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# Sugar reduction via a non-sweetener from the Andes

**Greg Aharonian, Founder of KukaXoco, explores a new non-sweetener flavouring chemistry, that can reduce sugar in sodas and chocolates, while maintaining their pleasant tastes**

Written by Greg Aharonian, KukaXoco

## Abstract

Chocolate and cola sodas seem to have a lot in common as sweet confections, with both being loaded with sugar. Remove sugar from chocolate and sodas, and few would consume either. These products are increasingly linked to public health problems, forcing companies to struggle for decades to reduce sugar use.

Both industries' products have mild psychoactive drugs (chocolate: caffeine, cola sodas: caffeine and myristicin), even though using caffeine requires more unhealthy sugar. These two "sugar" industries need more rapid innovation to reduce sugar, before the nimbler, tech-savvy Silicon Valley and e-commerce giants take over the chocolate and sodas businesses.

In this article, I offer a new non-sweetener, flavouring chemistry, based on the coca leaf from the Andes, that can reduce added sugar to create healthier and/or better tasting sodas and chocolates. Simply, KukaXoco believes that neither chocolates nor sodas need to use sugar, especially fructose.

## Cola sodas with 80% less sugar!

Take one 220 ml can of diet cola soda as sold in the U.S. and with only one artificial sweetener, aspartame. Add a teaspoon of de-cocainized coca leaf extract (FDA/DEA approved), and a five-gram bag of sugar. Stir. Drink. Enjoy. A taste, in my opinion, as pleasant as sugary cola sodas with their 25 grams of sugar, but with an 80% sugar reduction and costing about a penny per can.

Better, use six grams of glucose to achieve the first fructose-free cola soda. It can be made even tastier by replacing aspartame with a 10:1 ratio of cyclamate and saccharin.

Coca leaf extracts are not sweet, but instead a new natural aromatic flavouring chemistry that offers new, simple, pathways for sugar reduction.

## Siblings: Chocolate and sodas

The dictionary definition of "confection" is a "food or beverage loaded with sugar". Chocolate and sodas have much in common as confections. The average chocolate is 50% loaded with sugar. A standard chocolate bar (43 grams) has 24 grams of sugar, whilst a can of soda is loaded on average with 38 to 42 grams of sugar, a liquid confection. To the 80+% level, the taste of cola sodas is largely due to sugar and salt. Similarly, the taste of chocolate is mainly due to its 80%+ sugar and fat content. Both mix well with alcohol, for example, Cuba Libres, and chocolate liquors.

Caffeine? In a standard can of any cola soda, you can find approx. 34 milligrams. A dark chocolate bar has about 24 milligrams. Both are brown, though cola sodas don't contain caramel coloring for taste.

Both have slow innovation rates. Chocolate bars and sodas haven't changed much in 100 years while their customers demand healthy products. Both will be hit with consumer health lawsuits. Coca-Cola is now in U.S. courts facing three such lawsuits; will chocolate companies be next? Both confection industries rely solely on two main strengths: global



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distribution chains, and mystery “secret formulas”.

This article discusses a new development from the labs of KukaXoco: a non sweet coca-leaf extract that makes diet cola sodas taste and feel much like sugary cola sodas.

The article also discusses, for the first time together in print, complete formulations, including flavourings, for the most valuable (diet) cola sodas, which is useful for competitors and new entrants. Next, the article discusses new insights into the chemistry of soda and chocolate confections, including reports in medical journals as to the little-known health troubles associated with these sugary confections.

The article ends with ordering information on how any company can easily buy and start experimenting with (de-cocainized) coca leaf extracts, approved by both the DEA and FDA, with just one phone call to Lima, Peru (+51 84582027). Then use the e-commerce world to manufacture and distribute your new sodas!

Pepsi, it's finally time for you to call ENACO ([www.enaco.com.pe](http://www.enaco.com.pe)) and start using the coca leaf. And will we see a McDonald's McCola soda, a Nestlé NesCola soda, and/or an Amazon Amazona Kola soda?



**Diet colas with a sugary-cola taste**

Take one 220-milliliter can of Diet Coke as sold in the U.S. Add five to 10 milliliters of ENACO coca leaf extract, and a bag of a 10:1 mix of cyclamate and saccharin. This creates a taste more similar to sugary cola sodas, but sugar-free, more so if aspartame is eliminated.

This is a very unexpected discovery that hasn't been uncovered by cola soda giants. Most likely, decades ago, the company abandoned use of the coca leaf (officially stating so for its Diet Coke). Pepsi, on the other hand, has never used the coca leaf.

This breakthrough in diet sodas could launch a new era of sugar-free sodas, especially new artisanal sodas. Of course, it helps start-ups and designers of new sodas to have the crucial formulas for cola sodas.

