

**ANTIOXIDANT**  
CONTENT OF  
**FOODS**

PREPARED BY

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## Preface

This document, the *Antioxidant Content of Foods*, came about in order to better understand the impact eating certain foods has on one's antioxidant level. Fortunately, we now have an accurate method to measure antioxidant levels clinically.

Antioxidants have long been studied and, by definition, inhibit oxidation (a process which involves a loss of electrons or an increase in oxidation state). Oxidation reactions generate free radicals, which trigger further reactions causing cell damage and death. Antioxidants become reducing agents and are oxidized sacrificially to terminate these oxidation reactions.

Dietary antioxidants (those in foods) have been found in studies to lower the risk of cancer, heart disease, neuro-degenerative diseases and many more. Although not a complete measurement of health, a high level of antioxidants is an important aspect to health.

The content in the following tables was obtained and organized from various sources which can be found on page 41. Two different antioxidant assays were included: the Ferric Reducing Ability of Plasma (FRAP) assay and the Trolox Equivalent Antioxidant Capacity (TEAC) assay. It is possible that a food may rank slightly higher in one assay than another assay because the mode of measurement is different. These differences are often negligible, but the same assay was used consistently within a given category (e.g. Fruits and Fruit Juices, Vegetables, Grains).

The following categories were based upon the FRAP assay: Fruits and Fruit Juices, Vegetables, Grains, Legumes, Meat, Seafood and Poultry, Dairy, Herbs and Spices, Beer, Wine, Coffee and Tea.

The following categories were based upon the TEAC assay: Nuts, Seeds and Oils. Categories using the TEAC assay were ranked because specific antioxidant content could not be found in the literature.

Note that measurements were based upon 100-gram samples, or approximately the weight of one banana. Watermelon, for example, ranks near the end, but this is likely due to its high water content. You need to eat a larger portion in order to get the same amount of antioxidants as other fruits.

There are nine categories of foods in the following tables. Each category is organized top-to-bottom with the highest antioxidant-containing food listed first and the lowest antioxidant-containing food listed last.

As you are looking through the list, some foods may be unfamiliar to you – take this as an opportunity to discover new foods! The availability of these foods will differ depending on where you live and shop.

Additionally, at the end of the antioxidant tables you will find information on various cooking methods for a sample of vegetables because cooking methods impact nutrition.

It is our intent to educate you so that you can combine ingredients and create meals with the maximum benefit. Please enjoy this work and give us your feedback via email, phone, or the patient portal so we can continue to make this information more useful.

Sincerely,



*Alyssa A. Martel*

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## Table of Contents

FRUITS AND FRUIT JUICES.....	7
VEGETABLES.....	13
GRAINS .....	17
LEGUMES .....	19
MEAT, SEAFOOD AND POULTRY.....	21
DAIRY .....	23
NUTS, SEEDS AND OILS .....	24
HERBS AND SPICES .....	25
BEER, WINE, COFFEE AND TEA .....	33
SAMPLE STATISTICS.....	34
COOKING METHODS.....	35
OPTIMAL TIME TO CONSUME PRODUCE .....	39
REFERENCES .....	41

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<b>Fruits and Fruit Juices</b>	<b>Antioxidant content in mmol/100g</b>
Amla berries, dried	261.53
Dog Rose, dried, whole	78.09
Dog Roseshell, flour	75.84
Pomegranate, only yellow pith	55.52
Dog Rose, powder	54.30
Blackberries, dried	37.08
Red whortleberries, cultivated, dried	32.28
Amla, syrup from canned Indian Gooseberries	29.70
Zereshk (Barberries, dried)	27.30
Dog Rose	25.86
Rowanberries, dried	19.13
Chokeberries, black, wild	13.48
Amla, Indian gooseberries, whole, canned	13.27
Fruit from the African Baobab tree	10.84
Blueberries	9.24
Blackcurrant, cultivated	9.09
Pomegranate, arils and carpellar membrane	9.05
Crowberries	7.89
Bilberries, wild	7.57
Pomegranate arils, dried	7.28
Sour cherries, cultivated	7.14
Elderberry, syrup, without sugar (undiluted)	6.31
Blackberries, wild	6.13
Apples, dried	6.07
Blueberry, syrup, without sugar (undiluted)	5.91
Pomegranate, whole	5.57
Wild strawberries	5.44
Elderberries, black (berries from common elder), wild	5.24
Red whortleberries, wild	5.00
Apricots, dried	4.67
Goji Berries, organic, dried	4.31
Sweet cherries, dried	4.05
Blackberries, cultivated	4.02
Lemon skin	4.00
Prunes	3.70
Cranberries, cultivated	3.29
Olives, black Kalamata, with stone	3.25



<b>Fruits and Fruit Juices</b>	<b>Antioxidant content in mmol/100g</b>
Plums	3.24
Olives, Kalamata, with stone	3.13
Lime skin	3.05
Mango, dried	2.82
Blueberries, canned, heavy syrup, drained solids	2.79
Blackcurrant, syrup (40%), with sugar (undiluted)	2.73
Blueberry, jam	2.68
Juice, pomegranate, freshly squeezed from whole pomegranate	2.57
Cloudberry, wild	2.53
Grapes, blue	2.42
Blueberry, syrup (undiluted)	2.41
Juice, orange, frozen concentrate	2.39
Blackcurrant, syrup (100%), with sugar (undiluted)	2.38
Red whortleberries, syrup, without sugar (undiluted)	2.34
Raspberries, cultivated	2.33
Olives, green, with stone	2.26
Sea buckthorn, berries	2.21
Strawberries, cultivated	2.16
Crowberry, syrup (undiluted)	2.05
Strawberries	2.05
Cranberries, dried	2.03
Juice, apple, carrot, strawberry	1.96
Pomegranate, arils	1.94
Cranberry, syrup, without sugar (undiluted)	1.93
Blueberries, cultivated	1.92
Dates, dried	1.88
Figs, dried, Calimyrna	1.83
Juice, grape, purple	1.74
Raspberries, wild	1.73
Juice, with fruits and berries	1.69
Syrup from canned cherries	1.68
Cherries, sour, canned, water pack, drained liquid	1.66
Blueberries, canned, light syrup, drained liquid	1.65
Cherries, sour, canned, heavy syrup, total can contents	1.65
Kiwi, gold	1.63
Redcurrant, cultivated	1.61
Sweet cherries, dark, canned	1.60
Pomegranate, sour, arils and juice	1.59

