“Soap from Ashes”

By Kerri Mixon

A simplistic slide show presentation on the art of coaxing lye from ashes. Learn different tips and tricks to master the technique of making soap from scratch without electricity. Harvesting lye from ashes to make soap ads another creative aspect to the rewarding artistry of soapmaking.

Water: Rain, river, soft, distilled. Avoid hard water with excessive minerals.
Ashes: Hardwood (dicot), softwood (conifer), palm leaves or grasses (monocot).
Container: Stainless steel pot or polypropylene. Avoid cast iron, glass, wood, terracotta.
Fats: Only solid saturated fats to make soap bars. Liquid oils make soft, malleable soap.
Heat source: Wood-burning stove, open fire, stovetop, oven, hotplate, induction burner, crockpot.

Add excessive water to the ashes until the charcoal floats above the ashes. Remove the floating charcoal with a slotted spoon or skimmer. The goal is to extract an alkali solution from the watery ashes. What alkalis naturally occur in ashes? What if the ashes are not from hardwood?

Some alkalis present in ashes from some agro-wastes (non-hardwoods):				
Alkali	Cocoa Pod Ash	Palm Bunch Ash	Sorghum Chaff Ash	Groundnut Shell Ash
K_2CO_3 Potassium carbonate	**56.73** ± 0.16	**43.15** ± 0.13	**12.40** ± 0.08	**16.65** ± 0.05
KOH Potassium hydroxide	**16.07** ± 0.05	**15.91** ± 0.10	**5.22** ± 0.06	**9.80** ± 0.05
Na_2CO_3 Sodium carbonate	**0.17** ± 0.03	**0.36** ± 0.04	**0.22** ± 0.02	**0.24** ± 0.02
NaOH Sodium hydroxide	**0.07** ± 0.02	**0.13** ± 0.03	**0.08** ± 0.02	**0.09** ± 0.02
Taiwo, O.E. and Osinowo, F.A.O., 2001. “Evaluation of Various Agro-Wastes for Traditional Black Soap Production.” Bioresource Technology, 79: 95-97.				

No matter the ash source, it is likely potassium carbonate is most abundant and sodium hydroxide occurs only in trace amounts. Therefore, the goal is not to extract “sodium hydroxide,” it is to extract an “alkali solution,” which likely contains potassium carbonate as the predominant alkali. With this goal in mind, which alkalis are water soluble?

Substance	Solubility (grams/100 mL water)	
	Cold	Hot
Potassium carbonate	147	331
Calcium chloride	75	159
Sodium chloride	36	39
Potassium chloride	34	57
Sodium carbonate	22	421
Calcium carbonate	0.001	0.002
Dunn, K.M., 2002. “A Primitive Alkali: Potash.” Caveman Chemistry.		

The most effective way to extract the most potassium and sodium carbonates and potassium and sodium hydroxides is by heating the ash water to ensure greater solubility. Calcium carbonate is not very soluble, not in cold nor hot water. Calcium carbonate and heavy ash are not desirable in soap, so they may be avoided by allowing the heavy ash and calcium carbonate to settle to the bottom of the hot water and ladling the clearer hot water off the top. Further filtration of the hot alkali solution through a coffee filter paper will clarity the solution. To leach the greatest alkali content from the ashes, repeat the process 2 more times: Add more water to the muddy ashes, allow the heavy ash and calcium carbonate to settle to the bottom of the hot water, ladle the clearer alkali solution off the top, and filter it through a coffee filter—repeat again.

Due to the addition of the excessive water needed to easily separate the alkali solution from the ashes and charcoal, the alkali solution must be cooked to allow water to evaporate as steam and produce a more concentrated alkali solution. Enough water has been cooked off when the alkali solution is concentrated enough to float a raw chicken egg. The shell of the egg should be suspended above the surface of the alkali solution so a quarter-sized (or about 1 inch in diameter) circle is exposed above the surface. When this concentrated alkali solution cools, a dark powdery sludge will appear in the bottom of the solution. Do not remove or filter it out of the cooled solution. The dark sludge is likely the potassium and sodium carbonate and other alkalis that are less soluble in cold water that have fallen out of solution due to the drop in temperature because if the solution is re-heated, the dark sludge dissolves, leaving a very clear (although brownish orange) solution without sediment.

The strength of the alkali solution is only approximate, even using a chicken egg to test the concentration. Once the process is underway, it will be much easier to add more fat than to prepare more alkali solution from additional ashes. Therefore, the objective is to create a soap with excess alkali and slowly add more fat in small quantities until the soap is neutral. Weigh the concentrated alkali solution and prepare an equal weight in fat. Begin with equal weights of fat and alkali solution but halve the fat and begin with only one half. For example, if 20 ounces of concentrated alkali solution was leached from the ashes, prepare 10 total ounces of fat. Begin soapmaking with 20 ounces of concentrated alkali solution in 10 ounces of fat and reserve the remaining 10 ounces of fat in case it is needed to be added gradually until the cooked soap tests neutral.

Considering the alkali solution likely consists mainly of potassium carbonate, it is expected to produce a soft soap, similar to making liquid soap paste with potassium hydroxide. To create a more solid bar of soap, it should be made entirely of saturated fats or with minimal unsaturated fats. Likewise, to help ensure a harder bar, salt (sodium chloride) may be added to the recipe.

Starting recipe:		
Ingredient	Percentage	Weight
Alkali solution	66.6%	20.00 ounces
Salt	3.4%	1.00 ounces
Stearic acid (10% of fats)	3.0%	0.90 ounces
Lard (60% of fats)	18.0%	5.40 ounces
Coconut oil (30% of fats)	9.0%	2.70 ounces
Total	100.0%	30.00 ounces

Reserve an equal weight of fat to gradually add while hot processing until the soap is neutral:	
Fat	Weight
Stearic acid (10% of fats)	0.90 ounces
Lard (60% of fats)	5.40 ounces
Coconut oil (30% of fats)	2.70 ounces