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### Questions

**1. Which method produces the highest quality cocoa powder?**

In my opinion nib alkalizing provides the cleanest flavor and broadest range of color.

**2. Many chocolate-flavored foods – ice cream, cakes etc. – have a distinct cocoa powder flavor. How does one minimize the “powder” flavor?**

It's not clear as to what a “powder” flavor is. I will project the question refers the bitter and sour notes of a “non-alkalized” cocoa powder. Alkalizing will neutralize acidic sour notes and round out bitter notes making the powder more palatable.

**3. Is it possible to make alkalized chocolate by adding alkalized cocoa powder to chocolate liquor?**

Yes, it can be added to the liquor directly or added as a component of the chocolate recipe.

**4. Can cocoa powder bloom? Are there storage requirements that should be respected?**

Yes, the powder color will become dull. <70 Fahrenheit, <55% RH are recommended.

**5. Can sodium levels be significantly impacted by the choice of alkalizing agents?**

If a sodium compound is used as the alkalizing agent, sodium levels will rise. If a different alkali is chosen, sodium levels will not be affected.

**6. For which applications would you recommend a) nib alkalizing, b) cake alkalizing, c) liquor alkalizing?**

Each has positives and negatives. The key is matching the ideal process with the best application. Nib alkalization is a good choice for beverages, cake alkalization for cakes and pastry although nib alkalization is a good choice here as well, liquor alkalization for chocolate.

**7. Over 100 years ago Oreo cookies were first made – what company made the black cocoa powder and what was the process to alkalize it?**

Oreos were first produced in 1912. I do not know what cocoa companies were around at that time. It is possible Nabisco produced the cocoa themselves. Given the primitive technology for pressurized vessels and processing of the time, I suspect the cookies were lighter in color than the Oreo of today.

**8. Are some alkalizing methods better suited for certain final product applications, i.e. which is best in a) beverages, b) ice cream, c) baking?**

Each method will work for each application but you will usually use nib alkalization for beverages because of cleaner flavor. Nib alkalization will often be the choice for ice cream as well. Cake alkalization can be used in bakery because multiple ingredients are used and the

flavor of the finished product is less “cocoa dependent.”

**9. You mentioned color evaluation in oil. Can you please explain this further?**

The following procedure can be used as a quick method for evaluating cocoa color if the final product is an oil-based dessert.

Paste Test

- Weigh 5 g cocoa
- 17.5 g oil (coconut or shortening)
- 27.5 g powdered sugar (sifted)

Mix into a smooth paste and place on glass slide or Petri dish for evaluation.

**10. What sensory terms are used to describe alkalized chocolates?**

There are several factors affecting the alkalized chocolate; to what extent is the product alkalized (pH) and alkalizing agent used. Some terms would be brownny, marshmallow, Oreo, mild (no sour or astringency).

**11. How does nib/liquor alkalization impact the flavor of cocoa butter? What flavors are produced that may be undesirable?**

It will vary with the alkalizing compound and the intensity to which the solids were alkalized. For instance, the solids may have been alkalized to pH 6.8 or solids may be processed as high pH 8.0. The cocoa butter flavors produced may not be negative, but will be different from a natural cocoa butter.

**12. To what extent do residual soaps in dutched powders help the ability to be dispersed?**

Very little, if at all. While free fatty acids' conversion to soap makes them water soluble, there is only 10% cocoa butter in the cocoa powder and within that, 500 – 1500 ppm soap, so it is a very small amount.

**13. Why does dutching reduce cocoa flavanols? What do the reaction products taste like? Are these different from CF loss in fermentation?**

There are three main reasons alkalization reduces flavanols, high heat, reduced acid, and oxidation. Heating the product to 80-125C while alkalizing is common. Alkali is used to drive the pH to 7.0 or greater. Flavanols are best preserved in the presence of acid. Air is typically injected into the nib to enhance oxidation of phenolic compounds. During alkalization, polyphenols such as anthocyanins, procyanidins and catechins are changed into quinones, which undergo polymerization or form darker compounds. The resulting reaction product will be a less astringent, darker cocoa with decreased polyphenol content. Polyphenol loss will occur in fermentation as heat, acid reduction and air exposure occur here as well.