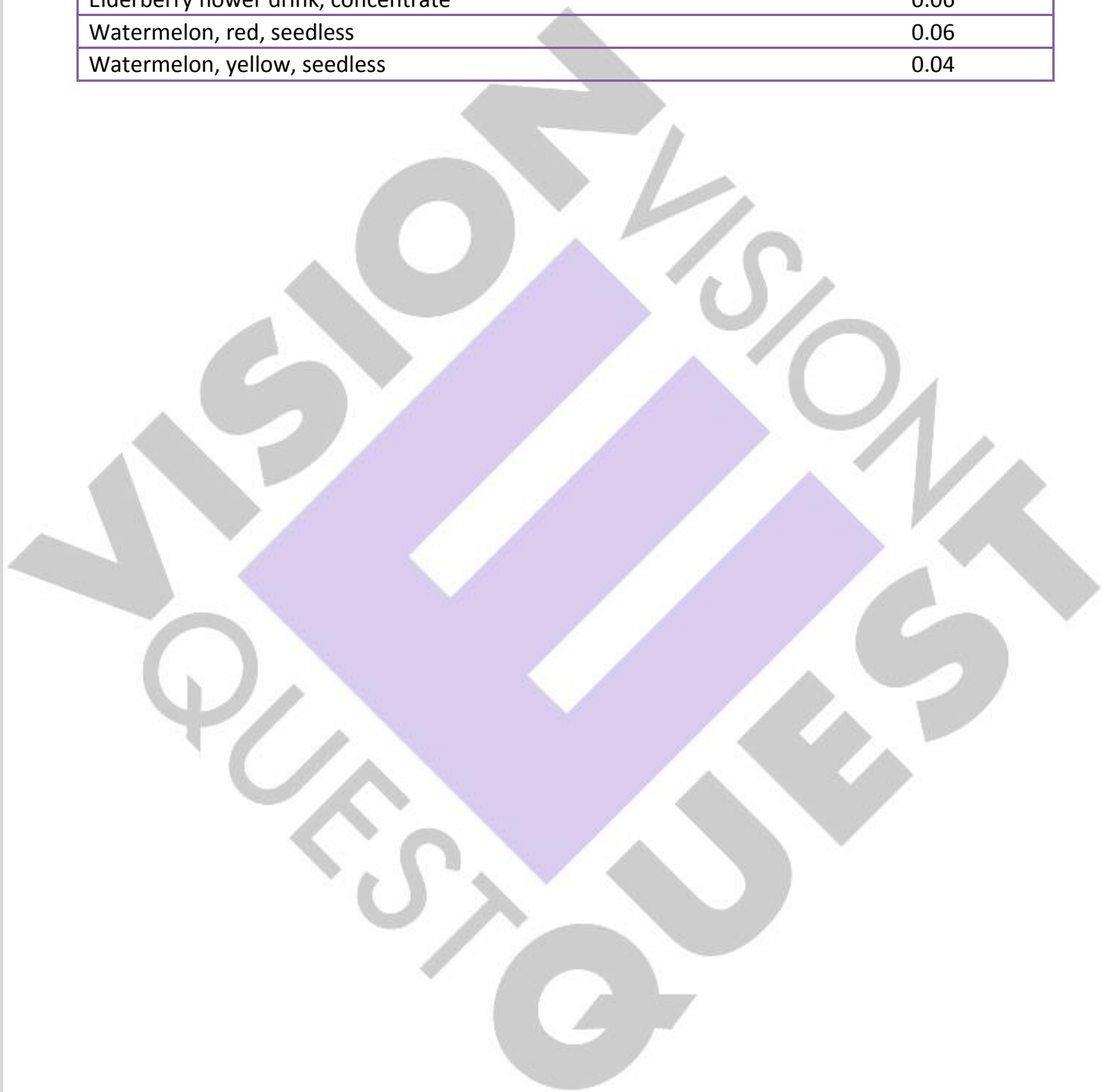


<b>Fruits and Fruit Juices</b>	<b>Antioxidant content in mmol/100g</b>
Pomegranate, freshly squeezed juice	1.59
Prune porridge	1.54
Juice, grape	1.50
Gooseberries, cultivated	1.45
Plums, red	1.42
Sweet cherries, cultivated	1.42
Pineapple	1.36
Blueberries, dried	1.32
Figs, dried, Mission	1.31
Kiwi, yellow	1.29
Juice, blackberry, juice/syrup from canned blackberries	1.27
Lemonade, grape	1.27
Raspberry, jam	1.26
Guava	1.21
Juice, prune	1.14
Juice, white grape	1.14
Raisins	1.14
Figs, dried	1.08
Orange	1.08
Juice, grapefruit	1.06
Dates	1.04
Kiwi	1.02
Lemon	1.02
Olives, green, without stone	1.01
Pomegranate, sweet, arils and juice	1.00
Juice, banana, pumpkin, kiwi	1.00
Clementines	0.99
Plums, red, canned	0.97
Oranges, navel	0.89
Pomegranate, only the white kernels	0.88
Juice, grape and grape blends, sweetened	0.87
Jam, apple	0.86
Juice, pineapple, canned or bottled, unsweetened	0.84
Grapefruit, red	0.83
Grapefruit, yellow	0.82
Juice, orange	0.81
Persimmon (Sharon fruit)	0.79
Syrup from canned plums	0.79

<b>Fruits and Fruit Juices</b>	<b>Antioxidant content in mmol/100g</b>
Figs	0.78
Juice, raspberry	0.78
Figs, dried, Smyrna	0.76
Juice, orange and strawberry	0.76
Papaya	0.76
Juice, cranberry	0.75
Lime	0.73
Dates, Deglet Noor	0.72
Juice, apple, calcium enriched, with added vitamin C	0.72
Juice, fruits with pomegranate	0.72
Juice, cranapple	0.71
Juice, grape and grape blends, unsweetened	0.69
Currant	0.67
Juice, orange, with pulp	0.65
Strawberry, jam	0.64
Sweet cherries	0.62
Tangerines	0.62
Juice, apple	0.60
Apples, red	0.57
Juice, orange, from Florida, with Omega-3 from plant	0.57
Juice, orange, refrigerated	0.57
Dates, Medjool	0.56
Juice, grapefruit, red, with pulp	0.55
Apples, Granny Smith	0.54
Juice, orange and pineapple	0.53
Apricots	0.52
Juice, orange and pineapple with pulp	0.51
Grapes, red	0.47
Japanese plum pulp, paste	0.45
Passion fruit, wild, handpicked	0.44
Tangerines, Honey	0.44
Juice, strawberry	0.43
Kiwi, green	0.43
Juice, pineapple	0.42
Grapes, green	0.41
Apples, red, Fuji	0.40
Apples, red, Red Delicious	0.40
Mango, red	0.37

