



ANCIENT SUNRISE®

Henna and Acidic Mixes

Catherine Cartwright-Jones PhD

Ancient Sunrise® Henna for Hair, Chapter 6, Henna and Acidic Mixes

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Henna, Cassia, and Mildly Acidic Mixes



Henna and an acidic mix versus henna mixed with water

Henna was mixed with lemon juice with lemon juice and applied to the hair at the left, seen above. Henna was mixed with boiling water and applied to the swatch on the right. When the henna was rinsed out, the swatch with the lemon mix was a paler orange, and the swatch mixed with water was a brighter orange. Over several months, the mildly acidic stain shown at left gradually darkened while the water stain gradually faded.

Lawsone in the henna will bind permanently to keratin without boiling¹ or mordants² if mixed with a mildly acidic liquid.³ The acid penetrates the cellulosic material in the powdered leaves, and makes the lawsone available for binding. As long as the mix is hydrogen-rich and mildly acidic⁴ the hydrogens on the corners of the lawsone molecule will be preserved, so the dye will bind to the keratin of hair in a Michael reaction. Lawsone binds so strongly to keratin that even repeated bleaching will not completely remove the color. Lawsone does not ‘coat’ the hair, it binds into the keratin scales that make up the outside layer of the hair. Once bound into hair, the lawsone molecule will gradually darken, unless something is done to prevent that darkening.

¹ Most dye molecules are large. When dyeing fabric, the dyer often boils the cloth or yarn in a dye bath. The heat expands the molecules so that the fiber will take up these large molecules more easily. Lawsone, chrysophanyl, and indoxyl are unusually small dye molecules that will bind to keratin without boiling. Don’t boil your head.

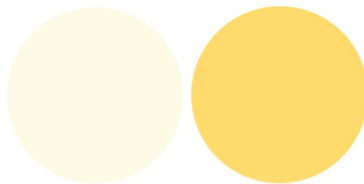
² A mordant is a chemical that partially breaks up fiber so that dye will bind to it more easily. Most mordants would be harmful to hair or toxic to skin. Stylists often use a ‘soap cap,’ a mix of detergent and peroxide to damage hair a bit so that dye will more easily adhere to the hair. Lawsone, chrysophanyl, and indoxyl have molecular shapes that will bind with keratin molecules without a mordant.

³ James, K. C., Spanoudi, S. P., Turner, T. D.. 1986 "The absorption of lawsone and henna by bleached wool felt" K. C. Society of Cosmetic Chemists, Vol. 37, No. 5, 359-367.

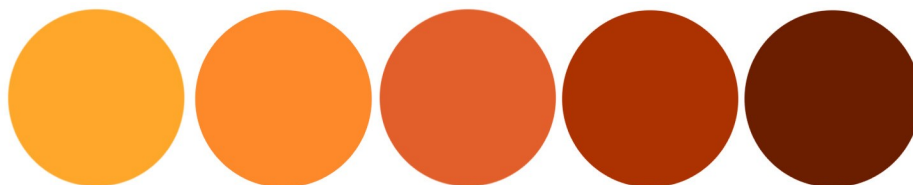
⁴ Any acidic liquid from pH2.0 to pH4.5 added to the pH neutral henna powder will make a satisfactory henna paste. Your choice of paste will depend on what smell you like, and how sensitive your skin is, and what other enzymes, anti-oxidants, or factors you want to work with.

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Fruit juices with their differing pH, differing kinds of acid, anti-oxidants, pigments and enzymes slightly change the tone, saturation, and oxidation of lawsone and chrysophanic acid in hair.⁵



Cassia stains range from minimal or no color in a pH neutral mix, to a golden stain color from an acidic mix.



The color progression of henna dyed hair as it oxidizes over time: it will not fade. Hennaed hair will gradually darken.

If henna is mixed with a very sour liquid, the stain will be a very light coppery orange at first and gradually darken towards deep auburn. If henna is mixed with a pH neutral mix, the stain will begin at a medium red-orange, but darken only minimally.

Fruit juices are chemically complex, highly variable, and may contain many different acids, as well as other enzymes and pigments. They vary in price, and have distinctive odors and textures when they are mixed into henna. The color of the fruit or juice generally has little to do with the color the dye produced. Blueberry juice does not actually make henna more blue; tea does not make henna browner. Try a few things until you find out what works best for you, what is most convenient for you, and what fits into your budget.