To begin, in a little-known PhD thesis from 2011, a formula for the cola flavouring – very closely matching cola soda taste and aroma - was published (See figure 1).

(Figure 1) COMPOUND	ng/g
(R)-(+)-limonene	5,050
alpha-terpineol	4,180
(E)-cinnamaldehyde	1600
4-terpineol	702
vanillin	176
1,8-cineole	101
(+)-borneol	107
(-)-borneol	99.3
linalool	74.1
coumarin	46.0
octanal	35.2
nonanal	26.4
geraniol	23.3
decanal	17.6
iso-borneol	15.8
nerol	11.5
guaiaicol	1.5
methyleugeneol	8.7
eugenol	6.3
(E)-isoeugeneol	2.7
(Z)-isoeugeneol	0.2

More formulas for (diet) cola sodas, published in corporate legal documents, are below.

**This breakthrough in diet sodas could launch a new era of sugar-free sodas**

**PEPSI COLA (100 years ago)**

INGREDIENT	QUANTITY
Water	10,000 lbs.
Confectioners Sugar	7,200 lbs.
Phosphoric acid	58 lbs.
Caramel	12 gallons
Lime juice	12 gallons
Alcohol	0.5 gallons
Oil Lemon	6 fl. ounces
Oil Orange	5 fl. ounces
Oil Cinnamon	4 fl. ounces
Oil Nutmeg	2 fl. ounces
Oil Coriander	2 fl. ounces
Oil Petit Grain	1 fl. ounces

### COCA-COLA (50 years ago)

(Quantities per gallon of syrup - does not include flavouring)

INGREDIENT	Coke	Diet Coke
Water	4.4927	8.0195 lbs.
Sugar	2.8267	0.0lbs.
HFCS-55	2.9816	0.0lbs.
Caramel	91.99	85.48 gms
Saccharin	0.0	8.944 gms
Caffeine	2.36	3.15 gms
Cola Nut extract	2.18	0.0gms
Phosphoric acid	12.20	5.96 gms
Citric acid	0.0	4.76 gms
Sodium benzoate	0.0	4.79 gms
Sodium	0.94	2.29 gms
Vanilla extract	1.86	1.13 gms



### DIET PEPSI/COKE (20 years ago)

(Gram quantities per gallon of syrup)  
(does not include flavouring)

INGREDIENT	Diet Pepsi	Diet Coke
Water	2000	3637.58
Caramel	n.a.	85.48
Saccharin	0.0	8.944
Sucralose	10.56	0.0
Phosphoric acid	5.50	5.96
Caffeine	1.24	3.15
Citric acid	0.267	4.76
Potassium citrate	4.070	0.00
Sodium benzoate	n.a	4.79
Sodium	n.a	2.29
Flavourings	22.22 mls	n.a.

### ARTIFICIAL SWEETENER LEVELS (Brazil and Canada)

(Brazil, per 100 milliliters) circa 2018

**Pepsi Zero:** 11.2 mg acesulfame 8.0 mg sucralose

**Coca-Cola Zero:** 27 mg cyclamate 15 mg acesulfame  
12 mg aspartame

(Canada, for cans)

**Coca-Cola Zero**

**Sugar:** .130 mg/ml acesulfame

.240 mg/ml aspartame

**Diet Coke:** .042 mg/ml acesulfame

.370 mg/ml aspartame

**Sprite Zero:** .141 mg/ml acesulfame

.210 mg/ml aspartame

**Diet Pepsi:** .090 mg/ml acesulfame

.350 mg/ml aspartame

### Coca tea - the Andean "coffee"

The coca leaf used to prepare coca leaf extracts is commonly consumed as coca tea. Enjoyed by families in South America for over 500 years, coca tea is a delicious green tea, with many vitamins and minerals. Coca-Cola's creation was inspired by Vin Mariani, a wine that used coca leaves.

Coca tea is less stimulating than coffee, and a 1995 World Health Organization study reported on its complete safety. For tourists in the Andes, it helps them cope with high altitudes and low oxygen levels. Powdered coca leaf extract is an exotic spice, a "cinnamon" from the Andes. And coca leaf extract goes great with sushi.

It is time for industry to help consumers enjoy and benefit from coca teas and coca leaf extracts. Perhaps time for a Nestlé coca tea!