<b>Fruits and Fruit Juices</b>	<b>Antioxidant content in mmol/100g</b>
Peaches, canned with syrup	0.37
Physalis ( <i>Physalis peruviana</i> ) wild	0.37
Mango, yellow	0.36
Apples, red, Pink Lady	0.35
Cherries	0.35
Juice, mango and pineapple	0.34
Nectar, orange	0.34
Juice, lemon	0.33
Mango	0.33
Juice, orange and carrot	0.29
Melon, yellow	0.29
Olives, black, without stone	0.23
Pears, Red Anjou	0.23
Apples, Gala	0.22
Pears, Bartlett	0.22
Pears, Green Anjou	0.22
Melon, Cantaloupe	0.19
Pears	0.18
Pears, Bosc	0.18
Pineapple, dried	0.18
Plantain	0.17
Apples, Golden Delicious	0.15
Peaches	0.15
Apricots, canned, drained	0.14
Glacè cherries	0.14
Juice from canned apricots	0.14
Nectar, apple	0.14
Papaya, dried	0.14
Honeydew	0.12
Nectarines	0.12
Ice, sorbet, mango	0.11
Peaches, canned in heavy syrup, drained liquid	0.11
Squash, green	0.11
Apples, Golden Delicious, without peel	0.10
Pears, Bartlett, canned	0.10
Syrup from canned pears	0.10
Apples, red, Red Delicious, without peel	0.08
Banana	0.08

<b>Fruits and Fruit Juices</b>	<b>Antioxidant content in mmol/100g</b>
Nectar, apple with pear	0.08
Elderberry flower drink, concentrate	0.06
Watermelon, red, seedless	0.06
Watermelon, yellow, seedless	0.04



Vegetables	Antioxidant content in mmol/100g
Leaves from the African Baobab tree, dry, crushed	48.07
Moringa Stenopetala, dried leaves and stem	11.9
Artichoke, canned	4.76
Artichoke, microwaved	4.69
Artichoke, water pack	4.32
Okra / gumbo, dry, flour	4.24
Curly kale, red	4.09
Artichoke, boiled	3.89
Cauliflower, blue, cooked	3.52
Cauliflower, blue	3.33
Cabbage, red, cooked	2.15
Pepper, bell-, orange	1.94
Pepper, bell-, red	1.81
Pepper, bell-, yellow	1.79
Cabbage, red	1.78
Beet (beetroot)	1.68
Artichoke, leaves	1.66
Pepper, red, cooked	1.64
Curly kale	1.62
Spinach, frozen, microwaved	1.31
Tomatoes, sundried	1.3
Pepper, green, cooked	1.22
Spinach, frozen, boiled	1.1
Iceberg salad	1.05
Leaves of the pumpkin plant	1.02
Broccoli, cooked	1.00
Broccoli raab, cooked	0.97
Potato, blue	0.93
Pepper, red	0.91
Leek	0.90
Edible mushroom (Agaricus bisporus/champignon)	0.90
Spinach	0.89
Broccoli	0.85
Cauliflower, boiled	0.80
Mushroom, Matriske (Russulaceae)	0.80
Sweet potato, baked	0.79
Asparagus, cooked	0.75
Brussels sprouts	0.74

Vegetables	Antioxidant content in mmol/100g
Onion, red	0.71
Artichoke	0.69
Mushroom, Funnel chantarelle, wild	0.68
Broccoli raab	0.65
Sugar peas	0.64
Rhubarb	0.62
Tomatoes, cherry	0.62
Lettuce, Lollo Rosso	0.60
Sweet potato, blue (Yam), peeled	0.54
Mushroom (Pholiota mutabilis)	0.50
Potatoes, Russet, cooked	0.50
Vegetable juice	0.50
Horse radish	0.49
Leaves of the Sweet Potato plant	0.48
Cabbage, cooked	0.45
Potatoes, red, cooked	0.45
Pepper, bell-, green	0.44
Mushroom, white, microwave cooked	0.43
Potatoes, white, cooked	0.43
Swede (rutabaga)	0.43
Okra (Abelmoschus esculentus)	0.42
Potatoes, Russet	0.42
Savoy cabbage	0.42
Avocado	0.41
Mushroom, white	0.38
Asparagus	0.36
Cauliflower	0.35
Tomatoes, plum	0.35
Asparagus bean, frozen	0.34
Mushroom, Portabella, grilled	0.34
Onion, boiled	0.34
Chinese cabbage	0.33
Mushroom, Shiitake, stir-fried	0.33
Onion	0.33
Sweet potato, boiled	0.33
Mixed vegetables	0.31
Mushroom, Enoki	0.31
Tomatoes, cluster tomatoes	0.29



Vegetables	Antioxidant content in mmol/100g
Turnip	0.29
Tomatoes, organic, peeled	0.28
French fried potatoes, frozen, cooked	0.27
Mushroom, Hedgehog fungus	0.27
Onion, yellow, cooked	0.26
Aubergine	0.25
Cantaloupe	0.25
Mushroom, Crimini	0.25
Lettuce, Green leaves	0.24
Onion, yellow	0.24
Tomatoes in tomato juice, canned, whole	0.24
Lettuce, Red leaves	0.23
Mushroom, Maitake	0.23
Mushroom, white, stir-fried	0.23
Garlic	0.22
Mushroom, Portabella	0.22
Potatoes, red	0.22
Tomatoes	0.22
Yam	0.22
Lettuce, Romaine	0.21
Sweet potato, pale	0.20
Potatoes, white	0.19
Tomato juice	0.19
Onion, small	0.18
Tomatoes, steak	0.18
Cassava	0.17
Lettuce, Iceberg	0.17
Beans with tomato sauce, canned	0.16
Sweet potato, red/white	0.16
Cabbage	0.15
Sweet onions	0.15
Alfa sprouts	0.14
Lettuce	0.13
Potatoes	0.13
Onion, white	0.12
Radishes	0.12
Sweet potato, yellow	0.12
Parsnip	0.11



Vegetables	Antioxidant content in mmol/100g
Summer squash, green	0.11
Carrots, cooked	0.10
Celeriac, turnip-rooted celery	0.10
Carrots, cut, frozen, microwaved	0.08
Carrots, frozen	0.07
Carrots, frozen, boiled	0.07
Fennel	0.07
Carrots	0.06
Carrot juice	0.06
Carrots, Yukon	0.06
Celery	0.06
Mushroom, Oyster	0.06
Summer squash, yellow	0.06
Pumpkin	0.05
Baby carrots	0.04
Courgettes	0.03
Cucumber	0.02
Celery, blanched	0.00

Grains	Antioxidant content in mmol/100g
Spring wheat	3.31
Autumn wheat	3.24
Wheat germ	3.23
Colosseo (durum)	2.59
Buckwheat, whole meal flour	2.24
Buckwheat, white flour	1.73
Millet, white flour	1.31
Barley, whole meal flour	1.19
Whole wheat bread, toasted	1.00
Barley, pearl	0.94
Maize, white flour	0.88
Common millet, whole meal flour	0.82
Barley, flour	0.74
Einkorn wheat	0.73
Sinskajae	0.68
Oats, rolled, rough oatmeal	0.54
Oat, flour	0.50
Oatmeal, instant	0.46
Corn Meal, degermed	0.40
Maize cob (Corn), dried	0.40
Wheat, whole grain	0.38
Oatmeal, old fashioned	0.37
Common millet, white flour	0.36
Wheat, whole meal flour	0.36
Rye, squeezed, whole meal flour	0.35
Rice, brown	0.33
Maize flour	0.32
Oat patent flour	0.31
Sorghum flour	0.30
Corn Grits, yellow, cooked on stovetop	0.28
Oat bran	0.27
Maize (Corn) cob, canned	0.26
Maize (Corn) cob	0.21
Spelt	0.21
Spelt, whole meal flour	0.21
Bulgur	0.20
Rye, flour, sieved	0.20
Rye, white flour	0.20

