw)[e]	Energy density (kcal/100 g fw)	Water content (g/100 g)
			Betaine	Choline	PAI (IP)[d]	Met	Mg	Niacin (B3)	Pantothenic acid (B5)	Folates (B9)			
Cereals (C)[f]													
Whole-grain amaranth (raw)	20001	C1	68.0	70.0	87 (396)	226.0	266	1.286	1.047	0.049	181.8	343.9	9.8
Barley malt flour	20131	C2	66.0	38.0	92 (193)	294.0	97	5.636	0.577	0.038	156.0	342.5	8.2
Roasted buckwheat groats	20010	C3	2.6	54.0	- (-)[g]	153.0	221	5.135	1.233	0.042	356.0	329.9	8.4
Cooked roasted buckwheat groats	20009	C4	0.5	20.0	- (-)	44.0	51	0.940	0.359	0.014	-[h]	88.1	75.6
Whole-grain maize cornmeal (raw)	20020	C5	12.0	22.0	- (208)	170.0	127	3.632	0.425	0.025	145.2	343.2	10.3
Maize bran	20015	C6	4.6	18.0	- (-)	174.6	64	2.735	0.636	0.004	-	68.3	4.7
Whole-grain *masa*	20317	C7	2.0	4.30	- (167)	196.0	110	3.681	0.658	0.024	32.6	338.1	9.0
Whole-grain oat flour (raw)	20038	C8	31.0	30.0	9 (261)	312.0	177	0.961	1.349	0.056	82.2	352.3	8.2
Oat bran	20033	C9	25.2	40.9	- (-)	335.0	235	0.934	1.494	0.052	116.2	335.8	6.6
Whole-grain quinoa (raw)	20035	C10	630.0	73.5	33 (204)	262.0	210	2.930	1.047	0.049	340.0	360.6	9.3
White rice (polished)	20052	C11	3.9	89.0	- (-)	153.0	23	1.600	1.287	0.006	18.0	336.1	13.3
Cooked white rice	20045	C12	0.3	2.1	5 (11)	63.0	12	0.400	0.390	0.003	-	124.4	68.4
Cooked brown rice	20037	C13	0.5	9.2	- (-)	58.0	43	1.528	0.285	0.004	21.0	103.1	73.1
Dark rye flour (raw)	20063	C14	150.0	30.0	- (236)	209.0	248	4.270	1.456	0.060	72.0	264.9	11.1
Whole-grain wheat flour (raw)	20080	C15	73.0	31.0	- (250)	212.0	138	6.365	1.008	0.044	108.9	313.1	10.3
White wheat flour	20081	C16	1.6	10.0	- (60)	183.0	22	1.198	0.248	0.029	65.3	344.6	11.9
Wheat bran	20077	C17	1399.5	81.4	- (1328)	234.0	611	13.578	2.181	0.079	182.5	187.3	9.9
Wheat germ	20078	C18	1163.5	168.4	109 (743)	456.0	239	6.813	2.257	0.281	349.0	334.5	11.1
Toasted wheat germ	08084	C19	738.3	170.7	- (-)	574.0	320	5.590	1.387	0.352	-	350.7	5.6
Whole wheat bread	18075	C20	61.3	27.0	0 (142)	155.0	86	3.837	0.552	0.050	205.7	233.4	37.7
White wheat bread	18069	C21	30.3	14.1	0 (28)	135.0	23	0.850	0.203	0.025	-	250.8	36.4
French/Vienna bread, sourdough	18029	C22	55.0	15.0	0 (34)	158.0	27	0.878	0.387	0.031	76.0	257.8	34.3
Toasted French/Vienna bread	18030	C23	59.0	18.0	- (-)	172.0	30	0.859	0.273	0.024	-	280.5	28.6
Cooked bulgur	20013	C24	83.0	6.9	- (-)	48.0	32	1.000	0.344	0.018	-	70.8	77.8
Dry pasta	20120	C25	137.2	15.0	- (89)	147.0	53	1.700	0.431	0.018	-	351.6	9.9
Boiled pasta	20121	C26	44.2	6.5	- (-)	64.0	18	0.400	0.112	0.007	-	147.8	62.1
Ready-to-eat breakfast cereal	08---[i]	C27	102.9	24.1	- (202)	125.4	121	9.765	0.574	0.025	291.0	353.4	4.0

Legumes (L)													
Raw common bean (raw)	16---[j]	L28	0.3	76.5	67 (287)	290.3	163	1.824	0.770	0.428	888.7	272.4	11.7
Boiled common bean	16---[k]	L29	0.1	37.0	- (103)	121.0	49	0.515	0.232	0.147	68.3	104.1	64.6
Canned common bean	16---[l]	L30	0.1	30.0	77 (75)	88.7	34	0.412	0.153	0.058	54.6	75.2	75.1
Raw soybean (raw)	16108	L31	1.3	118.6	50 (333)	492.0	280	1.623	0.793	0.375	506.1	408.9	8.5
Defatted soybean flour	16117	L32	2.8	190.0	- (544)	634.0	290	2.612	1.995	0.305	203.8	282.5	7.3
Tofu	16126-16127	L33	1.6	27.5	- (52)	84.0	32	0.318	0.081	0.032	-	69.6	86.1
Vegetable (V)													
Raw algae/seaweed (raw)	11---[m]	V34	0.0	39.2	7 (11)	87.8	77	0.897	0.444	0.133	235.7	43.7	85.0
Boiled artichoke	11008	V35	0.2	34.0	- (-)	52.2	60	1.001	0.342	0.051	792.0	38.5	84.0
Raw asparagus (raw)	11011	V36	2.8	16.0	20 (2)	22.0	14	0.978	0.274	0.052	83.9	16.8	93.2
Boiled asparagus	11012	V37	0.9	26.0	- (-)	25.0	14	1.084	0.225	0.149	159.0	19.9	92.6
Avocado (raw)	09038	V38	1.3	14.1	8 (38)	37.0	29	1.912	1.463	0.089	152.1	153.6	72.3
Fresh sweet basil (raw)	02044	V39	0.4	11.0	- (6)	36.0	81	0.925	0.238	0.064	231.8	17.4	91.0
Boiled green beans	11061	V40	0.1	14.0	68 (1)	18.0	24	0.383	0.049	0.023	41.4	21.0	91.4
Raw beetroot (raw)	11080	V41	162.4	6.8	8 (1)	18.0	23	0.334	0.155	0.109	176.1	34.8	87.6
Canned beetroot	11084	V42	180.9	6.8	4 (1)	10.0	17	0.157	0.156	0.030	130.0	26.8	91.0
Raw broccoli (raw)	11090-11096	V43	0.9	18.5	25 (5)	43.0	22	0.930	0.448	0.073	148.2	23.9	90.9
Boiled broccoli	11091	V44	0.1	40.0	- (-)	36.0	21	0.553	0.616	0.108	115.2	28.5	89.3
Boiled brussel sprouts	11099	V45	0.2	41.0	- (-)	24.0	20	0.607	0.252	0.060	200.0	32.3	88.9
Raw cabbage (raw)	11---[n]	V46	0.7	14.5	35 (4)	16.3	20	0.339	0.158	0.047	133.1	22.4	91.2
Boiled cabbage	11---[o]	V47	0.2	13.8	6 (6)	14.7	14	0.388	0.114	0.019	88.8	22.7	91.9
Sauerkraut	11439	V48	0.5	10.2	- (-)	8.9	13	0.143	0.093	0.024	67.0	10.4	92.5
Raw sweet pepper (raw)	11333-11821	V49	0.1	5.6	54 (3)	11.5	11	0.730	0.208	0.015	336.1	19.8	93.1
Raw carrot (raw)	11124	V50	0.4	8.2	10 (3)	7.0	11	0.770	0.337	0.026	48.2	30.6	89.3
Boiled carrot	11125	V51	0.1	8.8	- (-)	5.0	10	0.645	0.232	0.014	11.0	25.4	90.2
Boiled cauliflower	11136	V52	0.1	39.0	- (-)	26.0	9	0.410	0.508	0.044	100.0	16.8	93.0
Raw celery (raw)	11143	V53	0.1	6.1	0 (5)	5.0	11	0.320	0.246	0.036	44.4	9.3	95.4
Peeled cucumber (raw)	11206	V54	0.1	5.7	11 (4)	5.4	12	0.037	0.240	0.014	24.0	9.2	96.7
Pickles	11937	V55	0.0	3.4	- (-)	5.0	11	0.006	0.054	0.001	-	14.6	91.7
Lambsquarters (raw)	35196	V56	330.0	20.0	- (7)	49.0	34	1.200	0.092	0.030	232.8	37.2	84.3
Lettuce (raw)	11---[p]	V57	0.1	9.3	20 (0)	16.7	12	0.279	0.132	0.069	93.2	12.1	95.4
Boiled whole kernel sweet maize	11179	V58	0.2	22.0	- (24)	68.0	28	1.311	0.151	0.035	33.5	83.8	77.0
Raw mushroom (raw)	11---[q]	V59	2.8	10.8	- (41)	33.8	13	4.303	1.343	0.026	89.1	22.6	90.7
Raw onion (raw)	11282-11294	V60	0.1	5.8	32 (1)	9.0	10	0.108	0.110	0.021	74.5	34.7	89.9
Boiled green peas	11313	V61	7.8	28.0	- (-)	78.0	22	1.480	0.142	0.059	-	58.0	79.5
Raw potato with skin (raw)	11---[r]	V62	1.0	13.3	- (10)	30.3	22	1.083	0.287	0.017	23.0	67.1	80.4
Baked potato with skin	11---[s]	V63	0.2	16.0	- (-)	33.5	28	1.490	0.368	0.025	-	84.5	75.5

