ALL CURCUMIN EXTRACTS ARE NOT CREATED EQUAL

Oxalates in Turmeric? Rooting Out Misconceptions.

A recently published article in the "American Journal of Clinical Nutrition" reporting the incidence of high oxalate content in some commercial samples of turmeric powder, led to speculations that curcumin products with high oxalate content, when used as a dietary supplement, may increase the risk of hyperoxaluria, and kidney stone formation in susceptible individuals.

In light of this report, scientists from Sabinsa Corporation analyzed samples of Sabinsa's branded Curcumin C^3 Complex®, for the presence of oxalate. Negligible amounts of oxalate were detected in these samples, leading to the conclusion that **Curcumin C^3 Complex® is not a significant source of oxalates, and does not increase the risk of kidney stone formation in susceptible individuals.**

SABINSA CORPORATION

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Position Paper

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BACKGROUND

In a recent research article, Michael Liebman et. al, reported that "consumption of supplemental doses of turmeric can significantly increase the urinary oxalate levels, thereby increasing risk of kidney stone formation in susceptible individuals" (Ref: *"Effect of Cinnamon and Turmeric on urinary oxalate excretion, plasma lipids and plasma glucose in healthy subjects" American Journal of Clinical Nutrition. 2008 : 87: 1262-7*). This inference was based on a human clinical study, wherein subjects received supplemental amounts of **turmeric spice powder**. The published paper does not cover research on carefully standardized extracts of curcuminoids from turmeric. It only refers to the raw spice that contains numerous natural compounds, in addition to the curcuminoids.

Sabinsa Corporation is the manufacturer and supplier of a standardized extract from turmeric (*Curcuma longa*) rhizomes. This extract is marketed under the registered name "Curcumin C^3 Complex" referring to its proprietary "bioprotectant" composition of the three major natural Curcuminoids, (Curcumin: 70 - 80%, Demethoxycurcumin: 15 - 20% and Bisdemethoxycurcumin: 2.5 - 6.5%).

Curcumin C^3 Complex®, the branded composition of natural curcuminoids, pioneered and patented by Sabinsa Corporation in 1996, is a well characterized ingredient; its composition is determined by HPLC. The complex is standardized to contain not less than 95% curcuminoids and is currently being used by a number of clinical researchers, with IND (Investigational New Drug) approval from the FDA in the US, and by other regulatory organizations overseas.

Sabinsa Corporation helped the United States Pharmacopeial Convention Inc. (USP) in preparing the recently published monographs on curcuminoids and turmeric, and in developing validated analytical methods. Additionally, Sabinsa Corporation supplied reference standards for the individual curcuminoids to the USP. These monographs were published in the Pharmacopeial Forum 33(6), Nov-Dec 2007.

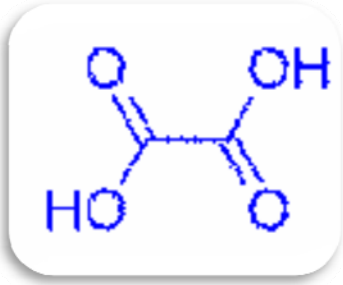
Sabinsa's Curcumin C^3 Complex is produced from dried rhizomes of turmeric. The three major curcuminoids are extracted from the dried rhizomes, and further purified by crystallization. A free flowing mixture curcuminoids is finally obtained after treatment with hot water. The product is standardized for total content of the three Curcuminoids (not less than 95%), and for specified levels of individual Curcuminoids. A validated HPLC method, using approved authenticated reference standards

is used to analyze the finished product. The product is also tested for heavy metals, aflatoxins, and other parameters to ensure compliance with regulatory guidelines.

Liebman's report on the presence of Oxalic acid in turmeric powder, led us to perform investigations on our Curcumin C^3 Complex® product, as well In view of our proprietary method of manufacture, which involves extraction, crystallization and water treatment processes, we did not anticipate to find significant amounts of oxalic acid in the standardized extract. Actual experimentation confirmed this presumption, as detailed in the text below.