Grains	Antioxidant content in mmol/100g
Sorghum, whole grain	0.19
Durum wheat	0.14
Oatmeal, instant, boiled	0.11
Oatmeal, old fashioned, boiled	0.11
Maize, whole grain	0.1
Oatmeal, instant, microwave cooked	0.09
Oatmeal, old fashioned, microwave cooked	0.09
Rice, long grain, white	0.08
Wheat, white flour	0.08
Couscous, swelled	0.07
Egg noodles, wide	0.07
Couscous	0.06
Oatmeal porridge with milk and water, prepared	0.06
Oatmeal porridge with water	0.06
Rice porridge	0.06
Sorghum	0.06
Corn Grits, white, instant, prepared with boiling water	0.05
Rice, white flour	0.05
Bulgur, prepared	0.04
Maizena	0.04
Fonio, whole grain	0.03
Rice, white, extra-long grain, cooked	0.03
Corn Grits, white, instant, microwave cooked	0.02
Cream of Wheat, cooked on stovetop	0.02
Cream of Wheat, instant, microwave cooked	0.02
Rice, grain, Jasmin	0.02
Rice, long grain, white, cooked	0.02
Rice, white, cooked, instant	0.02
Rice, whole grain	0.02
Rice, grain	0.01

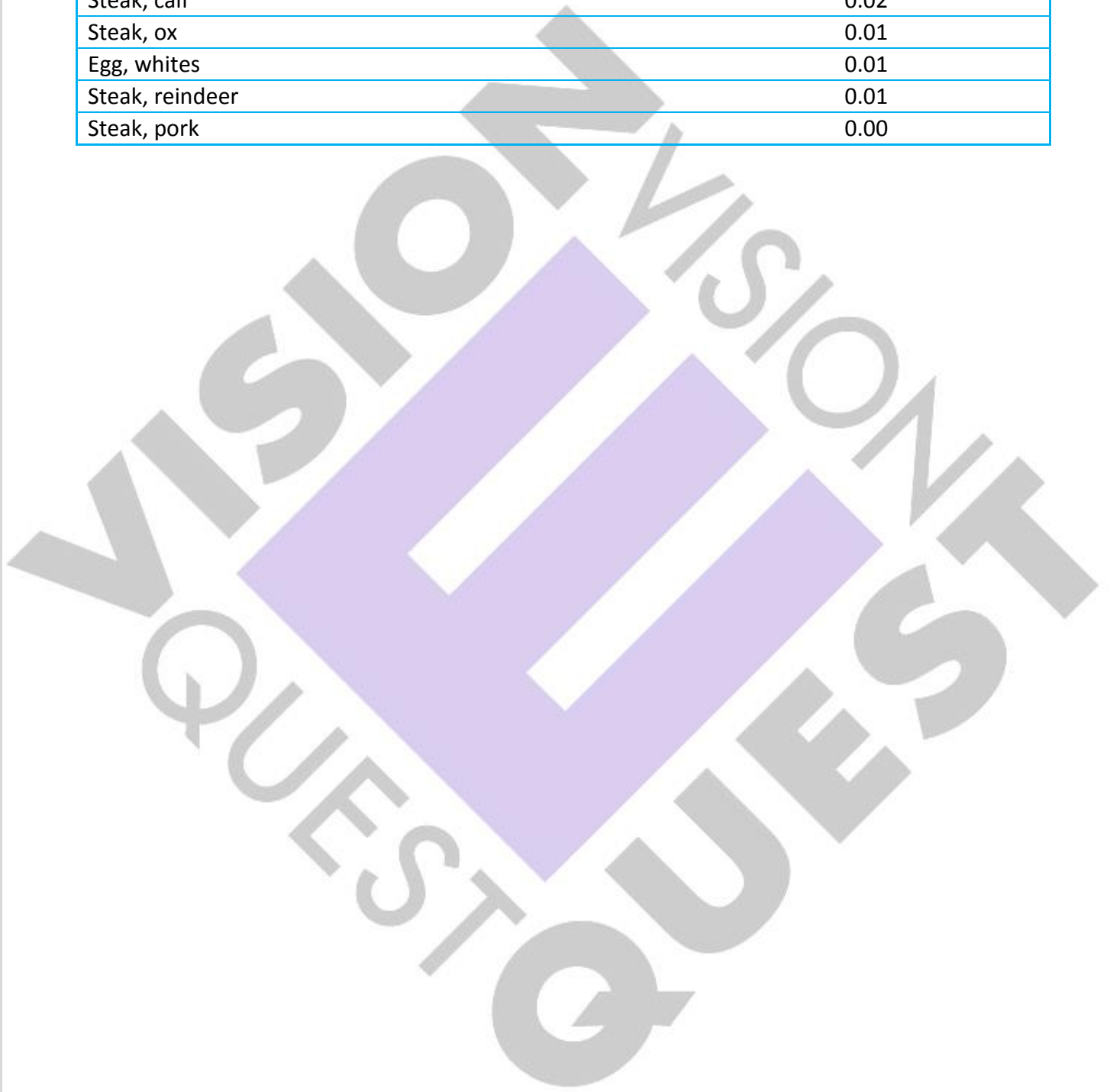
Legumes	Antioxidant content in mmol/100g
Broad beans, green	1.97
Borlotti beans	1.96
Broad beans, split	1.64
Kidney beans, striped, large size, dry	1.61
Kidney beans, medium size, dry	1.39
Pinto beans, dried	1.18
Pinto beans	1.15
Lentils	1.14
Lentils, green	1.00
Soy beans, white, small size, dry	0.99
Blue beans, cooked	0.98
Blue beans	0.85
Chinese broad bean paste	0.85
Soy beans, Red Bean	0.82
Kidney beans, dry	0.81
Kidney beans, large size	0.81
Black eye beans	0.75
Lentils, black with peel	0.66
Chickpeas, small size	0.57
Navy beans, dry	0.57
Mung bean (Moong Dal), with peel	0.53
Black eyes beans, white, medium size, dry	0.50
Black eye beans, white	0.47
Edamame, frozen, prepared	0.43
Navy beans	0.38
Beans, white, large size	0.36
Urad Dal Split	0.36
Lentils, Toor Dal, yellow	0.35
Lentils, Masoor-Dal, dark brown, with peel	0.34
Mung beans	0.34
Beans, red, canned, boiled	0.33
Kidney beans, canned, light red	0.27
Kidney beans, canned, light red, cooked	0.26
Lentils, red	0.23
Chickpeas	0.22
Flageolet beans, green, canned, boiled	0.20
Pinto beans, dried, cooked	0.19
Peas, regular, canned, drained liquid	0.17
Lentils, Cole-Dal, yellow, split	0.16