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Oven-heated French fries	11403	V64	0.6	23.0	- (27)	42.0	26	2.218	0.522	0.028	-	167.5	60.0
Potato chips	19411	V65	0.2	12.0	36 (54)	110.0	70	4.182	4.347	0.075	-	544.8	2.3
Baked sweet potato	11508	V66	35.0	13.0	- (-)	49.0	27	1.487	0.884	0.006	-	78.4	75.8
Radish (raw)	11429	V67	0.1	6.5	8 (2)	7.0	10	0.254	0.165	0.025	57.5	10.7	95.3
Spices & dried herbs	02---[f]	V68	6.9	50.1	- (308)	291.2	276	4.331	1.140	0.141	2841.7	273.0	8.3
Raw spinach (raw)	11463	V69	211.8	22.0	4 (2)	26.0	73	0.571	0.123	0.130	246.1	27.3	89.5
Boiled spinach	11464	V70	48.9	25.0	- (4)	59.0	82	0.439	0.075	0.121	125.1	26.3	88.9
Baked winter squash	11644	V71	0.2	11.0	- (-)	11.0	13	0.495	0.234	0.020	-	30.9	89.2
Boiled zucchini	11478	V72	0.3	9.4	- (-)	9.0	22	0.428	0.114	0.017	-	13.1	94.7
Raw tomato (raw)	11529	V73	0.1	6.7	47 (0.2)	7.0	11	0.594	0.089	0.015	45.2	15.6	94.5
Canned tomato sauce	11549	V74	0.8	9.9	- (-)	7.0	16	0.975	0.309	0.009	177.0	30.9	89.1
Canned tomato paste	11546	V75	0.4	39.0	- (-)	18.0	42	3.076	0.142	0.012	-	79.2	73.5
Catsup	11935	V76	0.2	12.1	36 (2)	15.0	19	1.501	0.046	0.010	249.0	109.5	69.2
Nuts and seeds (N)[u]													
Raw almond (raw)	12061	N77	0.5	52.0	0 (278)	188.0	275	3.925	0.349	0.029	296.1	572.6	5.3
Dried Brazil nut (raw)	12078	N78	0.4	29.0	- (332)	1008.0	376	0.295	0.184	0.022	285.5	674.2	3.5
Oil-roasted cashew nut	12586	N79	11.0	61.0	- (333)	334.0	273	1.736	0.880	0.025	86.7	604.7	2.3
Dried flaked coconut meat	12109	N80	1.3	19.0	0 (53)	61.0	48	0.300	0.696	0.008	-	475.6	15.6
Flaxseed (raw)	12220	N81	3.1	79.0	- (411)	370.0	392	3.080	0.985	0.087	509.0	458.9	7.0
Raw hazelnut (raw)	12120	N82	0.4	46.0	- (408)	221.0	163	1.800	0.918	0.113	639.4	634.6	5.3
Dry-roasted Macadamia nut	12632	N83	0.3	45.0	- (-)	23.0	118	2.274	0.603	0.010	36.2	735.2	1.6
Raw peanut (raw)	16087	N84	0.6	53.0	25 (216)	317.0	168	12.066	1.767	0.240	400.8	576.9	6.5
Peanut butter	16097-16098	N85	0.8	66.2	- (-)	302.0	157	13.546	1.089	0.083	536.0	604.0	1.5
Raw pecan nut (raw)	12142	N86	0.7	41.0	- (327)	183.0	121	1.167	0.863	0.022	1816.4	701.5	3.5
Dried pine nut (raw)	12147	N87	0.4	56.0	- (309)	259.0	251	4.387	0.313	0.034	58.2	707.6	2.3
Dry-roasted pistachio nut	12652	N88	0.8	71.0	- (230)	351.0	120	1.425	0.513	0.050	339.6	565.1	2.0
Sesame seed (raw)	12201	N89	0.7	26.0	56 (723)	880.0	345	5.800	0.290	0.115	-	633.2	3.8
Sunflower seed (raw)	12036	N90	35.0	55.0	- (282)	494.0	354	4.500	6.745	0.227	1601.0	570.3	5.4
Raw walnut (raw)	12154-12155	N91	0.4	37.8	- (568)	351.5	180	0.798	1.115	0.065	1414.9	657.8	4.3
Fruits (F)													
Apple with skin (raw)	09003	F92	0.1	3.4	40 (17)	1.0	5	0.091	0.061	0.003	209.5	46.9	85.6
Dried apricot	09032	F93	0.3	14.0	- (-)	15.0	32	2.589	0.516	0.010	330.7	227.5	30.9
Banana (raw)	09040	F94	0.1	9.8	0 (6)	8.0	27	0.665	0.334	0.020	154.7	87.7	74.9
Blackberry (raw)	09042	F95	0.3	8.6	170 (3)	4.2	20	0.646	0.276	0.025	640.7	25.5	88.2
Blueberry (raw)	09050	F96	0.2	6.0	14 (-)	12.0	6	0.418	0.124	0.006	13330.5	52.9	84.2
Cranberry (raw)	09078	F97	0.2	5.5	- (-)	3.0	6	0.101	0.295	0.001	543.1	31.2	87.1
Dried date	09087-09421	F98	0.4	7.5	- (-)	19.5	49	1.442	0.697	0.017	641.2	278.4	20.9

Dried fig	09094	F99	0.8	16.0	- (-)	34.0	68	0.619	0.434	0.009	960.0	236.9	30.1
Grape (raw)	09132	F100	0.1	5.6	16 (-)	9.0	7	0.188	0.050	0.002	163.0	72.5	80.5
Raisin	09298	F101	0.3	11.0	17 (3)	21.0	32	0.766	0.095	0.005	475.2	315.5	15.4
Grapefruit (raw)	09112	F102	0.2	7.5	111 (-)	7.0	9	0.204	0.262	0.013	162.7	39.1	88.1
Kiwifruit (raw)	09148	F103	0.5	7.8	139 (0)	24.0	17	0.341	0.183	0.025	237.7	54.4	83.1
Mandarin orange (raw)	09218-09433	F104	0.1	12.0	125 (24)	2.0	11	0.506	0.184	0.020	192.0	49.1	85.9
Melon (raw)	09181	F105	0.1	7.6	- (-)	12.0	12	0.734	0.105	0.021	59.3	34.0	90.2
Nectarine (raw)	09191	F106	0.2	6.2	- (-)	6.0	9	1.125	0.185	0.005	68.0	42.5	87.6
Orange (raw)	09202	F107	0.1	8.4	143 (-)	9.0	11	0.425	0.261	0.034	278.6	45.2	85.9
Peach (raw)	09236	F108	0.2	6.1	53 (-)	10.0	9	0.806	0.153	0.004	186.2	36.2	88.9
Canned peach	09370	F109	0.3	3.3	- (-)	14.0	5	0.614	0.050	0.003	47.0	73.4	79.3
Pear (raw)	09252	F110	0.2	5.1	21 (-)	2.0	7	0.157	0.048	0.007	176.0	48.6	83.7
Canned pear	09257	F111	0.3	1.9	- (-)	2.0	4	0.242	0.022	0.001	-	72.0	80.4
Pineapple (raw)	09429-09430	F112	0.1	5.6	30 (4)	12.0	12	0.489	0.205	0.015	147.9	50.9	86.5
Plum (raw)	98107-09279	F113	0.1	5.2	48 (-)	8.0	7	0.417	0.135	0.005	407.8	42.2	87.2
Prune	09291	F114	0.4	10.0	- (-)	16.0	41	1.882	0.422	0.004	1195.0	216.2	30.9
Raspberry (raw)	09302	F115	0.7	10.8	- (-)	3.6	22	0.598	0.329	0.021	572.0	30.3	85.8
Strawberry (raw)	09316	F116	0.3	5.7	13 (0.3)	2.0	16	0.386	0.125	0.024	356.9	27.0	91.0
Watermelon (raw)	09326	F117	0.2	4.1	38 (2)	6.0	10	0.178	0.221	0.003	51.5	32.2	91.5
Beverages (B)													
Apple juice	98005-09400	B118	0.1	1.8	41 (0)	1.0	3	0.100	0.063	0	33.9	46.2	87.9
Beer	14003-14006	B119	7.0	8.6	- (-)	0.0	6	0.452	0.036	0.006	44.5	36.3	93.4
Coconut milk	12118	B120	0.0	8.5	- (-)	38.0	46	0.637	0.153	0.014	-	211.3	72.9
Carbonated cola	14400	B121	0.1	0.5	0 (-)	0.7	0	0	0	0	8.1	38.7	90.3
Brewed ground coffee	14209	B122	0.1	2.6	- (1)	0.0	3	0.191	0.254	0.002	89.1	0.7	99.4
Dry instant coffee	14214-14218	B123	4.8	100.0	- (-)	23.0	327	28.173	0.097	0	438.6	260.7	3.1
Grape juice	09135	B124	0.2	3.2	16 (-)	1.0	10	0.262	0.041	0.003	104.0	62.8	84.1
Lemonade concentrates	14292-14542	B125	0.3	2.0	- (-)	1.4	5	0.074	0.057	0.008	-	187.2	52.3
Lime juice	09160	B126	0.2	5.1	59 (-)	2.0	8	0.142	0.123	0.010	122.0	29.6	90.8
Orange juice	09209-09215	B127	0.2	9.3	146 (-)	2.5	11	0.241	0.175	0.031	64.4	44.3	88.3
Carbonated orange juice	14150	B128	0.1	0.6	1 (0)	0.0	1	0	0	0	0	49.2	87.6
Soybean milk	16120	B129	1.0	24.0	- (39)	36.0	25	0.289	0.518	0.016	31.2	49.7	88.0
Brewed tea	14355	B130	1.7	0.4	3 (1)	0.0	3	0.000	0.011	0.005	104.9	1.2	99.7
Canned condensed tomato soup	06159	B131	4.2	13.0	5 (2)	18.0	14	1.032	0.053	0	11.7	60.3	82.5
Wine	14096-14106	B132	0.9	5.3	73 (-)	0.4	11	0.166	0.038	0.001	105.0	83.8	86.7

[a] Data are from general USDA [1], Souci [5], Afssa-Ciqual [29] and Phenol-Explorer [88] databases and from complementary references listed in Annex 2; choline and betaine databases from which foods have been selected are those by USDA[47], Zeisel *et al.*[89], Likes *et al.*[21], Sakamoto *et al.*[90] and DaSilva and Jensen[91]. [b] Numbers are those used by USDA in its databases. [c] fw: fresh weight. [d] PAI: Potentially Available *myo*-Inositol that corresponds to an estimation of the free *myo*-inositol fraction; number in brackets (IP), corresponds to an estimation of the total *myo*-Inositol Phosphate content (expressed in mg *myo*-inositol moities/100 g fresh weight) coming from all inositol phosphate compounds, *i.e.* from IP6 to IP1; however, values have to be taken with cautious since being rough estimations. [e] All data are expressed as Gallic Acid Equivalents (GAE), except for C3, C18, N81 and N90 expressed as Ferulic Acid Equivalents (FAE), V45, V52 and

