Oxalate Content Quick and Simple

greens and berries

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Better Facts: Understanding Oxalate Data

Here is something rare and valuable: accurate information on food oxalate content that is simple to understand and use. Now you can select the right low oxalate greens and berries with confidence and peace of mind. And you have handy numbers that show why some foods are best to avoid entirely, or to use only as a garnish.

The information presented here is accurate and detailed enough so you can make informed decisions about ingredients and portion sizes.

Often doctors will tell patients to avoid green vegetables and berries to prevent kidney stones. This simplistic advice doesn't work for two reasons. The first is that there are several high oxalate foods that are not green and are not berries. Examples include cinnamon, turmeric, potatoes, nuts and seeds. These foods need to be strictly limited to achieve a low intake of oxalate. The second reason is that there are several green vegetables that are low in oxalate. These vegetables are valuable for dietary variety and can provide needed nutrients. Cabbage and arugula are great examples.

Sometimes making the switch with confidence and consistency is challenging. If you would like additional guidance for protecting your heath through low-oxalate eating, please contact me to schedule a personalized consultation. My website is also loaded with information.

Intake Recommendation

Keep in mind the goal is to limit your exposure to dietary oxalate. Individual factors influence how much dietary oxalate is tolerated without deleterious health effects over time. But keep in mind that the symptoms can be subtle. For example, you don't notice the development of weak bones and unstable joints until an injury suddenly happens with minimal provocation. For prevention purposes, aim to consistently keep your intake *well* under 150 mg per day. For healing benefits and health optimization, shift your intake gradually to under 60 mg each day. (The recommended intake of dietary oxalates for an adult on a low oxalate diet is 40-60 mg a day.)

This lower intake level has therapeutic benefits. But it may also trigger the release and clearance of oxalate deposits within the body. This clearing process can elicit a wide variety of symptoms, which are variable in nature, intensity, and duration. Be kind to yourself and your body when you experience clearing symptoms. If these symptoms do occur before you have achieved the 40-60 mg/day intake level, maintain your current level of oxalate consumption until the symptoms abate before going lower.

Using the Data Tables

Items in each table were selected by food type and how they are used in the diet, either raw or cooked (The tests were conducted separately on raw and cooked foods.) The numbers are presented in 4 columns, indicating oxalate content in standard servings and, also per 100 gram amounts (which provides an estimate of comparative concentration in that food).

Items are roughly organized in color-coded groups based on their oxalate content per standard serving. The lowest items (< 4 mg *per serving*) at the top are in teal, moderate or medium items (between 4 and 9.9) are in black (placed in the middle), and high oxalate (10 mg and up) items are in red at the bottom.

Solubility. A low-oxalate diet is based on total oxalate, which comes in two general forms, soluble and insoluble. Only total and soluble are listed here (insoluble is the difference.)

Soluble oxalates (sodium-oxalate, potassium oxalate) are much more easily absorbed into the blood stream where they interact with whole-body physiology and become a hazard for the body. Thus, they are said to have a higher "bio-availability". Soluble oxalate is a concern for oxalate accumulation and stone formation. Absorption can be limited somewhat by including calcium as a supplement before meals or by including high-calcium dairy foods with meals. The question of oxalate absorption has led researchers to suggest that soluble oxalate is the chief concern when selecting foods on a low-

oxalate diet. That is, it is especially important to avoid foods that are very high in soluble oxalate.

Insoluble calcium-oxalate typically occurs in crystal forms that are not easily absorbed. However, they are a gastrointestinal irritant known to toxicologists and poison centers, and they may cause gastroenteritis. Insoluble oxalate crystals may have localized effects on susceptible tissues they encounter.

For gut health, both forms of oxalate are a concern and may be important to restrict.

Data Inconsistencies and Ranges

Various factors, both known and unknown, affect the oxalate content of food. It is unrealistic to assume that a single oxalate value can be assigned to a food definitively, for all time.