Legumes	Antioxidant content in mmol/100g
Lentils, white, split	0.16
Lentils, Moong-Dal, yellow, split	0.15
Peas, regular, canned, drained solids	0.12
Peas, regular, canned, drained solids, heated	0.12
Peas, yellow, split	0.12
Navy beans, dry, cooked	0.11
Peas, baby, canned, drained liquid	0.11
Lentils, Masoor-Dal, pink, without peel	0.10
Mung beans, peeled	0.10
Tofu	0.09
Soy milk	0.08
Soy milk, original, enriched with vitamins A, D & calcium	0.05
Peas, baby, canned, drained solids	0.01

Meat, Seafood and Poultry	Antioxidant content in mmol/100g
Chicken liver, fried	0.96
Bacon	0.85
Turkey hot dogs	0.76
Liver, ox	0.71
Chicken, drumstick, grilled, without skin	0.65
Kapenta, dried	0.65
Beef hot dogs	0.51
Liver, pork	0.46
Salami	0.46
Chicken, drumstick, grilled, with skin	0.44
BBQ chicken wings, cooked in conventional oven	0.38
BBQ chicken wings, microwave cooked	0.28
Chicken nuggets	0.25
Prawns, peeled, cooked	0.24
Tuna, canned, in oil	0.21
Pollock burger, fried	0.20
Crispy chicken sandwich	0.18
Chicken hot dogs	0.15
Chicken Sandwich, grilled	0.15
Tilapia, fillets, baked	0.14
Chicken patties, cooked	0.13
Chicken tenders	0.12
Crab, canned	0.12
Mackerel, fried	0.12
Mackerel, raw	0.11
Salmon, Red/Sockeye, canned with skin and bones	0.10
Tuna, canned, chunk, light, in water	0.10
Salmon, pink, canned with skin and bones	0.08
Tilapia, fillets, raw	0.08
Fish sticks, breaded, baked	0.07
Chicken, with skin	0.06
Egg, whole	0.06
Chicken, without skin, fried	0.06
Chicken, with skin, fried	0.05
Hamburger	0.04
Pollock filet	0.04
Shrimp, canned, cooked	0.04
Steak, moose	0.03
Orange roughy, fillets	0.03



Meat, Seafood and Poultry	Antioxidant content in mmol/100g
Salmon, raw	0.03
Steak, calf	0.02
Steak, ox	0.01
Egg, whites	0.01
Steak, reindeer	0.01
Steak, pork	0.00





Dairy	Antioxidant content in mmol/100g
Cheese, brown goat	0.78
Cheese, St. Agur	0.65
Cheese, Gorgonzola	0.54
Cheese, Stilton ring	0.54
Cheese, Roquefort	0.43
Cheese, Brie	0.22
Cheese, Philadelphia	0.19
Cheese, Mozzarella, whole milk	0.12
Sour cream, low fat	0.09
Cheese, Swiss cheese	0.08
Cream, 35% fat	0.07
Cheese, American cheese / pasteurized process	0.06
Cheese, Cheddar, chunk	0.06
Cheese, Mozzarella, low moisture part skim	0.06
Cheese, Parmesan, grated	0.06
Cream, 22% fat	0.06
Yogurt, frozen, fat free, vanilla	0.06
Yogurt, original	0.06
Buttermilk, skimmed	0.05
Buttermilk, special 1.5% fat	0.05
Cottage Cheese	0.05
Ice cream, regular fat, natural vanilla	0.05
Milk, 1%	0.05
Milk, skimmed fermented	0.05
Yogurt, frozen, vanilla	0.05
Cheese, American / skim, yellow, sliced	0.04
Cheese, processed, yellow, sliced	0.04
Goat milk	0.04
Milk, 2%	0.04
Milk, extra semi-skimmed	0.04
Milk, semi-skimmed	0.04
Milk, skim	0.04
Milk, whole	0.04
Yogurt	0.04
Cheese, American / skim, white, sliced	0.03
Cheese, processed, white, sliced	0.03
Sour cream	0.01

Nuts and Seeds	Rank
Pecan	1
Walnut	2
Hazelnut	3
Pistachio	4
Soybean	5
Almond	6
Peanut butter	7
Peanut (all types)	8
Cashew nut	9
Macadamia nut	10
Alfalfa seed	11
Brazil nut	12
Pine nut	13

Oils	Rank
Soybean	1
Extra virgin olive	2
Corn	3
Sunflower	4
Olive	5
Peanut	6

Herbs and Spices	Antioxidant content in mmol/100g
Clove, dried ground	465.32
Clove, whole, dried	327.77
Bearberry	182.10
Meadowsweet, flower, dried	167.82
Peppermint, leaves, dried	160.82
Meadowsweet (Filipendula ulmaria), dried	154.05
Rose, flower, dried	153.90
Wild marjoram, leaves, dried	142.86
Green mint, leaves, dried	142.58
Cinnamon, dried, ground	139.89
Alpine lady's mantle, leaves, dried	130.36
Lemon balm, leaves, dried	125.33
Rose-bay, willow herb, flower and leaves, dried	120.99
Meadowsweet, flower and leaves, dried	117.77
Woodland geranium (Geranium sylvaticum), dried	113.27
Meadowsweet, leaves, dried	111.30
Purple loosestrife (Lythrum salicaria), flower and leaves, dried	111.04
Red whortleberries, leaves, dried	102.07
Rose-bay, leaves, dried	101.33
Allspice, dried, ground	99.28
Blackcurrant, leaves, dried	97.83
Oregano, dried	96.64
Speedwell, dried	94.79
Rose-bay, willow herb flower, dried	93.48
Sweet marjoram, leaves, dried	92.31
Lemon thyme, leaves and flower, dried	92.18
Oregano, dried	89.51
Dwarf birch (Betula Nana), leaves, dried	86.22
Sundew (Drosera rotundifolia), dried	85.97
Somage, dried ground	85.58
Juniper berries, green, dried	80.26
Juniper berries, coniferous litter, dried	76.77
Yellow loosestrife, leaves, dried	72.96
St. John's wort, flower and leaves, dried	72.16
Mint, dried	71.95
Maral Root (Leuzea carthamoides), leaves, dried	69.57
Rosemary, dried	66.92
Thyme, dried	63.75