V56 expressed as Chlorogenic Acid Equivalents (ChAE), V47 expressed as Caffeic Acid equivalents (CAE), and F93, F101 and B128 expressed as Catechin Equivalents (CatE); mean TPC contents of C8, C14, C16, V44 and V53 have been collected exclusively from Phenol-Explorer database[88] and are aggregated means calculated from several TPC values expressed as GAE and/or FAE and/or ChAE, CAE or CatE. [f] All data are given for dehulled amaranth and quinoa seeds. [g] No data found. [h] No data found with the Folin-Ciocalteu's method. [i] Corresponds to the means of the 22 brands and/or products given in the USDA Choline & Betaine database[47], *i.e.* 08259, 08074, 08202, 08089, 08077, 08389, 08001, 08014, 08020, 08030, 08065, 08067, 08383, 08333, 08061, 08363, 08218, 08505, 08506, 08504, 08435 and 08147; for B-vitamin, only unenriched products were considered; for niacin (vitamin B3), only 3 values could have been obtained from the 22 products given in the USDA Choline & Betaine database: to reach a representative means, values of all other ready-to-eat unenriched breakfast cereals given in the general database and not present in the USDA Choline & Betaine database were added. [j] Numbers given in the USDA Choline & Betaine database, *i.e.* 16037 and 16042 completed by 16032 given in the general USDA database to calculate mean values for raw, boiled and canned common beans based on the same 3 varieties (pinto, navy and red kidney). [k] Numbers given in the USDA Choline & Betaine database, *i.e.* 16038 and 16043 completed by 16033 given in the general USDA database to calculate mean values for raw, boiled and canned common beans based on the same 3 varieties (pinto, navy and red kidney). [l] Those given in the USDA Choline & Betaine database, *i.e.* 16034 and 16039 completed by 16044 given in the general USDA database to calculate mean values for raw, boiled and canned common beans based on the same 3 varieties (pinto, navy and red kidney). [m] Those given in the USDA Choline & Betaine database, *i.e.* 11442, 11444, 11445, 11446, 11666 and 11669. [n] Those given in the USDA Choline & Betaine database, *i.e.* 11109, 11112 and 11114. [o] Those given in the USDA Choline & Betaine database, *i.e.* 11110, 11113 and 11234. [p] Those given in the USDA Choline & Betaine database, *i.e.* 11250, 11251, 11252 and 11257. [q] Those given in the USDA Choline & Betaine database, *i.e.* 11260, 11265, 11266, 11950 and 11987. [r] Those given in the USDA Choline & Betaine database, *i.e.* 11353, 11354 and 11355. [s] Those given in the USDA Choline & Betaine database, *i.e.* 11356, 11357 and 11358. [t] Those given in the USDA Choline & Betaine database, *i.e.* 02003, 02009, 02010, 02011, 02015, 02020, 02021, 02024, 02026, 02027, 02028, 02029, 02030, 02033, 02043 completed by other spices and dried herbs given in the general USDA database [1], *i.e.* 02006, 02014, 02013, 02005, 02039, 02004, 02066, 02036, 02023, 02019, 02017, 02012, 02042, 02038, and one value given by the Afssa-Ciqual database for an undefined spice entitled "spice, average food"[29]. [u] All data are given for shelled unblanched (that is the kernel with skin) nuts and dehulled seeds (*i.e.* flax, sesame and sunflower seeds).

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Table 2 Ranking of processed plant-based foods for betaine, choline, methionine and magnesium densities

	Betaine		Choline		Methionine		Magnesium
1	V[a]: Beetroot, canned (674.2)[b]	1	Coffee, ground, brewed (368.8)	1	V: Spinach, boiled (224.3)	1	Coffee, ground, brewed (425.5)
2	C: Wheat germ, toasted (210.5)	2	V: Cauliflower, boiled (232.3)	2	C: Wheat germ, toasted (163.7)	2	V: Spinach, boiled (311.7)
3	V: Spinach, boiled (186.0)	3	V: Broccoli, boiled (140.4)	3	V: Cauliflower, boiled (154.9)	3	Tea, brewed (252.3)
4	Tea, brewed (143.4)	4	V: Asparagus, boiled (130.4)	4	V: Artichoke, boiled (135.7)	4	V: Zucchini, boiled (167.6)
5	C: Bulgur, cooked (117.2)	5	V: Brussel sprouts, boiled (127.1)	5	V: Green peas, boiled (134.5)	5	V: Artichoke, boiled (155.9)
6	V: Sweet potato, baked (44.6)	6	V: Sauerkraut (97.8)	6	V: Broccoli, boiled (126.4)	6	Coffee, instant, dry (125.4)
7	C: Pasta, boiled (29.9)	7	V: Spinach, boiled (95.0)	7	V: Asparagus, boiled (125.4)	7	V: Sauerkraut (124.8)
8	C: Breakfast cereals, ready-to-eat (29.1)	8	V: Artichoke, boiled (88.4)	8	L: Tofu (120.6)	8	V: Green beans, boiled (114.1)
9	C: Whole wheat bread (26.3)	9	V: Zucchini, boiled (71.6)	9	L: Common bean, canned (117.9)	9	V: Spices and dried herbs (101.0)
10	C: French bread (21.3)	10	V: Green beans, boiled (66.5)	10	L: Common bean, boiled (116.3)	10	C: Wheat germ, toasted (91.2)
11	C: French bread, toasted (21.0)	11	V: Cabbage, boiled (60.8)	11	V: Spices and dried herbs (106.7)	11	V: Cucumber, pickles (75.2)
12	C: Beers (19.4)	12	V: Tomato paste, canned (49.3)	12	V: Green beans, boiled (85.6)	12	V: Broccoli, boiled (73.7)
13	Coffee, ground, brewed (14.2)	13	C: Wheat germ, toasted (48.7)	13	V: Sauerkraut (85.4)	13	V: Asparagus, boiled (70.2)
14	V: Green peas, boiled (13.5)	14	V: Green peas, boiled (48.3)	14	V: Sweet maize, boiled (81.1)	14	V: Beetroot, canned (63.4)
15	C: White wheat bread (12.1)	15	L: Soybean milk (48.3)	15	V: Brussel sprouts, boiled (74.4)	15	V: Cabbage, boiled (63.2)
16	V: Tomato soup, canned (7.0)	16	L: Common bean, canned (39.9)	16	L: Soybean milk (72.4)	16	V: Brussel sprouts, boiled (62.0)
17	V: Sauerkraut (4.8)	17	L: Tofu (39.5)	17	V: Zucchini, boiled (68.5)	17	C: Buckwheat, roasted, cooked (57.9)
18	V: Asparagus, boiled (4.5)	18	Coffee, instant, dry (38.4)	18	C: Bulgur, cooked (67.8)	18	V: Cauliflower, boiled (53.6)
19	V: Tomato sauce, canned (2.6)	19	V: Winter squash, baked (35.6)	19	C: Whole wheat bread (66.4)	19	V: Tomato paste, canned (53.1)
20	V: Spices and dried herbs (2.5)	20	L: Common bean, boiled (35.5)	20	V: Cabbage, boiled (64.6)	20	V: Tomato sauce, canned (51.7)
21	L: Tofu (2.3)	21	V: Carrot, boiled (34.7)	21	V: Sweet potato, baked (62.5)	21	L: Soybean milk (50.3)
22	V: Zucchini, boiled (2.3)	22	V: Tomato sauce, canned (32.0)	22	N: Pistachio nut, dry-roasted (62.1)	22	L: Common bean, boiled (47.4)
23	L: Soybean milk (2.0)	23	Tea, brewed (31.1)	23	C: French bread, toasted (61.3)	23	L: Tofu (46.0)
24	Coffee, instant, dry (1.8)	24	V: Sweet maize, boiled (26.2)	24	C: French bread (61.3)	24	L: Common bean, canned (45.2)
25	N: Cashew nut, oil-roasted (1.8)	25	V: Beetroot, canned (25.3)	25	C: Brown rice, cooked (56.3)	25	C: Bulgur, cooked (45.2)
26	F: Wines (1.0)	26	C: Beers (23.8)	26	N: Cashew nut, oil-roasted (55.2)	26	N: Cashew nut, oil-roasted (45.1)
27	V: Cabbage, boiled (1.0)	27	V: Cucumber, pickles (23.3)	27	C: White wheat bread (53.8)	27	V: Winter squash, baked (42.1)
28	V: Winter squash, baked (6.8)	28	C: Buckwheat, roasted, cooked (22.7)	28	C: White rice, cooked (50.7)	28	C: Brown rice, cooked (41.7)
29	F: Lime juice (0.7)	29	V: Tomato soup, canned (21.6)	29	N: Peanut butter (50.0)	29	V: Carrot, boiled (39.4)
30	V: Brussel sprouts, boiled (0.6)	30	F: Orange juice (20.9)	30	C: Buckwheat, roasted, cooked (50.0)	30	V: Green peas, boiled (37.9)
31	V: Cauliflower, boiled (0.6)	31	V: Potato with skin, baked (18.9)	31	C: Pasta, boiled (43.3)	31	C: Whole wheat bread (36.8)
32	C: Buckwheat, roasted, cooked (0.6)	32	V: Spices and dried herbs (18.4)	32	V: Potato with skin, baked (39.7)	32	V: Sweet potato, baked (34.4)
33	V: Artichoke, boiled (0.5)	33	F: Lime juice (17.2)	33	V: Beetroot, canned (37.3)	33	C: Breakfast cereals, ready-to-eat (34.1)
34	F: Orange juice (0.5)	34	V: Sweet potato, baked (16.6)	34	V: Winter squash, baked (35.6)	34	V: Potato with skin, baked (33.5)
35	V: Tomato paste, canned (0.5)	35	V: Oven-heated French fries (13.7)	35	C: Breakfast cereals, ready-to-eat (35.5)	35	V: Sweet maize, boiled (33.4)
36	C: Brown rice, cooked (0.5)	36	N: Pistachio nut, dry-roasted (12.6)	36	V: Cucumber, pickles (34.2)	36	F: Fig, dried (28.7)
37	V: Green beans, boiled (0.4)	37	C: Whole wheat bread (11.6)	37	V: Tomato soup, canned (29.8)	37	F: Lime juice (27.0)
38	F: Peach, canned (0.4)	38	V: Catsup (11.1)	38	V: Oven-heated French fries (25.1)	38	N: Peanut butter (26.0)
39	V: Carrot, boiled (0.4)	39	N: Peanut butter (11.0)	39	V: Tomato paste, canned (22.7)	39	F: Orange juice (23.7)
40	V: Oven-heated French fries (0.4)	40	N: Cashew nut, oil-roasted (10.1)	40	V: Tomato sauce, canned (22.6)	40	V: Tomato soup, canned (23.2)
41	F: Pear, canned (0.4)	41	C: Bulgur, cooked (9.7)	41	V: Chips (20.2)	41	N: Coconut milk (21.8)
42	V: Broccoli, boiled (0.4)	42	C: Brown rice, cooked (8.9)	42	V: Carrot, boiled (19.7)	42	N: Pistachio nut, dry-roasted (21.2)
43	F: Fig, dried (0.3)	43	C: Breakfast cereals, ready-to-eat (6.8)	43	F: Peach, canned (19.1)	43	F: Prunes (19.0)
44	F: Grape juice (0.3)	44	F: Fig, dried (6.8)	44	N: Coconut milk (18.0)	44	F: Date, dried (17.4)
45	N: Coconut meat, dried, flaked (0.3)	45	C: French bread, toasted (6.4)	45	F: Fig, dried (14.4)	45	V: Catsup (17.4)
46	Cola, carbonated (0.3)	46	F: Wines (6.3)	46	V: Catsup (13.7)	46	N: Macadamia nut, dry-roasted (16.1)
47	F: Apple juice (0.2)	47	F: Apricot, dried (6.2)	47	N: Coconut meat, dried, flaked (12.8)	47	F: Grape juice (15.9)
48	C: White rice, cooked (0.2)	48	N: Macadamia nut, dry-roasted (6.1)	48	Coffee, instant, dry (8.8)	48	V: Oven-heated French fries (15.5)
49	V: Sweet maize, boiled (0.2)	49	C: French bread (5.8)	49	F: Prunes (7.4)	49	C: Beers (15.2)
50	V: Potato with skin, baked (0.2)	50	C: White wheat bread (5.6)	50	F: Date, dried (7.0)	50	F: Apricot, dried (14.1)
51	F: Prunes (0.2)	51	F: Grape juice (5.1)	51	F: Lime juice (6.8)	51	F: Wines (13.1)
52	V: Catsup (0.2)	52	F: Prunes (4.6)	52	F: Raisin (6.7)	52	V: Chips (12.8)
53	F: Orange juice, carbonated (0.2)	53	F: Peach, canned (4.4)	53	F: Apricot, dried (6.6)	53	C: Pasta, boiled (12.2)
54	F: Date, dried (0.1)	54	C: Pasta, boiled (4.4)	54	F: Orange juice (5.6)	54	C: French bread, toasted (10.7)
55	N: Pistachio nut, dry-roasted (0.1)	55	N: Coconut milk (4.0)	55	N: Macadamia nut, dry-roasted (3.1)	55	C: French bread (10.5)
56	F: Lemonade concentrate (0.1)	56	N: Coconut meat, dried, flaked (4.0)	56	F: Pear, canned (2.8)	56	F: Raisin (10.1)
57	L: Common bean, canned (0.1)	57	F: Apple juice (3.9)	57	F: Apple juice (2.2)	57	N: Coconut meat, dried, flaked (10.1)
58	F: Apricot, dried (0.1)	58	F: Raisin (3.5)	58	Cola, carbonated (1.8)	58	C: White rice, cooked (9.6)
59	N: Peanut butter (0.1)	59	F: Date, dried (2.7)	59	F: Grape juice (1.6)	59	C: White wheat bread (9.2)
60	L: Common bean, boiled (0.1)	60	F: Pear, canned (2.7)	60	F: Lemonade concentrate (0.8)	60	F: Peach, canned (6.7)
61	F: Raisin (0.1)	61	V: Chips (2.2)	61	F: Wines (0.5)	61	F: Apple juice (6.5)
62	N: Macadamia nut, dry-roasted (0.04)	62	C: White rice, cooked (1.7)	62	C: Beers (0)	62	F: Pear, canned (5.6)
63	V: Chips (0.04)	63	F: Orange juice, carbonated (1.2)	63	Coffee, ground, brewed (0)	63	F: Lemonade concentrate (2.7)
64	V: Cucumber, pickles (0)	64	Cola, carbonated (1.2)	64	F: Orange juice, carbonated (0)	64	F: Orange juice, carbonated (2.0)
65	N: Coconut milk (0)	65	F: Lemonade concentrate (1.0)	65	Tea, brewed (0)	65	Cola, carbonated (0)