And the folks at ENACO in Lima are waiting to take orders for the coca teas and extracts, which are fully legal to import, use and sell in the United States under FDA GRAS rule U.S. 21 CFR 182.20 and DEA exemption rule 21 U.S.C. 812 Sched. II(a)(4) (and similarly in other parts of the world). More information on the science and chemistry of the coca leaf is available at: [www.cienciadelacoca.org](http://www.cienciadelacoca.org)

### Fat-free, sugar-free chocolate cream

Let me introduce you to some recent food chemistry from the KukaXoco labs! Take 220 grams of any unsweetened cacao, preferably one with low acidity. Mix in 320 grams of a milk protein powder that is microparticulated. Then add in 2.5 cups of water, a few tablespoons of coca leaf extract, 10





to 20 grams of an artificially sweetener, and thoroughly mix. The result is a delicious and healthy chocolate cream that is less than 5% fat and sugar. It's time for a new generation of chocolate products!

### Chocolate and cola soda taste mostly of sugar

Bob Holmes, in his book, "Flavor: the science of our most neglected sense" (2017), explains an experiment that cancels the cola soda taste by blocking the sweet and salty tastes. To prove this, he rinsed with Gymnema tea, which blocks sweet taste, and a chlorhexidine solution, which blocks salt taste.

The result? "... all that gargling [with four cups each] and swishing seems to have obliterated those two tastes [sweet and salty]. A sip of Pepsi yields a brief prickling on my tongue – the mouthfeel, or touch, sensation from the carbonation – then its flavor vanishes completely."

An experiment worth trying with chocolate using the Gymnema tea. Soda's reliance on sugar is now a liability in the modern health conscious world, especially in light of the following research. And with chocolate typically being around 50% sugar, its reliance on sugar could create the legal liability.

### Eliminating fructose with glucose?

Chocolate and sodas rely heavily on sugar: sucrose, which is 50% glucose and 50% fructose. Sodas now use the cheaper HFCS-55, which is 55% fructose.

This results in health problems as human cells cannot use fructose. Meaning it goes straight to the liver, which as many articles report, causes at least one disease:

"Association of sugar sweetened beverages consumption with non-alcoholic fatty liver disease", Eur. J. Nutrition, May 2018 – "... intake of sugar sweetened beverages should be limited to reduce fatty liver disease ...", a disease now affecting overweight children.

Fructose is not linked just to factor in fatty liver disease. Another study shows artificial sources of fructose, especially sodas and sweets, increase diabetes risk:

Br. Med. Journal, 21 November 2018 – "... several food sources of fructose-containing sugars (especially [sodas]) adding excess energy to the diet have harmful effects ..."

Further problems caused by fructose: Sugar-sweetened soft drinks and fructose consumption are associated with hyperuricemia [think gout], Nutrients, July 2018 – "... high fructose consumption in men, and moderate and high consumption in women were associated with hyperuricemia ..."

Using coca leaf extracts and glucose (or xylitol) to improve the taste of diet sodas, eliminates all fructose, a healthy solution for both sodas and chocolates.

Note: links to all of these journal articles, and further details on the data published in this article, are available at: [www.kukaxoco.com/KennedysData.html](http://www.kukaxoco.com/KennedysData.html)

### Should chocolate use more drugs like cola sodas?

Caffeine, to quote Wikipedia "... is a central nervous system stimulant ... the world's most widely consumed psychoactive drug". A dark chocolate bar has about 24 milligrams of caffeine, while a can of cola soda has 34 to 38 milligrams. Caffeine adds nothing to the flavour of soda, with one study showing that caffeine-free sodas can use five to 10 grams less sugar while still tasting the same.

Do sodas use caffeine and sugar to create a "mild form of dependence"? (according to Wikipedia). If so, why not use in some forms of chocolate? Why not add more caffeine to a dark chocolate bar, to match the 34 milligrams in sodas? Indeed, a chocolate milk start-up, Slate, is launching a coffee-flavored chocolate milk with 150 milligrams of caffeine.

But why stop at one psychoactive drug in chocolate? But who does that, you ask? Well some sodas. One flavour ingredient in some sodas is nutmeg oil.



One chemical in nutmeg oil is myristicin. It turns out that myristicin is classified as a very mild psychoactive drug. It is the precursor to MDMA, commonly known as Ecstasy. The levels are very low in sodas, it is present with less than a milligram per gram, however, the FDA should require the quantity be clearly labelled. (GC/MS studies are available indicating the presence of myristicin).

Could it contribute to caffeine's creating a "mild form of dependence"? If it's safe enough for use within the soda industry and their sugary confections, why shouldn't the chocolate industry make use of myristicin in its sugary confections?

### Health aspects of sugary and diet cola sodas

Despite the huge size of the soda industry, there has been very little published information about the chemical and health aspects. Some of which will impact the traditional confectionery industries. What follows are two significant abstracts from medical journals.

"Estimated global, regional, and national disease burdens related to sugar-sweetened beverage consumption in 2010", *Circulation*, June 2015 – "The model estimated 184,000 deaths/year attributable to sugar-sweetened beverage consumption ...".