Herbs and Spices	Antioxidant content in mmol/100g
Stevia rebaudiana, dried leaves	63.55
Saffron, dried ground	61.72
Coltsfoot, leaves, dried	61.32
Summer savory, leaves and flower, dried	59.66
Grey alder ( <i>Alnus incana</i> ), leaves, dried	59.27
Sage, dried	58.8
Japanese rose, Ramanas rose, fruit shell, dried	58.66
Orpine ( <i>Sedum telephium</i> ), rhizome	57.83
Heather, flower, dried	56.98
Rosemary, leaves, dried	56.95
Northern dock, root	56.69
Red-berried elder, leaves, dried	56.66
Barberry, bark	55.63
Spanish chervil, leaves, dried	54.96
Perforate St. John's wort, flower and leaves, dried	54.37
Merian, dried	53.92
Hyssop, flower, dried	52.29
Grass-of-Parnasuss ( <i>Parnassia palustris</i> ), dried	52.27
Pepper, dried ground	50.96
Wall germander ( <i>Teucrium chamaedrys</i> ), dried	48.14
Ash, young leaves, dried	47.78
Raspberry, leaves, dried	46.89
Bee balm	46.56
Hyssop, leaves, dried	44.9
Estragon, leaves, dried	44.75
Northern dock, dried	43.61
Nutmeg, dried, ground	43.52
Estragon, dried	43.31
Lady's mantle, leaves, dried	43.31
Thribi, dried	42.56
Sumac, dried ground	42.36
Common butterwort, leaves, dried	41.93
Cinnamon, bark, whole	40.14
Red clover, flower, dried	39.92
Sage, leaves, dried	39.36
Cirsium heterophyllum (melancholy thistle), leaves, dried	38.18
Mullein ( <i>Verbascum</i> ), flower, dried	37.71
Japanese pepper ( <i>Zanthoxylum piperitum</i> ), dried, ground	36.92

Herbs and Spices	Antioxidant content in mmol/100g
Lovage ( <i>Levisticum officinale</i> ), leaves, dried	36.17
Silverweed, dried	35.79
Hazel, leaves, dried	35.51
Common polypody, rhizome	35.42
Hops, leaves, dried	35.28
Common nettle, stinging nettle, leaves, dried	35.23
Southernwood, flower, stem, and leaves, dried	34.88
Small-leaved lime, flower, dried	34.83
Ribwort, leaves, dried	34.81
<i>Sanguisorba officinalis</i> , dried	33.37
Anisop, leaves, dried	33.14
Nutmeg, dried	33.00
Hound's tongue, leaves, dried	32.65
Ground-ivy ( <i>Glechoma hederacea</i> ), dried	31.72
Yarrow, flower and leaves, dried	31.66
Creeping jenny ( <i>Lysimachia nummularia</i> ), leaves, dried	31.31
Hop, cone	30.96
Tansy, flower, dried	30.71
Birch, leaves, dried	30.44
Devil's bit, dried	30.18
Lavender, leaves and flower, dried	29.61
Hoary plantain, leaves, dried	29.35
Spruce, leaves, dried	29.31
European golden rod, dried	28.43
Ajwain fruit pods, dried	28.42
Field forget-me-not, dried	28.15
English ivy, leaves, dried	27.98
<i>Imperatoria ostruthium</i> , rhizome	27.56
Trembling poplar, aspen, leaves, dried	26.65
Birch, leaves, fresh	26.23
Bay leaves, dried	26.04
Angelica, leaves, dried	25.25
Common fumitory, dried	25.06
Saffron, stigma	24.83
Common mallow, flower, dried	24.63
Dill, dried	24.47
Ginger, dried, ground	24.37
Common elder, flower, dried	24.13



Herbs and Spices	Antioxidant content in mmol/100g
Common valerian, flower and leaves, dried	24.03
Mugwort, dried	23.79
Blackberry, leaves, dried	23.31
Bird cherry, flower, dried	23.08
Dame's violet, dried	22.63
Common silver birch, leaves, dried	22.07
Greater plantain, leaves, dried	22.03
Raspberry, leaves, fresh	21.36
Dandelion, leaves, dried	21.07
Saffron, stigma	20.58
Common elder, leaves, dried	20.36
Nutmeg, dried ground	20.32
Sorrel, leaves, dried	19.52
Juniper berries, blue, dried	19.29
Fennel, leaves, dried	18.91
Yarrow, flower, dried	18.61
Tej patta (bay leaves), dried	18.54
Common alkanet, dried	18.37
Basil, dried	18.24
White dead nettle, dried	18.21
Chervil, dried	17.67
Field bindweed, dried	17.51
Celery, leaves, dried	16.91
Scented mayweed, flower, dried	16.63
Knotgrass, dried	16.62
Purple coneflower, flower and leaves, dried	16.09
Nutmeg, whole, dried	15.83
Turmeric, dried ground	15.68
Wych elm, leaves, dried	15.65
Bay leaves, fresh	15.05
Curry, powder	14.92
Greater burdock, root	14.26
Garden catmint, dried	14.18
Turmeric, whole, dried	13.6
Motherwort (Leonurus cardiaca), dried	13.19
Stinging nettle, dried	13.09
Viola canina, leaves, dried	12.90
Dandelion, flower, dried	12.72

Herbs and Spices	Antioxidant content in mmol/100g
Horehound ( <i>Marrubium vulgare</i> ), dried	12.49
Chili, dried ground	12.21
Common horsetail, dried	12.17
Cornflower, dried	11.96
Biting stonecrop, dried	11.89
Cumin, dried, ground	11.88
Pot marigold, flower, dried	11.47
Ginger, dried	11.31
Star anise, dried	11.30
Chives, dried	11.14
Rosemary, fresh leaves	11.07
Fir clubmoss, dried	10.58
Mustard seed, yellow, ground	10.53
Wormwood, absinth, dried	10.42
Mustard powder	10.39
Fakouhoye leaves, dried	10.2
Hollyhock, flower and leaves, dried	10.16
Field restharrow ( <i>Ononis arvensis</i> ), root	10.15
Parsley, dried	10.09
Vanilla pod, without seeds	10.09
Lady's bedstraw, dried	9.90
Marigold ( <i>Calendula officinalis</i> ), flower and leaves, dried	9.83
Mustard seeds, ground	9.44
Betonica officinalis, dried	9.41
Field horsetail ( <i>Equisetum arvense</i> ), leaves, dried	9.41
Piri-piri, dried ground	9.39
Juniper berries, dried	9.27
Lemon thyme, leaves, dried	9.22
Common mallow, leaves, dried	9.20
Common mallow, flower and leaves, dried	9.06
Cornflower, flower, dried	8.84
Pepper, black, dried ground	8.71
Figwort, dried	8.69
Paprika (powder), dried ground	8.60
Jalapeño pepper, dried	8.25
Celery seeds, whole	8.17
Chives, chopped, dried	7.80
Chili, dried	7.63