OXALATES IN FOOD AND THEIR HEALTH IMPLICATIONS

Dietary sources of oxalate can induce hyperoxaluria and crystal deposition in the kidneys with associated implications in healthy urological functions. Therefore clinical researchers propose that eliminating significant sources of oxalate from the diet decreases not only urinary oxalate, but also calcium oxalate crystal deposits in the kidneys, and improves their function[§]. Calcium oxalate crystals have low water solubility.



Oxalic acid

ANALYSIS OF TURMERIC POWDER AND CURCUMIN C^3 COMPLEX® FOR OXALATE CONTENT

We subjected our raw material powder (dry turmeric powder), its water extract concentrate, and the standardized extract (Curcumin C^3 Complex®) to HPLC analysis using LC-MS instrumentation.

The method for quantitative detection and estimation of oxalic acid in trace amounts was developed and validated in the analytical laboratories of Sami Labs Limited, the manufacturing arm of Sabinsa Corporation.

[§] Khan, SR et al. Dietary oxalate and calcium oxalate nephrolithiasis. ***J Urol.*** 2007 Nov;178(5):2191-6.

OBSERVATIONS

Oxalic acid content in samples of a) dry turmeric powder, b) a water extract concentrate of turmeric powder, and c) the standardized extract Curcumin C^3 Complex®, was determined using the validated method of analysis. Samples from six discrete lots of materials were analyzed in each case, and an average of the oxalate content values was obtained. The results are tabulated (Table 1).

Table 1: Oxalate Levels in Turmeric, A Water Extract Concentrate, and Curcumin C^3 Complex®

S. No	Material	Oxalate Content ppm	Oxalate Content % w/w
1	Dry Turmeric rhizome powder	2700	0.27%
2	Dry aqueous extract of Turmeric rhizome powder	90,000	9%
3	Curcumin C^3 Complex®	250	0.025%

Liebman et al reported that 2.8 gram of turmeric (the supplemental dose used in their study), provides 55 mg of Oxalic acid of which about 90% is water soluble. This is equivalent to about 20,000 ppm oxalic acid per supplemental dose. Supplemental doses of turmeric, as high as 12.5 g are reported in other studies, corresponding to about 245 mg of oxalate, per supplemental dose.

Sabinsa's product Curcumin C^3 Complex® is marketed as a dietary supplement and the recommended dose is 500 mg, equivalent to about 30 gm of dry turmeric rhizome powder. As mentioned earlier, the amount of oxalic acid in Curcumin C^3 Complex® is 0.025 % or 250 ppm (all of it in water soluble form). Table 2 presents a summary of these data.

Table 2: Oxalic Acid Content per Supplemental Dose Consumed

S. No	Material	Supplemental Dose Needed	Oxalate Content /dose (ppm)	Solubility of Oxalate
1	Turmeric Powder	2.8 g	20,000	90%
2	Curcumin C^3 Complex®	500 mg	250	100%

CONCLUSIONS

- The amount of oxalic acid in a supplemental dose of Curcumin C^3 Complex® (500 mg) is 0.025 mg or 250 ppm.

- According to accepted definitions, a "group 4 **low** oxalic food" is classified to contain 5 to 10 mg oxalic acid per serving. (Ref: *http://www.ohf.org/docs/Oxalate2008.pdf.)*. **Curcumin C^3 Complex® is therefore several magnitudes lower in oxalic acid content than "group 4, low oxalic acid food materials".**

- Curcumin C^3 Complex® yields about 160 times lower amount of oxalic acid than the material used in the clinical study published by Liebman, et al.

- A high oxalate food is classified to have 22 – 99 mg Oxalic acid per serving. (Ref: *http://www.ohf.org/docs/Oxalate2008.pdf).* Unless an individual consumes a minimum of 88 gm of the Curcumin C^3 Complex®, this high level of oxalate consumption would not be reached.

We conclude that the dietary supplement ingredient, Curcumin C^3 Complex®, manufactured and marketed by Sabinsa Corporation has very negligible amounts of Oxalic acid, and the amount present in the recommended supplemental dose is 88 times lower than the lowest level needed to attain classification as a "high oxalate" food.

Curcumin C^3 Complex® is therefore very safe for human consumption, and the probability of kidney stone formation due to its consumption is negligible. It is evident that this "bioprotectant" extract is several times safer for use as a dietary supplement, as compared to turmeric spice powder.

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