[a] V, C, F, N, L and B correspond respectively to Vegetable, Cereal, Fruit, Nut and seed, Legume and Beverage groups. [b] Density value expressed in mg/100 kcal.

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Table 3 Ranking of processed plant-based foods for niacin, pantothenic acid and folate densities

	Niacin		Pantothenic acid		Folates		Mean ranking[a]
1	Coffee, ground, brewed (27.09)[b]	1	Coffee, ground, brewed (36.03)	1	V: Asparagus, boiled (0.747)	1	V: Asparagus, boiled (7.1)
2	Coffee, instant, dry (10.81)	2	V: Cauliflower, boiled (3.03)	2	V: Spinach, boiled (0.460)	2	V: Spinach, boiled (9.0)
3	V[c]: Asparagus, boiled (5.44)	3	V: Broccoli, boiled (2.16)	3	Tea, brewed (0.421)	3	V: Cauliflower, boiled (10.4)
4	V: Tomato paste, canned (3.89)	4	V: Asparagus, boiled (1.13)	4	V: Broccoli, boiled (0.379)	4	V: Artichoke, boiled (11.3)
5	V: Zucchini, boiled (3.26)	5	V: Sweet potato, baked (1.13)	5	Coffee, ground, brewed (0.284)	5	V: Zucchini, boiled (11.4)
6	V: Tomato sauce, canned (3.15)	6	L: Soybean milk (1.04)	6	V: Cauliflower, boiled (0.262)	6	V: Broccoli, boiled (11.9)
7	C: Breakfast cereals, ready-to-eat (2.76)	7	V: Tomato sauce, canned (1.00)	7	V: Sauerkraut (0.230)	7	Coffee, ground, brewed (12.0)
8	V: Artichoke, boiled (2.60)	8	Tea, brewed (0.92)	8	V: Brussel sprouts, boiled (0.186)	8	C: Wheat germ, toasted (12.6)
9	V: Green peas, boiled (2.55)	9	V: Carrot, boiled (0.91)	9	L: Common bean, boiled (0.141)	9	V: Sauerkraut (12.6)
10	V: Carrot, boiled (2.54)	10	V: Sauerkraut (0.89)	10	V: Artichoke, boiled (0.133)	10	V: Brussel sprouts, boiled (14.7)
11	V: Cauliflower, boiled (2.44)	11	V: Artichoke, boiled (0.89)	11	V: Zucchini, boiled (0.129)	11	V: Green peas, boiled (16.7)
12	N: Peanut butter (2.24)	12	V: Zucchini, boiled (0.87)	12	V: Beetroot, canned (0.112)	12	V: Cabbage, boiled (17.9)
13	V: Broccoli, boiled (1.94)	13	V: Chips (0.80)	13	V: Green beans, boiled (0.109)	13	V: Green beans, boiled (18.4)
14	V: Sweet potato, baked (1.90)	14	V: Brussel sprouts, boiled (0.78)	14	V: Green peas, boiled (0.102)	14	V: Spices and dried herbs (19.6)
15	V: Brussel sprouts, boiled (1.88)	15	V: Winter squash, baked (0.76)	15	C: Wheat germ, toasted (0.100)	15	V: Beetroot, canned (19.7)
16	V: Green beans, boiled (1.82)	16	V: Beetroot, canned (0.58)	16	V: Cabbage, boiled (0.084)	16	V: Tomato sauce, canned (20.0)
17	V: Potato with skin, baked (1.76)	17	V: Cabbage, boiled (0.50)	17	V: Sweet maize, boiled (0.081)	17	L: Soybean milk (20.6)
18	V: Tomato soup, canned (1.71)	18	C: Bulgur, cooked (0.49)	18	L: Common bean, canned (0.077)	18	V: Sweet potato, baked (21.9)
19	V: Cabbage, boiled (1.71)	19	V: Potato with skin, baked (0.43)	19	F: Orange juice (0.070)	19	C: Bulgur, cooked (23.1)
20	V: Spinach, boiled (1.67)	20	V: Spices and dried herbs (0.42)	20	V: Winter squash, baked (0.065)	20	V: Winter squash, baked (23.4)
21	C: Whole wheat bread (1.64)	21	F: Lime juice (0.42)	21	V: Carrot, boiled (0.055)	21	Tea, brewed (23.7)
22	V: Winter squash, baked (1.60)	22	C: Buckwheat, roasted, cooked (0.41)	22	V: Spices and dried herbs (0.052)	22	V: Carrot, boiled (24.3)
23	C: Wheat germ, toasted (1.59)	23	C: Wheat germ, toasted (0.40)	23	L: Tofu (0.046)	23	C: Whole wheat bread (25.4)
24	V: Spices and dried herbs (1.59)	24	F: Orange juice (0.39)	24	F: Lime juice (0.034)	24	L: Tofu (26.0)
25	V: Sweet maize, boiled (1.56)	25	V: Pickles (0.37)	25	L: Soybean milk (0.032)	25	V: Tomato paste, canned (26.1)
26	C: Brown rice, cooked (1.48)	26	C: White rice, cooked (0.31)	26	V: Tomato sauce, canned (0.029)	26	C: Buckwheat, roasted, cooked (27.7)
27	C: Bulgur, cooked (1.41)	27	V: Oven-heated French fries (0.31)	27	V: Potato with skin, baked (0.029)	27	L: Common bean, boiled (28.3)
28	V: Sauerkraut (1.37)	28	V: Spinach, boiled (0.29)	28	C: Bulgur, cooked (0.025)	28	L: Common bean, canned (28.3)
29	V: Catsup (1.37)	29	C: Brown rice, cooked (0.28)	29	C: Whole wheat bread (0.021)	29	C: Breakfast cereals, ready-to-eat (30.0)
30	V: Oven-heated French fries (1.32)	30	F: Date, dried (0.25)	30	V: Oven-heated French fries (0.017)	30	V: Sweet maize, boiled (30.0)
31	C: Beer (1.25)	31	V: Green peas, boiled (0.24)	31	C: Beer (0.017)	31	V: Potato with skin, baked (30.0)
32	F: Apricot, dried (1.14)	32	C: Whole wheat bread (0.24)	32	C: Buckwheat, roasted, cooked (0.016)	32	Coffee, instant, dry (31.3)
33	C: Buckwheat, roasted, cooked (1.07)	33	V: Green beans, boiled (0.23)	33	V: Tomato paste, canned (0.015)	33	C: Brown rice, cooked (34.0)
34	F: Prunes (0.87)	34	F: Apricot, dried (0.23)	34	V: Chips (0.014)	34	F: Lime juice (34.0)
35	F: Peach, canned (0.84)	35	L: Common bean, boiled (0.22)	35	N: Peanut butter (0.014)	35	F: Orange juice (34.1)
36	V: Chips (0.77)	36	L: Common bean, canned (0.20)	36	C: French bread (0.012)	36	V: Oven-heated French fries (35.4)
37	V: Beetroot, canned (0.59)	37	F: Prunes (0.20)	37	C: White wheat bread (0.010)	37	N: Peanut butter (35.9)
38	L: Soybean milk (0.58)	38	F: Fig, dried (0.18)	38	V: Catsup (0.009)	38	V: Tomato soup, canned (36.0)
39	L: Common bean, canned (0.55)	39	N: Peanut butter (0.18)	39	N: Pistachio nut, dry-roasted (0.009)	39	C: Beers (37.0)
40	F: Orange juice (0.54)	40	V: Sweet maize, boiled (0.18)	40	C: French bread, toasted (0.009)	40	C: French bread (37.6)
41	F: Date, dried (0.52)	41	V: Tomato paste, canned (0.18)	41	V: Sweet potato, baked (0.008)	41	N: Cashew nut, oil-roasted (37.7)
42	L: Common bean, boiled (0.49)	42	C: Breakfast cereals, ready-to-eat (0.16)	42	C: Breakfast cereals, ready-to-eat (0.007)	42	V: Cucumber, pickles (38.1)
43	F: Lime juice (0.48)	43	C: French bread (0.15)	43	V: Pickles (0.007)	43	C: French bread, toasted (39.0)
44	L: Tofu (0.46)	44	N: Coconut meat, dried, flaked (0.15)	44	N: Coconut milk (0.007)	44	C: White wheat bread (41.1)
45	F: Grape juice (0.42)	45	N: Cashew nut, oil-roasted (0.15)	45	F: Date, dried (0.006)	45	C: Pasta, boiled (42.9)
46	C: French bread (0.34)	46	F: Apple juice (0.14)	46	F: Grape juice (0.005)	46	V: Chips (42.9)
47	C: White wheat bread (0.34)	47	L: Tofu (0.12)	47	C: Pasta, boiled (0.005)	47	N: Pistachio nut, dry-roasted (42.9)
48	F: Pear, canned (0.34)	48	C: Beer (0.10)	48	F: Apricot, dried (0.004)	48	V: Catsup (43.9)
49	C: White rice, cooked (0.32)	49	C: French bread, toasted (0.10)	49	N: Cashew nut, oil-roasted (0.004)	49	F: Fig, dried (44.9)
50	N: Macadamia nut, dry-roasted (0.31)	50	N: Pistachio nut, dry-roasted (0.09)	50	F: Peach, canned (0.004)	50	F: Prunes (45.9)
51	C: French bread, toasted (0.31)	51	V: Tomato soup, canned (0.09)	51	F: Lemonade concentrate (0.004)	51	F: Apricot, dried (46.0)
52	N: Coconut milk (0.30)	52	N: Macadamia nut, dry-roasted (0.08)	52	C: Brown rice, cooked (0.004)	52	F: Date, dried (46.1)
53	N: Cashew nut, oil-roasted (0.29)	53	C: White wheat bread (0.08)	53	F: Fig, dried (0.004)	53	C: White rice, cooked (46.4)
54	C: Pasta, boiled (0.27)	54	C: Pasta, boiled (0.08)	54	C: White rice, cooked (0.004)	54	F: Peach, canned (47.9)
55	F: Fig, dried (0.26)	55	N: Coconut milk (0.07)	55	F: Prunes (0.002)	55	F: Grape juice (49.9)
56	N: Pistachio nut, dry-roasted (0.25)	56	F: Peach, canned (0.07)	56	N: Coconut meat, dried, flaked (0.002)	56	N: Coconut milk (50.7)
57	F: Raisin (0.24)	57	F: Grape juice (0.07)	57	F: Raisin (0.002)	57	F: Wines (51.6)
58	F: Apple juice (0.22)	58	F: Wine (0.05)	58	F: Pear, canned (0.001)	58	N: Coconut meat, dried, flaked (52.1)
59	F: Wine (0.20)	59	V: Catsup (0.04)	59	N: Macadamia nut, dry-roasted (0.001)	59	N: Macadamia nut, dry-roasted (53.1)
60	N: Coconut meat, dried, flaked (0.06)	60	Coffee, instant, dry (0.04)	60	F: Wine (0.001)	60	F: Pear, canned (55.1)
61	V: Pickles (0.04)	61	F: Pear, canned (0.03)	61	F: Apple juice (0)	61	F: Apple juice (55.3)
62	F: Lemonade concentrate (0.04)	62	F: Lemonade concentrate (0.03)	62	Cola, carbonated (0)	62	F: Raisins (57.7)
63	Cola, carbonated (0)	63	F: Raisin (0.03)	63	Coffee, instant, dry (0)	63	F: Lemonade concentrate (59.9)
64	F: Orange juice, carbonated (0)	64	Cola, carbonated (0)	64	F: Orange juice, carbonated (0)	64	Cola, carbonated (60.1)
65	Tea, brewed (0)	65	F: Orange juice, carbonated (0)	65	V: Tomato soup, canned (0)	65	F: Orange juice, carbonated (61.4)