Herbs and Spices	Antioxidant content in mmol/100g
Chili, dark, whole, dried	7.54
Mustard seeds, yellow, whole	7.52
Vanilla pod, whole with seeds	7.38
Saunf (fennel seeds), big, dried	7.09
Dandelion, leaves	6.89
Cinnamon sticks	6.84
Mustard seeds, brown, whole	6.70
Calamus root	6.65
Curry, powder, Madras, hot, dried ground	6.65
Wood sorrel ( <i>Oxalis acetosella</i> ), dried	6.54
Piri-piri, dried	6.51
Saunf, small, dried	6.46
Chili, dried ground, hot	5.96
Cayenne pepper, dried ground	5.90
Fennel, whole seeds, dried	5.84
Paprika, (powder), red, dried ground	5.75
Rosemary, fresh	5.64
Roseroot, fresh	5.63
Paprika, (powder), dried ground	5.59
Shepherd's purse, dried	5.52
Shah jerra, dried	5.34
Ginger, raw paste	5.33
Houseleek, dried	5.24
Condiment with red pepper, dried ground	5.23
Common chickweed, dried	5.17
Vanilla pod, seeds from pod	5.15
Yellow sweet clover, flower and leaves, dried	5.14
Chili, Chile ancho, dark, whole, dried	5.09
Pepper, white, dried ground	5.02
Dandelion, root	4.91
Coriander, dried ground	4.66
Club-moss, dried	4.56
Caraway seeds, dried	4.48
Pepper, black, whole, dried	4.34
Chili, Chile don piquin, with seeds, crushed, dried	4.20
Curry, powder, mild, dried ground	4.17
Columbine, Granny's bonnet, dried	3.96
Ginger	3.93

Herbs and Spices	Antioxidant content in mmol/100g
Oregano, fresh	3.81
Mustard seeds	3.78
Chili, without seeds, dried	3.74
Stinging nettle, leaves	3.66
Tamarind	3.50
Coriander, seeds, green, dried	3.49
Pepper, white, whole	3.49
Dill, seeds	3.37
Stevia drypp, juice from fermented leaves	3.28
Stevia rebaudiana, fermented leaves	3.17
Chili, Chile de arbol, small red, whole, dried	3.11
Chili, red, whole	2.92
Coriander, leaves, dried	2.84
Rai, dried	2.84
Liquorice, sweet-root, root and rhizome	2.71
Thyme, fresh leaves	2.65
Cumin, seeds, whole, dried	2.54
Chili, red with seeds, dried	2.52
Cumin, whole	2.45
Pepperwort, garden cress, fresh	2.42
Cardamom, dried ground	2.35
Betterave	2.34
Chili, green, whole	2.33
Chili, Chile guajillo, dark, whole, dried	2.25
Dill, fresh	2.18
Garlic, dried ground	2.13
Fenugreek, seeds	2.09
Parsley, big leaves, fresh	2.03
Cardamom pod, green, whole	1.85
Fenugreek, whole	1.67
Cardamom seeds (from green pod)	1.64
Cardamom, whole fruit, dried	1.64
Garlic, dried ground	1.61
Lemon balm ( <i>Melissa officinalis</i> ), leaves, fresh	1.32
Mint ( <i>Mentha spicata</i> ), fresh	1.27
Coriander seeds	1.26
Coriander, leaves, fresh	1.20
Cardamom seeds, dried	1.13

Herbs and Spices	Antioxidant content in mmol/100g
Kaloonji, whole seeds, dried	1.02
Caper, flower	1.00
Lemon pepper	1.00
Onion, dried ground	0.95
Ajwain fruit pods, whole	0.94
Caper, small	0.94
Quack grass	0.88
Basil, fresh	0.87
Caper, fruits and stem	0.84
Iceland moss ( <i>Cetraria islandica</i> ), dried	0.71
Angelica, fresh	0.66
Piffi, dried ground	0.61
Chives, fresh	0.60
Pepper, green "berries" on the stem, fresh	0.46
Curled parsley, fresh	0.34
Maghaj, dried	0.27
Pepper, dark-green "berries" on the stem, fresh	0.26
Sugar kelp, dried	0.26
Wasabi, paste	0.11
Garlic, raw paste	0.08

Beer, Wine, Coffee and Tea	Antioxidant content in mmol/100g
Coffee (espresso)	129.00
Coffee (soluble)	109.00
Coffee (extracted)	96.40
Coffee (espresso, decaffeinated)	93.00
Wine (Chianti, red)	31.50
Wine (Aglianico, red)	30.50
Wine (Sauvignon, red)	23.90
Tea (green)	18.00
Tea (black)	10.10
Vinegar (red)	9.50
Wine (Villa Torre, rosé)	8.33
Wine (Tamerici, rosé)	7.22
Wine (Vernaccia, white)	5.04
Wine (Bardolino, rosé)	4.66
Wine (Greco di Tufo, white)	3.83
Wine (Pinot, white)	3.72
Whiskey	3.45
Beer (lager)	2.78
Cognac	2.25
Chamomile	0.65
Grappa	0.00
Rum	0.00

Sample Statistics	N	Mean	Median	Min	Max	25th Percentile	75th Percentile	90th percentile
Fruits and Fruit Juices	195	5.25	1.02	0.04	261.53	0.43	7.22	7.22
Vegetables	132	1.16	0.35	0.00	48.07	0.19	1.79	1.79
Grains	68	0.50	0.21	0.01	3.31	0.06	1.23	1.23
Legumes	52	0.56	0.36	0.01	1.97	0.16	1.18	1.18
Meat, Seafood, and Poultry	45	0.23	0.12	0.00	0.96	0.05	0.65	0.65
Dairy	47	0.15	0.06	0.01	0.78	0.05	0.47	0.47
Herbs and Spices	301	30.91	14.18	0.11	465.32	5.09	80.26	80.26
Beer, Wine, Coffee and Tea	22	26.90	7.78	0.00	129.00	3.52	28.90	96.10

## Cooking Methods

Cooking changes the chemical structure of foods, affecting the bioavailability of certain nutrients and their cancer-protective qualities [20]. By using the appropriate cooking method, you can optimize and even enhance nutritional quality.

In general, the things to limit are cooking duration, temperature, direct water contact and air exposure. When exposed to excess light, heat, and/or oxygen, certain nutrients will degrade. [15]

Jiménez-Monreal, García-Diz, Martínez-Tomé, Mariscal, and Murcia (2009) found that overall, griddling and microwaving contribute least to antioxidant losses, while pressure-cooking and boiling contribute the most. However, these are generalizations and depend on the vegetable.