Accurate oxalate analysis has always been difficult. Ascorbic acid and other substances interfere with the extraction and detection of oxalate from foods. Timing, temperature, pH, equipment errors, and human errors can all hamper the accuracy of oxalate measurement. Improvements in the testing technologies have gradually made food oxalate testing more accurate and reliable—especially since 2000. According to The VP Foundation's scientific adviser, Michael Liebman (Professor of Human Nutrition at the University of Wyoming), data prior to 1980 is not reliable.

An even more challenging issue is the natural variability in the foods themselves. Researchers have not always been careful to document specific varietal and source information. Different plant varieties, growing conditions, and stages of growth are some factors that cause variability in oxalate concentration in plant material. Keep in mind that there is *no such thing* as a "standard green bean" that perfectly represents the bean you are considering for consumption. There are many varieties of green beans and test results vary widely. Many plants produce more or less oxalate in response to growing conditions. Even when we know which variety was tested, variability in natural things requires us to remember that while a value expressed as single number (the average) is simple to read and remember, it is not completely truthful. The average represents the middle of a range of possibilities.

The data presented here will help you adjust your diet, but remember to eat a diverse diet of many types of low-oxalate foods rather than relying heavily on a few foods that may sometimes have more oxalates than you expect.

About the Data Sources

This document was derived from a variety of sources, which are referenced. I'd like to express my particular gratitude for the work of the Vulvar Pain (VP) Foundation, a 501(c)3 organization. They are the pioneering leader in making oxalate in food data available to the public. They have worked for 25 years sponsoring accurate testing for oxalate content. These analyses were performed by the academic laboratory established by Michael Liebman. He served as the scientific adviser to the VP foundation and director of their food testing program for many years.

To ensure these data are as complete and accurate as possible, I have scoured the medical literature looking for additional testing results and a broader understanding of the data (and have corrected mistakes as I find them).

If you find this information valuable, please consider contributing to (or becoming a member of) the VP Foundation or the Autism Oxalate Project. Both organizations are committed to on-going food testing and they need your support.

Raw Greens Oxalate Content Comparison

Raw Item	Oxalate Content (Mg)				Reference
	per 1 Cup (raw)		per 100 gms (3.3 oz.)		
	Total	Soluble	Total	Soluble	Source
Corn Salad (Mâche) *(valerianella locusta)*	<1	<1	1	1	[1][2]
Lettuce, Green Romaine	1	1	2	1	[3]
Arugula	2	<1	7	2	[4] (AOP 2014/09)
Napa Cabbage	3	2	3	2	(AOP 2011/01)
Lettuce, Iceberg	2	2	3	2	
Lettuce, Boston	3	2	4	4	[3]
Lettuce, Red Romaine	4	4	7	7	[4]
Watercress	4	3	8	5	[5]
Watercress (*nasturtium officinale*)	4	2	14	8	[15]
Endive, Belgian	4	4	8	8	[6]
Lettuce, Bibb	5	5	9	8	[7]
Red Cabbage	6	2	9	3	(AOP 2011/03)*
Radish Tops (Leaves) (*Raphanus sativus*)	8	0	12	0	[13]
Escarole	5	4	12	11	[6]
Pea Greens	5	1 (per 20 gm)	26	6	[8]
Cilantro	6	5	35	33	[8]
Cilantro, India (Coriandrum sativum)	7	0	41	0	[13]
Celery	24	22	20	18	[3]
Parsley, fresh	5/ 1Tb	3/ 1Tb	75 - 170	40	[5] [16]
Basil, sweet, fresh	10/ 1Tb	3/ 1Tb	133 - 202	40	[8] [17]
Sorrel, raw	>200	>140	780	542	[7]
Beet Greens, Baby raw			600		[12] [16]
Beet Greens, Mature			1,320	1,130	[17]
Purslane			860 – 1,300	560	[15] [16]
Swiss Chard, Burpee Fordhook Giant			720	550	[17]
Swiss Chard, Burpee Rhubarb Chard			1,020	820	[17]
Spinach, raw Baby	320	230	1,063	768	[5]
Spinach, mature			1,145		[9]

† Reference not verified. * AOP stands for Autism Oxalate Project. They send items for analysis to the same lab used by the VP Foundation and share the data through their online forums on Facebook and Yahoo.