Citrus Fruits and Citric Acid

⁵ These variants are difficult to quantify and every person's hair is slightly different. In this book, I decided to not post images of the varying results we got testing mixes on hair, because every person will get slightly different results from their mix, and the color resolution on each person's monitor (or printer) is slightly different. Please understand that these colors represented are a very rough approximation of what you might get as results. Test mixes on your own hair until you find your favorite, then stick with it. I recommend that stylists do their own tests on harvested human hair to become familiar with the range.

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When mixing henna for use as hair dye, citrus juice is convenient, smells nice, and is very reliable. Dilute orange juice⁶ or lemon juice with filtered or distilled water, or use it straight from a bottle; there is no need to squeeze it fresh. If you want to dilute juice, add filtered or distilled water or tea until it tastes like mild lemonade; that's sour enough. You can dilute the acidity to as little as a few spoonfuls per cup of water and still maintain a hydrogen rich paste. Citrus fruit juices mixed with henna create hair stains that are initially a light color, gradually darken, and do not fade over time.

Lemon juice, pH 2.3, mixed with henna leaves a pale orange stain at first, the stain will gradually darken to a deep auburn. Many women with very dark but graying hair simply add lemon juice to henna and leave the paste in their hair overnight for a thorough saturation in a hydrogen-rich medium. With this technique, the gray is virtually invisible and the dark hair shimmers deep red in the sunlight.

The sensation of dryness that follows a lemon juice application is not hair damage, though it may feel 'crunchy' when you handle the hair. This 'crunchy' feeling is caused by the scales of keratin being raised to bind with the lawsone, rather like rubbing a cat's hair backwards to more effectively sprinkle in flea powder. The scales will settle back down in a few washings. Rinsing with hair conditioner will eliminate the 'roughed-up' sensation more quickly.

Lime juice, pH 2, is very acidic. At first, hair dyed with henna/lime juice paste is very light, but it will gradually darken to the darkest of all acidic mixes. Lime juice is the juice most likely to cause skin irritation, so use it cautiously.

⁶ Orange juice is very convenient because it's in most people's refrigerators, but many brands of orange juice contain pulp. This might not be a problem in your hair dye, if you don't mind washing out a bit of pulp, but don't use orange juice with pulp for your henna body art paste. I made that mistake once. Very embarrassing.

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Ancient Sunrise® Citric Acid

Ancient Sunrise® Citric Acid is convenient for mixing a mildly acidic henna paste. You can add powdered citric acid to your favorite tea, filtered, or distilled water. Add 6g or 1 teaspoon per 100g of henna, or enough citric acid to the tea or water to make it taste as tart as lemonade. Citric acid mixture stains do not darken as much as citrus juice mixtures. Citric acid paste mixtures tend to create bright coppery stains that stay light and bright.

Citric acid and citrus fruits can irritate some people's skin. Other fruit acids with different characteristics can be used to make a hydrogen-rich henna paste. These will give slightly different results.



The above example shows the difference between cassia stains created with a mixture of purified citric acid and water, and a stain created with a mixture of other natural fruit acids.

Citric acid mixed with henna and cassia creates the lightest, brightest henna and cassia stains on pale, gray hair. Fruit acids and juices that are more chemically complex, containing other acids, enzymes, antioxidants, and anthocyanins. By varying the fruit acids and juices, you subtly vary the colors with henna, cassia, and indigo on hair.

Ancient Sunrise® Amla, *Emblica Officinalis*



Ancient Sunrise® Amla

Amla, *emblica officinalis*, is a wild gooseberry that grows in South Asia. Ancient Sunrise® Amla powder is typically about 3.5 pH, and naturally contains gallic acid, ellagic acid, and ascorbic acid.⁷ Gallic acid is commonly found in tree barks, ellagic acid is commonly found in berries, and ascorbic acid is a form of vitamin C. Add 25g of Ancient Sunrise® Amla to 100g of henna or cassia and enough filtered or distilled water to make a paste. No further acid will be needed. The gallic acid in amla lends ash tones to henna/indigo mixes. Amla's acids temporarily snap the hydrogen bonds in keratin, and allow greater uptake of indigo, and make henna/indigo mixes considerably darker and more ash colored.