**14. Is it possible to alkalize a product twice? If not, why?**

Yes, it is possible, but the CFR limit of 3 parts potassium carbonate or equivalent per 100 parts cacao nib cannot be exceeded.

<p><b>15. Which alkalizing agent is most commonly used?</b> Potassium carbonate.</p>
<p><b>16. How can you measure un-reacted alkali in dutched powders?</b> There is no official method for un-reacted alkali in cocoa. Methods do exist in the American Oil Chemist Society manual for other products (soap in this case) and may be worth trying. A.O.C.S. Da 4a-48, A.O.C.S. Da 5-44</p>
<p><b>17. After you remove the “soap” portion from the alkalized cocoa butter, what use do you have for it and can it be sold as a cosmetics product?</b> Soaps are typically captured by filtering with bleaching earth. The soap is bound to the bleaching earth (by adsorption and ion attraction through ion exchange) and is difficult to remove. It is also not alone in the bleaching earth since there is also phosphatides and neutral oil as well as color bodies. This combination would make the soap difficult to purify for sale.</p>
<p><b>18. Aside from flavor, are there any other factors that can be changed by using different alkali salts?</b> Color may be different. For instance, NaOH can create purple notes while K<sub>2</sub>CO<sub>3</sub> will favor red. Process variables will still remain important time/temp, atmosphere, moisture, bean quality, etc.</p>
<p><b>19. What variable during the alkalization process would you say affects flavor the most and why?</b> The alkalizing compound because some of the compound remains with the cocoa. For instance, if potassium carbonate is the alkali chosen for the process, potassium levels will increase. The roasting level (high heat or low heat) will have significant impact as well.</p>
<p><b>20. What is the legal limit for alkali salt additions? Does this change with difference alkali salts?</b> 21CFR163.110. For each 100 parts by weight of cacao nibs, used as such, or before shelling from the cacao beans, the total quantity of alkali ingredients used is not greater in neutralizing value (calculated from the respective combined weights of the alkali ingredients used) than the neutralizing value of 3 parts by weight of anhydrous potassium carbonate.</p>
<p><b>21. Is there any difference in the preservation of polyphenols depending on whether alkalization is done before of after roasting?</b> Information is limited, but a correlation is drawn between high pH and low polyphenols, therefore, no, there is not a difference. Fermentation and roasting are detrimental to polyphenols as well.</p>
<p><b>22. Do you think alkalization can align with the “natural” and “simple” movement? What is the outlook for alkalized powder?</b> Alkalized products will never be as “natural and simple” as non-alkalized chocolate liquor or</p>

cocoa. But, it is a process which has been around for 187 years and when used as a coloring agent, it replaces artificial colors. It is often labeled “Dutched,” which people see as positive and it still contains significant antioxidants. Therefore, I think alkalized cocoa powder has a bright future with strong demand.

**23. Does cocoa butter from nibs or liquor alkalization need to be declared as alkalized butter?**

Alkalizing agents would be considered to be processing aids and would not need to be labeled for cocoa butter. That is, assuming that they do not have a technical function in the cocoa butter (which they do not) and that alkali is present is in “insignificant levels.”

According to the Food and Drug Administration's (FDA) regulations (21 CFR 101.100 (a) (3) (ii)), the **definition** of a **processing aid** is either:

- a. Substances that are added to a food during the **processing** of such food but are removed in some manner from the food before it is packaged in its finished form.
- b. Substances that are added to a food during processing, are converted into constituents normally present in the food, and do not significantly increase the amount of the constituents naturally found in the food.
- c. Substances that are added to a food for their technical or functional effect in the processing but are present in the finished food at insignificant levels and do not have any technical or functional effect in that food.

**24. How is black cocoa powder made?**

It could be made utilizing the nib, cake, or liquor alkalizing method. Liquor alkalization would be rare because of the detrimental effect on the cocoa butter. Nib and cake alkalization are the most prominent. High pH, high temperature, and pressure are critical variables for each method.

**25. What is the residue level of the alkalizing agent in the products?**

It will vary by the extent the product is alkalized. For instance, the final product could be lightly alkalized (pH 6.8) or heavily alkalized (pH 8.4). If Potassium carbonate was used to make cocoa powder, an increase in potassium may be 500-2000 milligrams.