[a] Means of the 7 ranks obtained for betaine, choline, methionine, magnesium, niacin, pantothenic acid and folate densities. [b] Density values are expressed in mg/100 kcal. [c]V, C, F, N, L and B correspond respectively to Vegetable, Cereal, Fruit, Nut and seed, Legume and Beverage groups.

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Table 4 Ranking of processed plant-based foods for *myo*-inositol fraction densities and mean ranking based on 7 or 8 lipotrope densities

	Potentially Available *myo*-Inositols (PAI) fraction[a]	Mean ranking based on 8 lipotrope densities[b]	Mean ranking based on 7 lipotrope densities[c]	*Myo*-Inositol Phosphates (IP) fraction
1	F[d]: Orange juice (329.3)[e]	V: Green beans, boiled (3.9)	V: Green beans, boiled (4.1)	Coffee, ground, brewed (113.5)
2	V: Green beans, boiled (322.2)	V: Cabbage, boiled (4.8)	V: Cabbage, boiled (4.1)	V: Spices and dried herbs (112.7)
3	Tea, brewed (210.3)	V: Beetroot, canned (5.0)	V: Beetroot, canned (4.1)	L: Common bean, canned (100.0)
4	F: Lime juice (198.4)	Tea, brewed (6.4)	C: Whole wheat bread (5.9)	L: Common bean, boiled (98.6)
5	L: Common bean, canned (101.8)	L: Common bean, canned (7.0)	Tea, brewed (6.9)	L: Soybean milk (78.8)
6	F: Apple juice (89.5)	C: Whole wheat bread (7.3)	L: Common bean, canned (7.3)	L: Tofu (74.1)
7	F: Wine (87.1)	F: Orange juice (7.8)	F: Lime juice (8.4)	C: Whole wheat bread (60.8)
8	V: Catsup (33.0)	F: Lime juice (7.9)	F: Orange juice (8.7)	C: Breakfast cereals, ready-to-eat (57.3)
9	V: Cabbage, boiled (27.3)	V: Tomato soup, canned (9.5)	V: Tomato soup, canned (9.1)	N: Cashew nut, oil-roasted (55.0)
10	F: Grape juice (25.5)	C: French/Vienna bread (10.6)	C: French/Vienna bread (9.7)	Tea, brewed (42.1)
11	V: Beetroot, canned (15.7)	V: Catsup (11.4)	V: Chips (11.3)	N: Pistachio nut, dry-roasted (40.6)
12	V: Tomato soup, canned (9.0)	V: Chips (11.5)	C: White wheat bread (11.6)	V: Sweet maize, boiled (29.0)
13	V: Chips (6.5)	C: White wheat bread (12.3)	V: Catsup (11.9)	V: Cabbage, boiled (25.6)
14	F: Raisin (5.4)	F: Grape juice (13.1)	C: White rice, cooked (13.4)	V: Oven-heated French fries (16.3)
15	C: White rice, cooked (3.9)	F: Wines (13.4)	F: Grape juice (13.6)	V: Spinach, boiled (14.4)
16	F: Orange juice, carbonad (2.0)	C: White rice, cooked (13.6)	F: Wines (14.3)	C: French/Vienna bread (13.2)
17	C: Whole wheat bread (0)	N: Coconut meat, dried, flaked (14.8)	N: Coconut meat, dried, flaked (14.4)	C: White wheat bread (11.2)
18	C: White wheat bread (0)	F: Apple juice (14.9)	F: Apple juice (16.1)	N: Coconut meat, dried, flaked (11.0)
19	C: French/Vienna bread (0)	F: Raisin (16.3)	F: Raisin (16.6)	V: Chips (9.8)
20	N: Coconut meat, dried, flaked (0)	Cola, carbonated (18.4)	Cola, carbonated (18.6)	C: White rice, cooked (9.0)
21	Cola, carbonated (0)	F: Orange juice, carbonad (18.9)	F: Orange juice, carbonad (19.3)	V: Green beans, boiled (5.7)
22				V: Beetroot, canned (3.0)
23				V: Tomato soup, canned (2.7)
24				V: Catsup (1.7)
25				F: Raisin (1.0)
26				F: Orange juice, carbonad (0)

[a] PAI data could not have been found for 44 processed plant-based food products. [b] Means of the 8 ranks obtained for betaine, choline, PAI, methionine, magnesium, niacin, pantothenic acid and folate densities. [c] Means of the 7 ranks obtained for betaine, choline, methionine, magnesium, niacin, pantothenic acid and folate densities when considering only the 21 products for which PAI density could have been founds in literature. [d] V, C, F, N, L and B correspond respectively to Vegetable, Cereal, Fruit, Nut and seed, Legume and Beverage groups. [e] Density values are expressed in mg *myo*-inositol moities/100 kcal.