If you apply an amla paste to your hair, and the hydrogen bonds in the keratin are loosened, then they reconnect. When they reconnect, they tend to be slightly off the original axis. This makes hair appear more 'fluffy.' Apply an amla paste to your hair for about 10 minutes, then rinse, then braid or set curls into the damp hair and let it dry. This will shape the new axis, and hair will have a temporary, gentle waves or curl.

If you apply an amla paste as a facial, and gently massage it in for about five minutes, it will loosen the top dead layer of skin. Rinse the amla away to reveal the healthy skin beneath. Many people find that a daily amla facial reduces acne breakouts. Amla is anti-bacterial, and the daily exfoliation helps keep skin clear

Acids with Anthocyanins and Antioxidants

⁷ Singh, Mhaveer, Y. T. Kamal, E. T. Tamboli, Rabea Parveen, Khalid M. Siddiqui, S. M. A. Zaidi, and Sayeed Ahmad. 2012. "SIMULTANEOUS ESTIMATION OF GALLIC ACID, ELLAGIC ACID, AND ASCORBIC ACID IN EMBLICA OFFICINALIS AND IN UNANI POLYHERBAL FORMULATIONS BY VALIDATED HPLC METHOD." *Journal Of Liquid Chromatography & Related Technologies* 35, no. 17: 2493-2502. Academic Search Complete, EBSCOhost (accessed September 20, 2014).

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Ancient Sunrise® Nightfall Rose: *Aronia Prunifolia*

Ancient Sunrise® Nightfall Rose is a mildly acidic wild fruit powder with a high level of anthocyanin, a pigment produced naturally in the berries. Anthocyanin pigments range from blue to purple to pink. Anthocyanins create the colors in ripe blueberries, blackberries, grapes, elderberries, cranberries, raspberries, cherries, pomegranates, and plums, eggplants, beetroots, and red cabbage, the fruits and vegetables that are beneficial in our diets.⁸ Anthocyanin pigments can give rise to an array of red to blue colors, depending on the pH of the medium.⁹

⁸ Bueno, Julia Martín, Purificación Sáez-Plaza, Fernando Ramos-Escudero, Ana Maria Jiménez, Roseane Fett, and Agustin G. Asuero. 2012. "Analysis and Antioxidant Capacity of Anthocyanin Pigments. Part II: Chemical Structure, Color, and Intake of Anthocyanins." *Critical Reviews In Analytical Chemistry* 42, no. 2: 126-151. *Academic Search Complete*, EBSCOhost (accessed September 20, 2014).

⁹ Entertain yourself by soaking red cabbage with vinegar and watch the color change from alkaline to acidic pH. "Ancient Sunrise® Henna for Hair," Chapter 6, Henna and Acidic Mixes, Copyright © 2015, Catherine Cartwright-Jones PhD, TapDancing Lizard® LLC <http://www.mehandi.com> <http://www.hennaforhair.com> <http://www.ancientsunrise.com>



Ancient Sunrise® Nightfall Rose powder

Ancient Sunrise® Nightfall Rose naturally has malic acid and is acidic enough to make a hydrogen rich henna or cassia paste. Add 25g of Nightfall Rose to filtered or distilled water or the tea of your choice, and stir that into 100g of henna or cassia powder; increase the amount of Nightfall Rose as you increase the amount of henna or cassia.

The malic acid in Nightfall Rose is very gentle to hair. Though Nightfall Rose is a deep rose color, it will not add a dark red color to cassia or henna. The anthocyanins in Nightfall Rose will add a subtle ash tone to henna and cassia mixes, and creates lovely brunettes with henna and indigo mixes. The antioxidants in Nightfall Rose deter browning that may occur over time with henna.



Ancient Sunrise® Copperberry: *Malpighia Glabra L*

Ancient Sunrise® Copperberry can be used to mix a hydrogen-rich henna paste. Copperberry has high levels of antioxidants and vitamin C, higher than other fruits.¹⁰ Antioxidants in your henna mix will keep the henna color brighter, and less likely to darken over time. You may mix Ancient Sunrise® Copperberry with filtered or distilled water or your favorite tea to make your henna paste, just as you would use Amla. Amla's gallic acid adds an ash tone to henna; Copperberry's ascorbic acid keeps the henna bright and rosy.