**26. Any suggestions for getting rid of “black butter?”**

Dark chocolate is an ideal application or blending the dark color away with a non alkalized cocoa butter.

**27. Can you describe how you could alkalize liquor using standard chocolate-making equipment?**

At minimum a heated vessel with agitation is required. Chocolate-making processes will often have this in place for melting chocolate liquor and cocoa butter. Add chocolate liquor to the vessel. Add an alkali solution. Allow time to react and evaporate the moisture.

**28. In terms of processing time, for a similar pH, do the three processes have similar process**

times?

It is dependent on the equipment and goals (how dark, how much red). Powders with high red notes and darker color utilize high rates of water in the process. Removing the water after the alkalization process will be the limiting factor.

**29. What, if anything, are cocoa manufacturers doing with FDA to see if they could label alkalized cocoa to just cocoa for simplicity?**

At this time, I am not aware of any industry initiatives to modify the standards of identity for cocoa powder.

**30. Many consumers are opting for “natural” non-alkalized chocolate. Do you have a way to make the alkalizing process more natural and consumer-friendly – less chemical-sounding?**

The term “dutched” is often used to describe alkalized cocoa powder, however per the standard of identity, alkalized cocoa is required to be labeled with a term “processed with alkali” or “processed with \_\_,” with the blank being filled by the common or usual name of the alkalizing agent. Depending on the name of the alkalizing agent used, there may be more or less consumer acceptance of that ingredient.

**31. What is the exact chemical reaction between the cocoa and the alkali?**

Neutralization reaction. Basic pH, high heat, and oxidation favor formation of enhanced colors due to sugar degradation, Maillard reactions, and anthocyanin polymerization.

**32. Would a cocoa powder that has higher fat and therefore darker color appear darker in the finished product compared to a lighter, lower fat powder?**

Typically the cocoa powder with more non-fat solids will have greater coloring and flavoring impact in application, therefore, the finished product utilizing the higher fat powder will be lighter in application and have less flavor impact.

**33. Currently, what type of alkalization is most used?**

It’s difficult to put a number on because they are proprietary processes provided by mostly private companies. But in my experience, in addition to knowing what I compete against, and interviewing alkalization equipment suppliers, nib alkalization is most prominent, at least in North America and Europe.

**34. What will be the next enhancements in alkalized cocoa in the next 5-10 years?**

I suspect flavanol preservation will be a focus since the industry has received a lot of positive news in that area.

**35. Can alkalized chocolates be labeled natural or not artificial?**

FDA’s policy on natural labeling is: *food may be labeled “natural” provided it contains no added colors, artificial flavors, or synthetic substances and that nothing artificial or synthetic has been included that would not normally be expected to be in the food.* 58 Fed. Reg. 2302, 2407 (Jan. 6,

1993).

It is not possible justify the use of a natural claim on cocoa treated with alkalizing agents that have been derived from synthetic sources. If the alkalizing agents have been derived from a natural source (some can be), it becomes more difficult to determine the appropriateness of a natural claim. There is no clear industry-wide policy on the use of the term natural on alkalized cocoa. Additionally, there have been lawsuits filed against manufacturers for using the term “natural” on products containing alkalized cocoa powder. At this time, I would not advise using the term natural on alkalized cocoa powder. However, where the alkali is from a natural source, I believe there is a case for it.

With respect to “not artificial”, this term would be likely safer to use. Particularly the term “no artificial flavors or colors” may be an attractive option, assuming this statement is truthful and not misleading.

**36. Can the addition of sugars during alkalization affect final color?**

Yes, there are a number of reactions taking place affecting the color during alkalization and roasting. One of them is the Maillard reaction (nonenzymatic reaction between amino groups and reducing sugar). Added reducing sugar should help to darken color.

**37. As consumers move towards more natural product offerings, is there a consumer push away from cocoa treated with alkali? Or products containing this ingredient?**

I do not believe so. The use for alkalized liquor and alkalized cocoa is a very broad category. In some cases it’s the main ingredient and some it’s a minor inclusion. For some products, it’s the best choice you have available, and for some it’s a requirement. For instance, what would an Oreo look like if you decided to remove black cocoa? It would be an entirely different product.