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Table 5 Ranking of processed plant-based foods for sum of B-group vitamin, sum of 7 lipotrope and total phenolic compound densities

	Total B vitamins[a]		Total 7 lipotropes[b]		TPC[c]
1	Coffee, ground, brewed (63.404)[d]	1	Coffee, ground, brewed (871.9)	1	Coffee, ground, brewed (12638)
2	Coffee, instant, dry (10.845)	2	V: Spinach, boiled (819.4)	2	Tea, brewed (8823)
3	V[e]: Asparagus, boiled (7.312)	3	V: Beetroot, canned (801.5)	3	Coffee, instant, dry (5114)
4	V: Cauliflower, boiled (5.730)	4	C: Wheat germ, toasted (516.2)	4	V: Artichoke, boiled (2058)
5	V: Broccoli, boiled (4.483)	5	V: Cauliflower, boiled (447.1)	5	V: Spices and dried herbs (1041)
6	V: Zucchini, boiled (4.257)	6	Tea, brewed (428.2)	6	V: Asparagus, boiled (797)
7	V: Tomato sauce, canned (4.182)	7	V: Artichoke, boiled (384.1)	7	V: Sauerkraut (643)
8	V: Tomato paste, canned (4.081)	8	V: Broccoli, boiled (345.4)	8	V: Brussel sprouts, boiled (620)
9	V: Artichoke, boiled (3.623)	9	V: Asparagus, boiled (337.8)	9	V: Cauliflower, boiled (596)
10	V: Carrot, boiled (3.513)	10	V: Sauerkraut (315.3)	10	V: Tomato sauce, canned (572)
11	V: Sweet potato, baked (3.031)	11	V: Zucchini, boiled (314.2)	11	F: Prunes (553)
12	C: Breakfast cereals, ready-to-eat (2.932)	12	V: Green beans, boiled (268.8)	12	V: Beetroot, canned (485)
13	V: Green peas, boiled (2.899)	13	V: Brussel sprouts, boiled (267.0)	13	V: Spinach, boiled (476)
14	V: Brussel sprouts, boiled (2.849)	14	C: Bulgur, cooked (241.9)	14	F: Lime juice (412)
15	V: Sauerkraut (2.495)	15	V: Green peas, boiled (237.1)	15	F: Fig, dried (405)
16	N: Peanut butter (2.437)	16	V: Spices and dried herbs (230.6)	16	V: Broccoli, boiled (404)
17	V: Winter squash, baked (2.423)	17	L: Tofu (209.0)	17	V: Cabbage, boiled (391)
18	V: Spinach, boiled (2.414)	18	L: Common bean, canned (204.0)	18	F: Date, dried (230)
19	V: Cabbage, boiled (2.296)	19	L: Common bean, boiled (200.1)	19	V: Catsup (227)
20	V: Potato with skin, baked (2.229)	20	V: Cabbage, boiled (191.9)	20	V: Green beans, boiled (197)
21	V: Green beans, boiled (2.163)	21	Coffee, instant, dry (185.3)	21	F: Grape juice (166)
22	C: Wheat germ, toasted (2.090)	22	L: Soybean milk (174.6)	22	F: Raisin (151)
23	V: Spices and dried herbs (2.056)	23	V: Sweet potato, baked (161.1)	23	F: Apricot, dried (145)
24	C: Bulgur, cooked (1.924)	24	C: Whole wheat bread (143.0)	24	F: Orange juice (145)
25	C: Whole wheat bread (1.902)	25	V: Sweet maize, boiled (142.8)	25	F: Wine (125)
26	V: Tomato soup, canned (1.799)	26	V: Pickles (133.1)	26	C: Beer (123)
27	V: Sweet maize, boiled (1.786)	27	C: Buckwheat, groats, roasted, cooked (132.7)	27	N: Peanut butter (89)
28	C: Brown rice, cooked (1.763)	28	V: Tomato paste, canned (129.7)	28	C: Whole wheat bread (88)
29	L: Soybean milk (1.655)	29	V: Winter squash, baked (116.3)	29	C: Breakfast cereals, ready-to-eat (82)
30	V: Oven-heated French fries (1.653)	30	V: Tomato sauce, canned (113.2)	30	F: Apple juice (73)
31	V: Chips (1.579)	31	N: Cashew nut, oil-roasted (112.7)	31	L: Common bean, canned (73)
32	C: Buckwheat, groats, roasted, cooked (1.491)	32	C: Brown rice, cooked (109.2)	32	L: Common bean, boiled (72)
33	V: Catsup (1.422)	33	C: Breakfast cereals, ready-to-eat (108.5)	33	F: Peach, canned (64)
34	F: Apricot, dried (1.369)	34	C: French bread, toasted (99.9)	34	L: Soybean milk (63)
35	C: Beer (1.362)	35	C: French/Vienna bread (99.4)	35	N: Pistachio nut, dry-roasted (60)
36	Tea, brewed (1.346)	36	V: Carrot, boiled (97.7)	36	V: Carrot, boiled (43)
37	V: Beetroot, canned (1.278)	37	N: Pistachio nut, dry-roasted (96.4)	37	V: Sweet maize, boiled (40)
38	F : Prunes (1.068)	38	V: Potato with skin, baked (94.6)	38	C: French/Vienna bread (29)
39	F: Orange juice (1.008)	39	C: Pasta, boiled (90.1)	39	Cola, carbonated (21)
40	F: Lime juice (0.929)	40	N: Peanut butter (89.5)	40	C: Brown rice, cooked (20)
41	F: Peach, canned (0.908)	41	V: Tomato soup, canned (83.4)	41	V: Tomato soup, canned (19)
42	L: Common bean, boiled (0.859)	42	C: White wheat bread (81.1)	42	N: Cashew nut, oil-roasted (14)
43	L: Common bean, canned (0.829)	43	C: White rice, cooked (62.9)	43	N: Macadamia nut, dry-roasted (5)
44	F: Date, dried (0.774)	44	C: Beer (59.7)	44	F: Orange juice, carbonated (0)
45	C: White rice, cooked (0.637)	45	V: Oven-heated French fries (56.3)		
46	L: Tofu (0.619)	46	F: Lime juice (52.6)		
47	C: French/Vienna bread (0.503)	47	F: Orange juice (51.7)		
48	F: Grape juice (0.487)	48	F: Fig, dried (50.6)		
49	F: Fig, dried (0.448)	49	N: Coconut milk ()		
50	N: Cashew nut, oil-roasted (0.437)	50	V: Catsup (43.7)		
51	C: White wheat bread (0.430)	51	V: Chips (36.9)		
52	V: Pickles (0.417)	52	F: Prunes (32.2)		
53	C: French bread, toasted (0.412)	53	F: Peach, canned (31.6)		
54	N: Macadamia nut, dry-roasted (0.393)	54	F: Apricot, dried (28.3)		
55	N: Coconut milk (0.381)	55	F: Date, dried (28.0)		
56	F: Pear, canned (0.368)	56	N: Coconut meat, dried, flaked (27.4)		
57	F: Apple juice (0.353)	57	N: Macadamia nut, dry-roasted (25.7)		
58	N: Pistachio nut, dry-roasted (0.352)	58	F: Grape juice (23.4)		
59	C: Pasta, boiled (0.351)	59	F: Wine (21.1)		
60	F: Raisin (0.274)	60	F: Raisin (20.7)		
61	F: Wine (0.245)	61	F: Apple juice (13.2)		
62	N: Coconut meat, dried, flaked (0.211)	62	F: Pear, canned (11.8)		
63	F: Lemonade concentrate (0.074)	63	F: Lemonade concentrate (4.7)		
64	Cola, carbonated (0)	64	F: Orange juice, carbonated (3.4)		
65	F: Orange juice, carbonated (0)	65	Cola, carbonated (3.2)		

[a] Total B vitamins are niacin (vitamin B3), pantothenic acid (vitamin B5) and folates (vitamin B9). [b] Total 7 lipotropes are betaine, choline, methionine, magnesium and B vitamins. [c] TPC, Total Phenolic Compounds as determined by the Folin-Ciocalteu's colorimetric method. [d] Density values are expressed in mg/100 kcal. [e] V, C, F, N, L and B correspond respectively to Vegetable, Cereal, Fruit, Nut and seed, Legume and Beverage groups.

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Table 6 Ranking of processed plant-based foods for the sums of lipotrope densities considering only the 21 products for which potentially available *myo*-inositol density could have been estimated

	BeChIMe[a]		Total B vitamins[b]		Total 7 lipotropes[c]		Total 8 lipotropes[d]
1	V[e]: Beetroot, canned (752.5)[f]	1	V: Cabbage, boiled (2.296)	1	V: Beetroot, canned (801.5)	1	V: Beetroot, canned (817.2)
2	V: Green beans, boiled (474.8)	2	V: Green beans, boiled (2.163)	2	Tea, brewed (428.2)	2	Tea, brewed (638.4)
3	Tea, brewed (384.8)	3	C: Whole wheat bread (1.902)	3	V: Green beans, boiled (268.8)	3	V: Green beans, boiled (591.0)
4	F: Orange juice (356.3)	4	V: Tomato soup, canned (1.799)	4	L: Common bean, canned (204.0)	4	F: Orange juice (381.0)
5	L: Common bean, canned (259.7)	5	V: Chips (1.579)	5	V: Cabbage, boiled (191.9)	5	L: Common bean, canned (305.8)
6	F: Lime juice (223.0)	6	V: Catsup (1.422)	6	C: Whole wheat bread (143.0)	6	F: Lime juice (251.0)
7	V: Cabbage, boiled (153.8)	7	Tea, brewed (1.346)	7	C: French/Vienna bread (99.4)	7	V: Cabbage, boiled (219.2)
8	C: Whole wheat bread (104.3)	8	V: Beetroot, canned (1.278)	8	V: Tomato soup, canned (83.4)	8	C: Whole wheat bread (143.0)
9	F: Apple juice (95.8)	9	F: Orange juice (1.008)	9	C: White wheat bread (81.1)	9	F: Wine (108.3)
10	F: Wine (94.9)	10	F: Lime juice (0.929)	10	C: White rice, cooked (62.9)	10	F: Apple juice (102.7)
11	C: French/Vienna bread (88.4)	11	L: Common bean, canned (0.829)	11	F: Lime juice (52.6)	11	C: French/Vienna bread (99.4)
12	C: White wheat bread (71.5)	12	C: White rice, cooked (0.637)	12	F: Orange juice (51.7)	12	V: Tomato soup, canned (92.3)
13	V: Tomato soup, canned (67.3)	13	C: French/Vienna bread (0.503)	13	V: Catsup (43.7)	13	C: White wheat bread (81.1)
14	V: Catsup (57.9)	14	F: Grape juice (0.487)	14	V: Chips (36.9)	14	V: Catsup (76.7)
15	C: White rice, cooked (56.4)	15	C: White wheat bread (0.430)	15	N: Coconut meat, dried, flaked (27.4)	15	C: White rice, cooked (66.7)
16	F: Grape juice (32.5)	16	F: Apple juice (0.353)	16	F: Grape juice (23.4)	16	F: Grape juice (48.9)
17	V: Chips (28.9)	17	F: Raisin (0.274)	17	F: Wine (21.1)	17	V: Chips (43.4)
18	N: Coconut meat, dried, flaked (17.1)	18	F: Wine (0.245)	18	F: Raisin (20.7)	18	N: Coconut meat, dried, flaked (27.4)
19	F: Raisin (15.6)	19	N: Coconut meat, dried, flaked (0.211)	19	F: Apple juice (13.2)	19	F: Raisin (26.0)
20	F: Orange juice, carbonad (3.4)	20	Cola, carbonated (0)	20	F: Orange juice, carbonad (3.4)	20	F: Orange juice, carbonad (5.4)
21	Cola, carbonated (3.2)	21	F: Orange juice, carbonad (0)	21	Cola, carbonated (3.2)	21	Cola, carbonated (3.2)

[a] BeChIMe is the acronym for the sum of betaine, choline, PAI and methionine densities. [b] Total B vitamins are niacin (vitamin B3), pantothenic acid (vitamin B5) and folates (vitamin B9) densities. [c] Total 7 lipotropes are betaine, choline, methionine, magnesium and B vitamin densities. [d] Total 8 lipotropes are betaine, choline, PAI, methionine, magnesium and B vitamin densities. [e] V, C, F, N, L and B correspond respectively to Vegetable, Cereal, Fruit, Nut and seed, Legume and Beverage groups. [f] Density values are expressed in mg/100 kcal.