Ancient Sunrise® Copperberry powder

You can mix Ancient Sunrise® Citric acid, Amla, Copperberry and Nightfall Rose powders directly into henna or cassia powder and then add filtered or distilled water, or you may mix them with herbal tea. If these acids make your tea or water about as sour as lemonade, that's sour enough to preserve the hydrogens in your henna paste so the lawsone will bind properly with the keratin. Tea won't change the resulting color of your stain, even though the tea itself has a color. Black tea won't darken your henna stain, and caffeinated teas may give you the jitters if you're sensitive to caffeine. Hibiscus and roobios teas are dark red from anthocyanins but they do not add red tones to the henna stain. Spicy teas, particularly cardamom or ginger tea, can help mask the earthy smell of henna.

You may mix fruit powders or fruit juices into your henna paste; whichever is more convenient for you. Powders may be convenient because you can keep them on hand for months, even years. Juices may be convenient if you happen to have them in your kitchen anyway.

¹⁰ Mezadri, T., D. Villaño, M.S. Fernández-Pachón, M.C. García-Parrilla, and A.M. Troncoso. 2008. "Antioxidant compounds and antioxidant activity in acerola (*Malpighia emarginata* DC.) fruits and derivatives." *Journal Of Food Composition & Analysis* 21, no. 4: 282-290. *Academic Search Complete*, EBSCOhost (accessed September 20, 2014).

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**Ancient Sunrise® Kristalovino, Diprotic Acid and
Ancient Sunrise® Malluma Kristalovino, Potassium Bitartrate**



Diprotic acid, Ancient Sunrise® Kristalovino, occurs naturally in grapes, bananas and tamarind, and is used in many recipes as leavening, and in whipping egg whites in meringue. Both diprotic acid, and potassium bitartrate, Ancient Sunrise® Malluma Kristalovino,¹¹ are byproducts of wine. Potassium bitartrate often appears as the little red crystals at the bottom of a wine glass. The difference between the two is that potassium bitartrate is partially neutralized with potassium.



Ancient Sunrise® Kristalovino
Diprotic acid



Ancient Sunrise® Malluma Kristalovino
Potassium bitartrate

Of all the mildly acidic liquids that may be used to mix henna, diprotic acid and potassium bitartrate are the most gentle and least likely to cause skin irritation or dryness in hair. Mix one teaspoonful (4g) Ancient Sunrise® Kristalovino into filtered or distilled water per 100g of

¹¹ If you have a difficult time remembering ‘Kristalovino’ and ‘Malluma Kriastalovino’, just remember “crystal wine’ and ‘dark crystal wine.’

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Ancient Sunrise® henna. Do not use too much Kristalovino or your mix will go too sour! You can from one teaspoonful (4g) up to 25g of Ancient Sunrise® Malluma Kristalovino for 100g of henna; you can use more without overdoing the acidity because Malluma Kristalovino's acidity is buffered. Stir in additional filtered or distilled water until the henna paste is the consistency of mashed potatoes. If you like to leave your henna on overnight for convenience, or to cover stubborn gray, Ancient Sunrise® Malluma Kristalovino or Ancient Sunrise® Kristalovino would be your best choice for people with sensitive skin or fragile hair.

Ancient Sunrise® Malluma Kristalovino or Ancient Sunrise® Kristalovino can be kept indefinitely, ready to use. There is no need to scrounge around in your house or run to the store for juice to mix with your henna.



Henna mixed with diprotic acid, Ancient Sunrise® Kristalovino, makes a lighter, brighter red henna stain on blonde hair. Henna mixed with potassium bitrurate, Ancient Sunrise® Malluma Kristalovino, makes a darker, more auburn henna stain on blonde hair.



When mixed with henna, the results of these two acids look identical when the henna is first shampooed out of the hair; then, the stains mature to different colors. Ancient Sunrise® Kristalovino produces a light, bright red with henna on blonde hair; diprotic acid is often used as an antioxidant in food. Ancient Sunrise® Malluma Kristalovino, potassium bitrurate, helps the henna color oxidize to a deep, rich auburn.

What Acids Do You Have Around the House?