Yuan, Sun, J. Yuan, and Wang (2009) analyzed chlorophyll, vitamin C, total carotenoids, total soluble sugars, total soluble proteins and glucosinolates on broccoli using five different cooking methods: boiling, pressure-cooking, griddling, microwaving and frying. It was found that all cooking methods lead to a decrease in chlorophyll content except steaming. Soluble proteins and soluble sugars decreased in every instance. This study also showed that boiling and stir-frying caused dramatic losses in vitamin C, while steaming did not. It appears that vitamin C is leached into cooking water rather than being thermally degraded. [20]

Carotenoids (a family of antioxidants) seem to survive better in heat than vitamin C. In fact, sometimes carotenoids are enhanced through cooking – as is the case with sweet potatoes and tomatoes. Both boiling and steaming lead to an increase in carotenoids, while frying markedly decreased the carotenoid content. Microwaving and griddling seemed to have no effect on carotenoids. [20]

Yuan et. al (2009) also found all cooking methods decreased the amount of glucosinolates in broccoli, precursors to isothiocyanates that protect against cancer. Cooking affects all cruciferous vegetables like broccoli depending on how they are processed (cut, chopped, etc.) and the cooking duration. Steaming was the best method to preserve glucosinolates in broccoli and similar vegetables. This could be due to the inactivation of myrosinase, an enzyme that, when combined with glucosinolates, causes glucosinolate hydrolysis. Boiling causes the most damage to glucosinolates. Glucosinolates, like vitamin C, are leached into the cooking water.

The following cooking methods are discussed below: boiling, pressure-cooking, baking, steaming, microwaving, griddling, stir-frying, frying and grilling.



## **Boiling**

Jiménez-Monreal et al. (2009) found that boiling leads to the greatest loss of nutrients in most vegetables. Boiling exposes the outer layers of vegetables to water, and the outer layers are most concentrated in phenolic acids. Direct contact with hot water causes the phenolic acids to leach out – which is why you should consume the cooking water (e.g. soup, broth). In broccoli, it was shown that the chlorophyll content decreased by 27%, while soluble proteins, sugars, vitamin C, total carotenoids, and glucosinolates all similarly decreased. [20]

## **Pressure-Cooking**

Jiménez-Monreal et al. (2009) also showed that pressure-cooking causes a 64% loss of total carotenoids and a 49% loss of phenolic acids. Similar to boiling, many of the nutrients are lost to the cooking water.

## **Baking**

Baking requires a high cooking temperature for a long period of time. Vegetables often lose more nutrients baking than with the other water-free cooking methods (microwaving, steaming, stir-frying). [7]

## **Steaming**

Steaming may be the ideal cooking method for most vegetables. Yuan et al. (2009) found that broccoli, when steamed, had negligible losses in chlorophyll content. Studies have also shown that steamed broccoli lost considerably less vitamin C than boiled broccoli. Steaming was also shown in another study to preserve folate, even after 4.5 minutes of steaming spinach and 15 minutes of steaming broccoli. When these vegetables were boiled they lost half of their folate [7].

## **Microwaving**

Nutrient loss when microwaving is situation-dependent. Microwaving retains nutritive elements in cooked vegetables because it does not cause a release of ascorbic acid like seen in boiling [12]. The first key to retaining nutrients in the microwave is a quick cooking time (minimizes the loss of heat-sensitive nutrients). Another important key is using a minimal amount of water when cooking. As long as these are true, studies have shown only slight losses in vitamins and phytochemicals. [7]



## Griddling and Stir-Frying

Griddling and stir-frying retain much of the nutrients and protective phytochemicals in vegetables. The quick cooking time minimizes the losses, even though the vegetables are exposed to high heat [7, 8].

## Frying

The nutritive value of fried vegetables depends much on the cooking conditions. An important point is that oxygen is more soluble in oil than water – so frying is, in general, less nutritive [11]. Frying at high temperatures and/or reusing oils releases harmful toxins [16, 19]. Yuan et al (2009) found that frying broccoli resulted in a 67% loss of carotenoids, powerful plant pigments associated with a reduced risk of cancer, heart disease, and eye degeneration. However, according to Fillion and Henry (1998), the high temperature and short cooking time causes less loss of heat-sensitive nutrients. They even showed the content of vitamin C, a heat-sensitive vitamin, remained the same before and after frying.

## Grilling

Information on the effect of grilling vegetables is sparse, but keeping the cooking duration short and temperature low, keeping them whole to limit their exposure to oxygen and limiting water remain key factors.

On the other hand, grilling meat may create harmful substances called nitrosamines. The grilling time and the leanness of the meat contribute to these substances – aim for a short cooking duration and choose the leanest cut of meat. [13]

The following table shows some of the best ways to cook a small sampling of vegetables.

Cooking Methods for Maximum Nutrition							
	Boiling	Pressure-cooking	Baking	Steaming	Microwaving	Griddling or Stir-Frying	Frying
<b>Artichoke</b>	✓	✓	Unavailable	✓	✓	Unavailable	✗
<b>Asparagus</b>	✗	✗	Unavailable	✓	Unavailable	✓	✗
<b>Beetroot</b>	✗	✗	✗	✓	✗	Unavailable	✗
<b>Broad Bean</b>	✓	✗	✗	Unavailable	✗	✗	✗

## Cooking Methods for Maximum Nutrition

	Boiling	Pressure-cooking	Baking	Steaming	Microwaving	Griddling or Stir-Frying	Frying
<b>Broccoli</b>	✗	✗	Unavailable	✓	✗	✓	✗
<b>Brussels Sprout</b>	✗	✗	✗	✓	✗	✗	✗
<b>Cauliflower</b>	✗	✗	✗	✗	✗	✓	✗
<b>Carrot</b>	✗	✗	✗	✓	✗	✗	✗
<b>Celery</b>	✗	✗	✗	✓	✗	Unavailable	✗
<b>Eggplant</b>	✗	✓	✓	✓	✓	Unavailable	✓
<b>Garlic*</b>	✗	✗	✗	Unavailable	Unavailable	Unavailable	✗
<b>Green Bean</b>	✗	✗	✓	✓	✗	✓	Unavailable
<b>Leek</b>	✗	✗	✗	Unavailable	✗	✓	✗
<b>Maize</b>	✗	✗	✓	✓	✓	Unavailable	✗
<b>Onion</b>	✗	✗	✗	Unavailable	Unavailable	✓	✗
<b>Pea</b>	✗	✗	✗	Unavailable	✗	✓	✗
<b>Pepper</b>	✗	✗	Unavailable	✓	✓	✗	✗
<b>Spinach</b>	✗	✗	✓	✓	Unavailable	✓	✗
<b>Swiss Chard</b>	✗	✗	✓	✓	✓	✓	Unavailable
<b>Zucchini</b>	✗	✗	✗	✓	✗	✗	✗

\*Garlic is best used raw, but if cooking is preferred, crush the garlic and wait 10 minutes before cooking (and add at the end). This allows the compound alliin to turn into the enzyme allicin, the phytonutrient linked with garlic's beneficial qualities [10].

### Optimal Time to Consume Produce

Most produce is best consumed at its peak maturity. Produce spends as long as five days in transit, another 1-3 days in the grocery store, and then up to an additional week in the customer's refrigerator. All this time, the produce is losing nutrients to cellular respiration. Respiration can lead to moisture loss, quality and nutrient breakdown, and spoilage. It is best to consume your fruits and vegetables in a timely manner – as soon as they are ripe. [3]

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