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Table 7 Effect of specific processes on the lipotrope density and content of some grains[a]

	Cereal fermentation						Cereal toasting				Cereal cooking					
	Barley malt flour	Beer	Whole-grain wheat flour	Whole wheat bread	White wheat flour	White wheat bread	Wheat germ	Toasted wheat germ	French/Vienna bread	Toasted French/Vienna bread	Roasted buckwheat groats	Cooked roasted buckwheat groats	White rice	Cooked white rice	Pasta	Cooked pasta
Food code[b]	C2	B119	C15	C20	C16	C21	C18	C19	C22	C23	C3	C4	C11	C12	C25	C26
Betaine density	19.3	19.4	23.3	26.3	0.5	12.1	347.9	210.5	21.3	21.0	0.8	0.6	1.2	0.2	39.0	29.9
Content change (%)[c]		+48		+21		+2516		-40		-1		-36		-79		-23
Choline density	11.1	23.8	9.9	11.6	2.9	5.6	50.3	48.7	5.8	6.4	16.4	22.7	26.5	1.7	4.3	4.4
Content change (%)		+215		+25		+95		-5		+11		+39		-94		+4
Methionine density	85.8	0	67.7	66.4	53.1	53.8	136.3	163.7	61.3	61.3	46.4	50.0	45.5	50.7	41.8	43.3
Content change (%)		-100		+5		+2		+19		0		+8		+13		+3
Magnesium density	28.3	15.2	44.1	36.8	6.4	9.2	71.5	91.2	10.5	10.7	67.0	57.9	6.8	9.6	15.1	12.2
Content change (%)		-14		-10		+44		+26		+2		-13		+43		-19
Niacin density	1.65	1.25	2.03	1.64	0.35	0.34	2.04	1.59	0.34	0.31	1.56	1.07	0.48	0.32	0.48	0.27
Content change (%)		+12		-13		-1		-23		-10		-31		-31		-44
Pantothenate density	0.17	0.10	0.32	0.24	0.07	0.08	0.67	0.40	0.15	0.10	0.37	0.41	0.38	0.31	0.12	0.08
Content change (%)		-13		-21		+14		-42		-36		+9		-17		-38
Folate density	0.011	0.017	0.014	0.021	0.008	0.010	0.084	0.100	0.012	0.009	0.013	0.016	0.002	0.002	0.005	0.005
Content change (%)		+122		+63		+19		+18		-28		+24		+29		-10
PAI[d] density	26.9	-[e]	-	≈ 0[f]	-	≈ 0	32.5	-	≈ 0	-	-	-	-	3.9	-	-
↓ density(ies)[g]	Raw	4/7	Raw	4/7	Raw	1/7	Raw	4/7	Raw	4/7	Raw	3/7	Raw	4/7	Raw	4/7
↓ content(s)		3/7		3/7		1/7		4/7		4/7		3/7		4/7		5/7
TPC[h] density	45.6	122.7	34.8	88.1	19.0	-	104.3	-	29.5	-	107.9	-	5.4	-	-	-
Content change (%)		297		172		-		-		-		-		-		-
IP[i] density	56.3	-	79.9	60.8	17.5	11.2	222.3	-	13.2	-	-	-	-	9.0	25.3	-
Content change (%)		-		-18		-35		-		-		-		-		-

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	Maize nixtamalization		Cereal refining				Common bean boiling and canning			Soybean processing				Peanut processing	
	Whole-grain maize cornmeal	Whole-grain masa	Whole-grain wheat flour	White wheat flour	Cooked brown rice	Cooked white rice	Raw common bean	Boiled common bean	Canned common bean	Raw soybean	Defatted soybean flour	Tofu	Soybean milk	Raw peanut	Peanut butter
Food code[b]	C5	C7	C15	C16	C13	C12	L28	L29	L30	L31	L32	L33	B129	N84	N85
Betaine density	3.5	0.6	23.3	0.5	0.5	0.2	0.092	0.096	0.133	0.3	1.0	2.3	2.0	0.1	0.1
Content change (%)[c]		-84		-98		-49		-18	+43		+107	+721	+493		+27
Choline density	6.4	1.3	9.9	2.9	8.9	1.7	28.1	35.5	39.9	28.7	67.3	39.5	48.3	9.2	11.0
Content change (%)		-81		-67		-81		+21	+39		+58	+53	+54		+19
Methionine density	49.5	58.0	67.7	53.1	56.3	50.7	106.6	116.3	117.9	120.3	224.4	120.6	72.4	55.0	50.0
Content change (%)		+13		-12		+8		+4	+8		+27	+12	-44		-10
Magnesium density	37.0	32.5	44.1	6.4	41.7	9.6	59.8	47.4	45.2	68.5	102.7	46.0	50.3	29.1	26.0
Content change (%)		-15		-84		-76		-26	-26		+2	-25	-32		-11
Niacin density	1.06	1.09	2.03	0.35	1.48	0.32	0.67	0.49	0.55	0.40	0.92	0.46	0.58	2.09	2.24
Content change (%)		0		-80		-78		-30	-50		+59	+29	+36		+7
Pantothenate density	0.12	0.19	0.32	0.07	0.28	0.31	0.28	0.22	0.20	0.19	0.71	0.12	1.04	0.31	0.18
Content change (%)		+53		-75		+14		-25	-30		+147	-33	+397		-41
Folate density	0.007	0.007	0.014	0.008	0.004	0.002	0.157	0.141	0.077	0.092	0.108	0.046	0.032	0.042	0.014
Content change (%)		-7		-33		-40		-14	-52		-20	-44	-68		-67
PAI[d] density	-	-	-	-	-	3.9	24.6	-	101.8	12.3	-	-	-	4.4	-
		-		-		-		-	+305		-	-	-		-
↓ density(ies)[g]	Raw	3/7	Whole-grain	7/7	Whole-grain	6/7	Raw	4/7	4/8	Raw	0/7	3/7	3/7	Raw	4/7
↓ content(s)		4/7		7/7		5/7		5/7	4/8		1/7	3/7	3/7		4/7
TPC[h] density	42.3	9.6	34.8	19.0	20.4	-	326.3	65.6	72.6	123.8	72.1	-	62.8	69.5	88.7
Content change (%)		-78		-39		-		-84	-78		-60	-	-53		27
IP[i] density	60.6	49.5	79.9	17.5	-	9.0	105.5	98.6	100.0	81.3	192.5	74.1	78.8	37.4	-
Content change (%)		-21		-76		-		-11	-7		+61	+3	-11		-

[a] Results are expressed in mg/100 kcal. [b] Product description can be found in Table 1, Supplementary Materials. [c] Variation(s) in compound content as compared to raw product (dry weight basis). [d] PAI: Potentially available *myo*-inositol fraction

[e] No data found for the PAI content. [f] "0" value has to be read near 0, that is "~0", since, in some cases, *myo*-inositol content was under the limit of detection or indicated as "traces". [g] Number of lipotropic compounds for which the density/content weight basis) decreases after processing: each density- and content-value is compared with that of initial food product called "Raw" and "Whole-grain". [h] TPC: "easily extractable" total phenolic compounds as determined with the Folin-Ciocal method. [i] IP: *myo*-inositol phosphates (includes *myo*-inositol moities derived from IP6 to IP5).

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Table 8 Effect of processing on the lipotrope density and content of some vegetables[a]

	Vegetable boiling[b] (n = 5)		Beetroot canning		Cucumber pickling		Cabbage processing		
Food code[c]	Raw vegetables B119	Boiled vegetables C15	Raw beetroot V41	Canned beetroot V42	Raw peeled cucumber V54	Pickles V55	Raw cabbage V46	Boiled cabbage V47	Sauerkraut V48
Betaine density	160.0	38.4	466.9	674.2	1.1	0	3.2	1.0	4.8
Content change (%)[d]		-75		+53		-100		-66	-19
Choline density	68.9	92.3	19.4	25.3	61.9	23.3	64.6	60.8	97.8
Content change (%)		+32		+38		-76		+3	-17
Methionine density	100.3	112.1	51.8	37.3	58.9	34.2	72.7	64.6	85.4
Content change (%)		+13		-23		-63		-2	-36
Magnesium density	112.8	111.6	66.1	63.4	130.3	75.2	87.8	63.2	124.8
Content change (%)		-9		-23		-64		-23	-23
Niacin density	3.16	2.66	0.96	0.59	0.40	0.04	1.51	1.71	1.37
Content change (%)		-15		-35		-94		+8	+24
Pantothenate density	1.15	1.00	0.45	0.58	2.61	0.37	0.70	0.50	0.89
Content change (%)		-19		+38		-91		-22	-31
Folate density	0.277	0.345	0.313	0.112	0.152	0.007	0.210	0.084	0.230
Content change (%)		+16		-62		-97		-56	-40
PAI[e] density	154.4[e]	27.3[e]	23.3	15.7	118.3	-[f]	154.4	27.3	-
Content change (%)		-81		-28		-		-81	-
↓ density(ies)[g]	Raw	5/8	Raw	5/8	Raw	7/7	Raw	7/8	1/7
↓ content(s)[g]		5/8		5/8		7/7		6/8	6/7
TPC[h] density	554.2	445.2	506.3	484.5	260.5	-	593.9	391.3	643.0
Content change (%)		-23		+2		-		-28	-41
IP[i] density	12.1[j]	20.1[j]	4.0	3.0	44.5	-	16.1	25.6	-
Content change (%)		+76		-21		-		+63	-