Vinegar, cranberry juice, apple juice

You probably have some vinegar in your kitchen. Vinegar is pH 2.4 and contains acetic acid. Vinegar is cheap and plentiful. The stains from henna mixed with vinegar tend slightly to a brownish tone when they mature. The only problem with using vinegar to mix henna paste is that the smell of vinegar can be very unpleasant.¹²

You may have some cranberry juice, pH 2.3, in the house; cranberry juice is convenient but not a bargain. Cranberry juice contains quinic, malic and citric acids¹³ and is sour enough to make a hydrogen-rich paste. The color of cranberry juice will not make your henna stain more of a dark red color. The anthocyanins and natural anti-oxidants in cranberry juice will slightly deter the subsequent darkening, and the stain will stay more in the mid-red range without going brown.

Apple Juice, 3.4 pH, contains malic acid. Apple juice is convenient, sour enough to make a good henna paste, and is very gentle on hair. Apple juice also contains enzymes that break henna's cellulostic material down a bit faster than some other juices, so the dye release may go faster than you expect. Both apple and cranberry juice henna mixes tend to be sticky (because of the fructose in the juice) and to have a booze-y smell. Both apple and cranberry juice mixes hold well in the refrigerator for several days because they contain antioxidants.¹⁴

Coffee, Wine, Yoghurt, Oil and Eggs: Don't Bother

¹² Everyone has a slightly different perception of scent, but it is this author's opinion that the smell of a vinegar-henna mix has a 'three buzzard rating' warning for disagreeable smell.

¹³ Forney, Charles F., Wilhelmina Kalt, Michael A. Jordan, Melinda R. Vinqvist-Tymchuk, and Sherry A.E. Fillmore. 2012. "Blueberry and cranberry fruit composition during development." *Journal Of Berry Research* 2, no. 3: 169-177. *Academic Search Complete*, EBSCOhost (accessed September 22, 2014).

¹⁴ Apple juice and cranberry juice mixes, accidentally left in the back of the refrigerator for several days seem to give more of a non-darkening bright rosy-orange stain than you would expect.

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Don't mix coffee, wine, yogurt, oil and eggs into your henna.

You probably have these in your kitchen, but don't mix them into your henna, even though someone will say, "My grandmother did it this way." These were probably added to henna because they were kitchen leftovers, not because they were effective as a henna mix.

Coffee is around pH 5, so it has few hydrogen ions to donate to your henna mix. Coffee will not darken your henna stain and it contains caffeine. Caffeine is transdermal, so coffee in henna paste may give you a headache and the jitters¹⁵ if you're sensitive to caffeine. Coffee may also leave an unpleasant smell in your hair. Wine mixed into the henna paste will not make the henna stain a darker red. Though wine has anthocyanins, it is not worth having to endure the smell of wearing wine on your head for several hours.¹⁶ There are other, pleasanter, sources of anthocyanins. At 4 pH, yoghurt isn't a bad thing to mix with henna, but the proteins in yogurt will hinder dye uptake. If you're trying to cover gray, or to get a robust color out of your henna, don't use yoghurt in your mix. If you want a creamier mix, Ancient Sunrise® CMC powder is a better choice.

People often ask if they should add eggs and oil to their henna. Both eggs and oil will hinder dye uptake. If you want to do an oil or protein treatment, do those separately from the henna, either in the week before or the week after you apply henna.

Do you want a truly 'pure water-only' mix for your henna? Don't use tap water, because that tap water is usually pH 7 or 8, and may be as high as 9.5.¹⁷ Instead, collect rainwater or melt some snow! Rainwater and snow in industrialized countries is usually pH 4, and may be lower.

¹⁵ Shakeel, Faiyaz, and Wafa Ramadan. 2010. "Transdermal delivery of anticancer drug caffeine from water-in-oil nanoemulsions." *Colloids & Surfaces B: Biointerfaces* 75, no. 1: 356-362.

¹⁶ It is this author's opinion that henna mixed with wine has a 'five buzzard warning' for disagreeable smell.

¹⁷ The alkalinity and dissolved minerals in tap water contribute to fatalities of houseplants. "Ancient Sunrise® Henna for Hair," Chapter 6, Henna and Acidic Mixes, Copyright © 2015, Catherine Cartwright-Jones PhD, TapDancing Lizard® LLC <http://www.mehandi.com> <http://www.hennaforhair.com> <http://www.ancientsunrise.com>