Cooked Greens Oxalate Content

Cooked Item	Oxalate Content (Mg) per ½ Cup Total	per ½ Cup Soluble	per 100 gms (3.3 oz) Total	per 100 gms (3.3 oz) Soluble	Reference
Bok Choy stalk only τ *	1	1	1	1	[3]
Brussel sprouts, boiled	1	1	1	1	[1] [2]
Asparagus, boiled	2	1	3	1	[1] [2]
Cabbage, boiled 10 min	2	2	2	2	[3]
Kale, Lacinato (Dino), Boiled	2	1	5	4	(AOP 2012 May)
Broccoli, Boiled 8 min	1 - 3	1	1 3	1	[1] [2] [9]
Creasy Greens, boiled *20* minutes	4	3	9	6	[7]
	(Land cress, American cress, Upland cress, Early winter cress, *barbarea verna*)				
Mustard Greens, steamed	6	3	8	4	[10]
Collard Greens, boiled 10 min	6	3	7	4	[3]
Collard Greens, steamed 10 min	10	5	10	5	[3]
Broccoli Raab (Rabe or Rapini) steamed 8 minutes	5	2	9	4	[5]
Turnip Greens, steamed	5 - 9	3 - 5	6 - 12	4 -7	[4] [14]
Broccoli, Steamed 10 min	11	4	14 9	6	[5] [9]
Kale, Curly τ	8 - 19	4 - 12	12 28	7 18	[6] (AOP 2011 Jan)
Dandelion greens τ	15	9	28	17	[7]
Grape Leaf, canned Krinos	14	4 (2 leaves)	135	34	[7]
Green Beans	9 – 24	N/A	15 – 40	N/A	(VPF various)
Spinach, Fzn, steamed	517	288	544	304	[3]
Red Swiss Chard, steamed	920	N/A	1,050	N/A	[11]

τ = Estimate from Raw;

*leaf and stalk were analyzed separately, for details refer to VPF Newsletter No. 37, June 2012

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Notes

* AOP stands for Autism Oxalate Project. They send items for analysis to the same lab used by the VP Foundation and share the data through their online forums on Facebook and Yahoo.

BERRIES OXALATE CONTENT COMPARISON

Type	Oxalate Content (mg)				Reference
	per ½ Cup (or as noted)		per 100 gm (3.3 oz.)		
	TOTAL	SOLUBLE	TOTAL	SOLUBLE	SOURCE
Bilberry/Whortleberry	1	0.1	1.5	0.1	[1]
Cranberries, whole, fresh, cooked	1	0.1	1.8	0.3	[2]
Cranberries, dried	6	3	2.4	1	[3]
Blueberries, fresh, whole	4	2	5.3	2.8	[4]
Blueberry jam (1 Tbsp.)	1.3	0.6	6.4	3.2	[5]
Black Elderberry Syrup, Sambucol	1/Tbs.	1/Tbs.	7	6	AOP Sept. 2014
Craisins, Ocean Spray	5.8	3.0	7.2	4	[6]
†Strawberries, fresh, halved	2.5—20	0.7—2.5	3—25	1—>3	[1], [4],[7–10]
Strawberries, canned	11	N/A	15	N/A	[11]
Currants, black, raw	11	1.7	19	3	[1]
Raspberries	11.6	2	19	3.4	[1]
Currants, red, raw	11	2.7	20	5	[1]
Huckleberries	18	8	22	9.5	[6]
Gooseberries	14—20	2.3—3.2	18—27	3.1—4.3	[1]
Blackberries	23—37	1—13	29—52	1—18	[1]
Elderberries	N/A	N/A	72	7	[1]
Goji berries, dried	*(1 Tbsp.)*10.5	4	131	49	AOP∫ Aug 2010
Mulberries, fresh, organic *(10 berries, 5 grams)*	16	1	316	24	AOP∫ Oct 2015

NOTES

† Oxalate content varies considerably between different samples and tests of the same species. A single, 12 g, strawberry may vary in oxalate content from 0.4 – 3 mg oxalate.

∫ AOP: Autism Oxalate Project, tested at University of Wyoming, Laramie, WY

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