	Potato processing				Tomato processing				
	Raw potato with skin V62	Baked potato with skin V63	Oven-heated French fries V64	Chips V65	Raw tomato V73	Canned tomato sauce V74	Canned tomato paste V75	Catsup V76	Canned condensed tomato soup B131
Betaine density	1.4	0.2	0.4	0.04	0.4	2.6	0.5	0.2	7.0
Content change (%)[d]		-84	-69	-96		+478	+20	-51	+1790
Choline density	19.9	18.9	13.7	2.2	43.1	32.0	49.3	11.1	21.6
Content change (%)		-4	-15	-82		-25	+21	-68	-39
Methionine density	45.2	39.7	25.5	20.2	45.0	22.6	22.7	13.7	29.8
Content change (%)		-12	-32	-27		-50	-47	-62	-19
Magnesium density	32.8	33.5	15.5	12.8	70.7	51.7	53.1	17.4	23.2
Content change (%)		+3	-42	-36		-27	-21	-69	-60
Niacin density	1.62	1.76	1.32	0.77	3.82	3.15	3.89	1.37	1.71
Content change (%)		+10	0	-23		-17	+8	-55	-45
Pantothenate density	0.43	0.44	0.31	0.80	0.57	1.00	0.18	0.04	0.09

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Content change (%)		+3	-10	+205		+75	-67	-91	-81
Folate density	0.025	0.029	0.017	0.014	0.096	0.029	0.015	0.009	0
Content change (%)		+17	-20	-11		-70	-84	-88	-100
PAI[e] density	-	-	-	6.5	304.0	-	-	33.0	9.0
Content change (%)		-	-	-		-	-	-86	-96
↓ density(ies)[g]	Raw	3/7	7/7	6/7	Raw	5/7	4/7	8/8	7/8
↓ content(s)[g]		3/7	6/7	6/7			4/7	8/8	7/8
TPC[h] density	34.3	-	-	-	290.5	572.4	-	227.4	19.4
Content change (%)		-	-	-		+98	-	+81	-92
IP[i] density	14.3	-	16.3	9.8	1.3	-	-	1.7	2.7
Content change (%)		-	+32	+8		-	-	+47	+217

[a] Results are expressed in mg/100 kcal. [b] Values for raw and boiled vegetables are means of 5 raw and boiled vegetables for betaine, choline, methionine, magnesium, B vitamin and TPC densities and contents, *i.e.* asparagus (V36 *vs* V37), broccoli (V43 *vs* V44), cabbage (V46 *vs* V47), carrot (V50 *vs* V51) and spinach (V69 *vs* V70); for asparagus, broccoli, cabbage, carrot and spinach, content changes (dry weight basis) upon boiling were respectively -70, -91, -66, -72 and -78% for betaine, +49, +84, +3, +17 and +7% for choline, -81% (cabbage only) for PAI, +4, -29, -2, -22 and +115% for methionine, -8, -19, -23, -1 and +6% for magnesium, +2, -49, +8, -9 and -27% for niacin, -25, +17, -22, -25 and -42% for pantothenic acid, +26, +163, -56, -41 and -12 for folates, +74, -34, -28, -75 and -52% for TPC, and +63 (cabbage) and +89% (spinach) for IP. [c] Product description can be found in Table 1, Supplementary Materials. [d] Variation(s) in compound content on dry weight basis as compared to raw product. [e] PAI: Potentially Available Inositol fraction; for boiled vegetables, only data for raw and boiled cabbage were given (no data have been found in literature for other boiled vegetables). [f] No data found. [g] Number of lipotropic compounds for which the density and content (dry weigth basis) decreases after processing: each density- and content-value is compared with that of initial food product called “Raw”. [h] TPC: “easily extractable” total phenolic compounds as determined with the Folin-Ciocalteu’s method. [i] IP: *myo*-Inositol Phosphates moieties. [j] Values are means of only raw and boiled cabbage (V47) and spinach (V70).

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Table 9 Effect of processing on the lipotrope density and content of some fruits[a]

	Apple juicing		Fruit canning				Grape processing				Plum drying		Orange processing		
	Raw apple	Apple juice	Raw peach	Canned peach	Raw pear	Canned pear	Raw grape	Raisins	Grape juice	Wine	Raw plum	Prune	Raw orange	Orange juice	Soda
Food codes[b]	F92	B118	F108	F109	F110	F111	F100	F101	B124	B132	F113	F114	F107	B127	B128
Betaine density	0.2	0.2	0.4	0.4	0.3	0.4	0.1	0.1	0.3	1.0	0.2	0.2	0.2	0.5	0.2
Content change (%)[c]		+43		+7		+45		-3	+250	+1697		-26		+177	-67
Choline density	7.3	3.9	16.8	4.4	10.5	2.7	7.8	3.5	5.1	6.3	12.3	4.6	18.6	20.9	1.2
Content change (%)		-37		-71		-69		-55	-30	+39		-64		+33	-92
Methionine density	2.1	2.2	27.6	19.1	4.1	2.8	12.4	6.7	1.6	0.5	19.0	7.4	19.9	5.6	0
Content change (%)		+20		-25		-17		-46	-86	-94		-63		-67	-100
Magnesium density	10.7	6.5	24.8	6.7	14.4	5.6	9.7	10.1	15.9	13.1	16.6	19.0	24.3	23.7	2.0
Content change (%)		-29		-70		-52		+5	+75	+130		+8		+15	-90
Niacin density	0.19	0.22	2.22	0.84	0.32	0.34	0.26	0.24	0.42	0.20	1.00	0.87	0.94	0.54	0
Content change (%)		+31		-59		+28		-5	71	30		-17		-32	-100
Pantothenate density	0.13	0.14	0.42	0.07	0.10	0.03	0.07	0.03	0.07	0.05	0.32	0.20	0.58	0.39	0
Content change (%)		+24		-95		-62		-58	+1	+12		-42		-19	-100
Folate density	0.006	0	0.011	0.004	0.014	0.001	0.003	0.002	0.005	0.001	0.012	0.002	0.075	0.070	0
Content change (%)		-100		-88		-61		-40	90	-20		-85		+10	-100
PAI[d] density	85.3	89.5	147.1	-[e]	42.4	-	21.9	5.4	25.5	87.1	113.8	-	316.5	329.3	2.0
Content change (%)		+22		-		-		-75	+23	+573		-		+23	-99
↓ density(ies)[f]	Raw	3/8	Raw	6/7	Raw	5/7	Raw	6/8	2/8	5/8	Raw	5/7	Raw	5/8	7/8
↓ content(s)[f]		3/8		6/7		5/7		7/8	2/8	2/8		6/7		3/8	8/8
TPC[g] density	446.8	73.4	513.9	64.0	362.3	-	224.9	150.6	165.6	125.3	967.0	552.7	616.1	145.2	0
Content change (%)		-81		-86		-		-33	-22	-6		-46		-72	-100
IP[h] density	36.5	-	-	-	-	-	-	1.0	-	-	-	-	-	-	0
Content change (%)		-		-		-		-	-	-		-		-	-100

[a] Results are expressed in mg/100 kcal. [b] Product description can be found in Table 1, Supplementary Materials. [c] Variation(s) in compound content on dry weight basis as compared to raw product. [d] PAI: Potentially Available Inositol fraction; for boiled vegetables, only data for raw and boiled cabbage were given (no data have been found in literature for other boiled vegetables). [e] No data found. [f] Number of lipotropic compounds for which the density and content (dry weigth basis) decreases after processing: each density- and content-value is compared with that of initial food product called “Raw”. [g] TPC: “easily extractable” total phenolic compounds as determined with the Folin-Ciocalteu’s method. [h] IP: *myo*-Inositol Phosphates moieties.

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Table 10 Effect of processing whole-grain cereals and common bean upon free *myo*-inositol and *myo*-inositol phosphate profiles[a]

	IP6 (%)	IP5 (%)	IP4 (%)	IP3 (%)	IP2 (%)	IP1 (%)	Free *myo*-Inositol (%)
Raw cereals							
Whole-grain cornmeal	95.8	4.2	-	-	-[b]	-	-
Whole-grain quinoa	84.5	0.8	0.8	0	-	-	14.0
Dark whole-grain rye flour	90.4	9.6	0	0	-	-	-
Whole-grain oat flour	79.9	17.5	-	-	-	-	2.6
Whole-grain wheat flour	44.6	12.4	8.1	12.0	7.7	15.3	-
Means	60.8	7.1	2.4	3.2	6.1	12.1	6.6
Processed cereals							
White wheat flour	6.6	13.4	20.2	12.4	16.9	30.7	-
Whole wheat bread	15.6	16.8	9.9	14.5	15.2	28.0	-
White wheat bread	12.7	14.3	10.3	28.2	22.3	12.3	-
Dry pasta	85.8	12.3	2.0	0	-	-	-
Ready-to-eat Breakfast cereals	52.0	33.5	10.8	3.7	-	-	-
Means	34.6	18.2	10.6	11.8	10.9	13.8	-
Raw legumes							
Common bean	80.4	10.7	1.8	0.2	-	-	7.0
Soybean	57.6	22.8	6.4	3.2	-	-	10.0
Lentil[c]	97.4	1.7	0.9	-	-	-	-
Means	75.9	11.3	2.9	1.6	-	-	8.2
Processed legumes							
Boiled common bean	69.6	18.4	8.2	1.4	-	-	2.4
Canned common bean	71.6	20.0	5.7	2.7	-	-	-
Means	69.7	19.0	6.9	2.1	-	-	2.4

[a] Percentages were calculated from *myo*-inositol phosphates (from IP6 to IP1) and from free *myo*-inositol contents collected in literature[2]; data for processed Vegetable, Nut and seed, Fruit and Beverage groups were not sufficient to calculate significant percentage values; free *myo*-inositol was different from what we have defined as the potentially available *myo*-inositol fraction (PAI) since the PAI fraction, in addition to free *myo*-inositol, may also include *myo*-inositol moieties coming from other soluble conjugated *myo*-inositols such as galactinol (glycosylated *myo*-inositol). [b] No data found. [c] Data are from Helfrich and Bettmer [92] and are not used for other calculations within this study; water and energy contents of lentils are from USDA databases[1].