"Flavor constituents in cola drinks induce hepatic DNA adducts in adult and fetal mice". DNA adducts are segments of DNA bound to a cancer-causing chemical. The flavour constituent here is myristicin.

Cyclamates (artificial sweeteners) were banned in U.S. markets for having a tenuous link to cancer, which was later disproved. So, should products with myristicin be pulled from U.S. markets as well?

### New competition for companies?

Companies are forced to compete in a world where Amazon and Walmart will distribute anything within in two hours for ten pence, delivered to your home or restaurant. Who needs retail chains when there is UberEats? Social media is disrupting the old-school world of advertising. Look at the industries vanquished to date: bookstores, toy stores, video stores, drug stores, and superstores such as Sears. Look at Harry and David's, a billion-dollar company delivering what? Razor blades to the home. Who needs Gillette?

## Companies are forced to compete in a world where Amazon and Walmart will distribute anything within two hours

So how vulnerable are chocolate and soda companies to competition from Silicon Valley and e-commerce giants who are less wedded to sugar? These giants innovate more rapidly, can conquer traditional retail distribution chains, and have powerful AI design tools to explore new food chemistries using the above data and formulas.





Products available now

## ENCYCLOPEDIA OF COLA SODA CHEMISTRY 2019 edition

KukaXoco and Kennedy's are launching the first in a series of encyclopedias for the confection industry. The first will be the Encyclopedia of Cola Soda Chemistry, followed by the Encyclopedia of Chocolate Chemistry, and then the Encyclopedia of Sugar Reduction Technology.

The Encyclopedia of Cola Soda Chemistry, 2019 edition, will be over 1,500 pages of studies and documents that span the world of cola soda chemistry:

- 150-page, 200-year history of cola sodas
- GCMS/LCMS studies of cola sodas
- Key patents for cola soda flavourings
- Little known chemical journal articles on cola soda flavourings and other soda ingredients - including the coca leaf
- Background chemical data on dozens of chemicals in cola sodas
- Copies of lawsuits concerning cola soda chemistry
- Financial data on the cola soda industry

The Encyclopedia is available for \$10,000, and can be ordered from the Kennedys or KukaXoco web sites.

### KukaXoco Cola Booster

KukaXoco is now accepting orders for its KukaXoco Cola Booster, a combination of concentrated coca leaf extract and a small amount of sweetener. Available in ketchup bottle sized containers, all you have to do to make a delicious diet cola sodas is squeeze a few drops of our Booster, and enjoy, enjoy, enjoy!



## Licensing

KukaXoco has patent pending technology of all of its breakthrough technologies on the use of the coca leaf extracts, including the identification of new flavoring chemicals completely ignored by the food and beverage industry.

For those companies interested in licensing our technology, and experiencing our training seminar on cola soda chemistry, please contact

Gregory Aharonian by email at [greg.aharonian@kukaxoco.com](mailto:greg.aharonian@kukaxoco.com) or on the phone: 415-981-0441.

KukaXoco is arranging for the private label manufacturing of our new delicious diet cola sodas. We can brand with your company's logos, or create a new brand.

## Enaco S.A

They are currently selling a 50-gallon container of concentrated de-cocainized coca leaf extract. A rough ratio is one milliliter of extract per hundred milliliters of cola soda beverage, or six milliliters per hundred milliliters of cola soda syrup. Each 5 gallon container costs \$125 (which does not include shipping costs from Callao, Peru, the port city for Lima).

These extracts are legal to use and sell in the United States under FDA GRAS rule U.S. 21 CFR 182.20 and DEA exemption rule 21 U.S.C. 812 Sched. II(a)(4)). The ENACO web site ([www.enaco.com.pe](http://www.enaco.com.pe)) has a safety certificate provided by the Ministry of Health of Peru. KukaXoco has available a food safety analysis done by an independent testing lab.

## Private Label Specialties

One company that offers private label manufacturing of soda is Private Label Specialities (Goffstown, New Hampshire).

Sample bottles are available on request. For large orders, they will customise for you the diet cola soda recipe.

For more information, contact Private Label Specialities at 888-669-6632, or [Sales@PLspecialites.com](mailto:Sales@PLspecialites.com)

They also do private label branding for other sodas, including (diet) root beer, vanilla and orange cream soda, the classic soda tastes (grape, orange, ginger, and black cherry) and other flavours.

For companies interested in developing their own cola sodas, and experimenting with coca leaf extracts, you can order supplies of liquid coca leaf extract from ENACO ([www.enaco.com.pe](http://www.enaco.com.pe), telephone: (+51 84582027), the Peruvian government agency that coordinates the legal coca leaf industry in Peru.

