

## Indigo, *Indigofera Tinctoria*



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What is indigo?

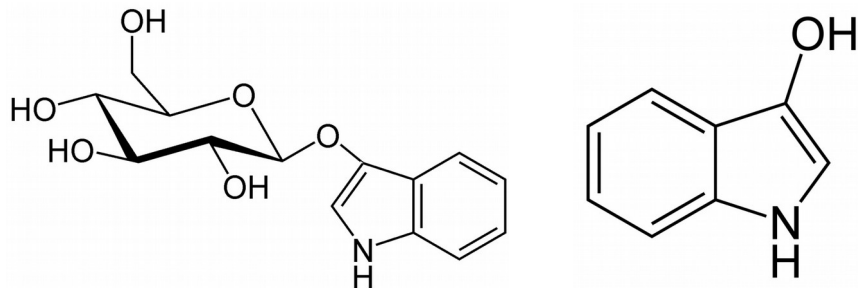
Indigo, *Indigofera tinctoria*, is a tropical plant that has been used to dye cloth since at least 9,000 BCE.<sup>1</sup> Ancient Sunrise® Indigo is still made from fermented indigo leaves as was originally done. Natural indigofera tinctoria dye was a major product of India and West Africa before the invention of synthetic indigo. Ancient Sunrise® Indigo is pure, partially fermented indigo powder, known as *vashma*. Ancient Sunrise® Indigo is pH neutral and safe for hair, free of contaminants, chemicals, pesticides and adulterants. Synthetic indigo has largely replaced natural indigo in the clothing and textile industry today. Synthetic indigo cannot be used to dye hair because the chemicals, alkalinity and heat required can damage hair and skin.

Indigo is a legume, and the indigo powder smells somewhat like peas. Indigo leaves contain indican, a colorless molecule. When the leaves are soaked in water and partially fermented, the precursor indican molecule breaks into  $\beta$ -D-glucose and indoxyl. Indoxyl is the intermediate to indigo. These partially fermented indoxyl-containing leaves are then dried and powdered to make Ancient Sunrise® indigo powder for hair. This powder keeps the indoxyl molecule in the intermediate state so it will bind to the keratin and dye your hair. Mix indigo powder with water into a paste, and quickly put it on hair. The indoxyl molecules will migrate from the indoxyl-rich paste into the keratin and bind with it. If the indoxyl molecule is oxidized to the indigo molecule before it has a chance to bind to and stain keratin, it will not bind, and will wash out of your hair. This oxidation happens rapidly, so once you stir water into the powder, you must use it

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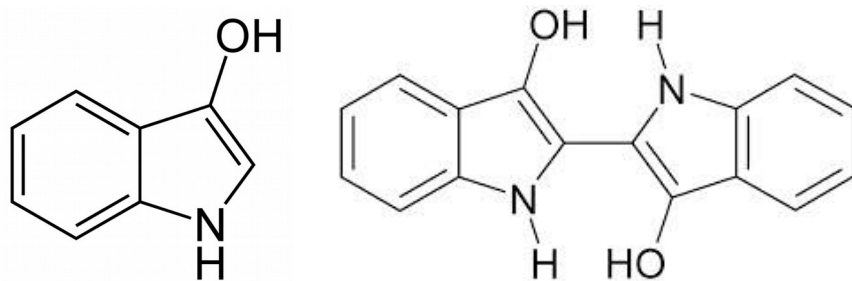
<sup>1</sup> This date is based on a Neo-Babylonian Mesopotamian cuneiform tablet that describes dyeing wool with indigo.

immediately for the indoxyl to dye your hair before it can change to the oxidized indigo molecule.<sup>2</sup>



The indican molecule releases the indoxyl molecule that can dye hair.

You can see the indoxyl precursor dye oxidize and produce the blue indigo molecule if you mix the indigo powder with water and leave it out in the air. The surface of paste will turn metallic dark blue in about twenty minutes when exposed to air. When the paste turns blue, the indoxyl molecule is oxidizing to the blue indigo molecule. The blue indigo molecule will no longer dye hair; the color will wash away.<sup>3</sup>



The indoxyl molecule changes to the blue indigo molecule. The blue indigo molecule cannot dye hair.

Do not let your indigo powder freeze, be exposed to the air, or to become damp; these will also change the indoxyl molecule to indigo and make it useless for dyeing hair. Your indigo powder or paste will no longer dye hair after it oxidizes to the indigo molecule, the color blue. You cannot freeze your indigo paste for later use as you can freeze and re-use henna paste.

Indigo is not synthesized directly by the plant; it is a product derived from indole glucoside precursors which are secondary metabolites. The indigo precursor, indoxyl, mainly in the form of the glucoside, indican is found in most indigo-producing plants. To form indigo from the

<sup>2</sup> Kerry G. Gilbert (nee Stoker) & David T. Cooke. "Dyes from plants: Past usage, present understanding and potential" *Plant Growth Regulation* 34: 57–69, 2001. © 2001 Kluwer Academic Publishers.

<sup>3</sup> If indigo chemistry seems bewildering, imagine it as a sort of hair tetris with tetraminos that you can split apart and join back up. At first, you have a tetrimino that is the wrong shape to fit into the available hole. That is the indigene molecule. You smash up the indigene tetramino. One piece, the indoxyl tetrimino, fits perfectly into the hole, but you must get the indoxyl into that available hole very quickly, or it will join to another piece. If it joins to that other piece, it becomes an indigo, and that again is the wrong shape to fit into the hole.

precursors, the carbohydrate moiety is cleaved from the indoxyl group and two of the resulting indoxyl molecules combine oxidatively to produce an indigo molecule.

Indigo by itself dyes human hair a dull grayish dark blue, like new blue jeans. Though indigo is a blue dye, it does not create purple when mixed with henna; together they create brown. In different proportions, henna and indigo mixes create a broad array of brown tones in hair, conveniently very natural-looking brunette colors.

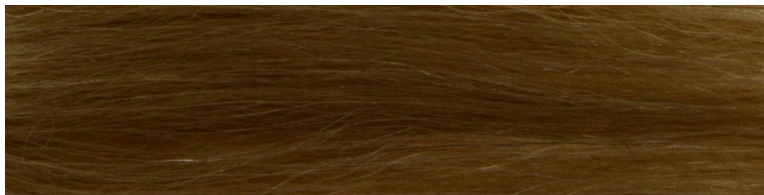


The above image shows an array of henna through indigo colors on white mohair, with henna at the left and indigo at the right and mixtures of henna and indigo in the middle.



Indoxyl green is rarely seen and changes quickly; it's just part of the process of indigo staining hair black or brunette with henna.

If there is a greenish tone after you first dye your hair with indigo mixes, don't panic. This is simply the indoxyl molecule in its green precursor form. The color will rapidly change to the brunette or black tone as it binds to the keratin in your hair, just from being in contact with the air.



Henna and indigo mixed sparingly with cassia produces a lighter, pale brunette color.





Hair dyed with equal parts of henna and indigo

If henna and indigo are mixed evenly, they will produce a medium brunette. If the henna-indigo mix is more henna than indigo, the brunette will be reddish brunette. If the henna-indigo mix has a higher proportion of indigo than henna, the result will be darker brunette. Different fruit acids also change the brunette tone; amla creates darker, more ash tones of brunette. Ancient Sunrise® henna-indigo mixes effectively cover gray and do not fade.



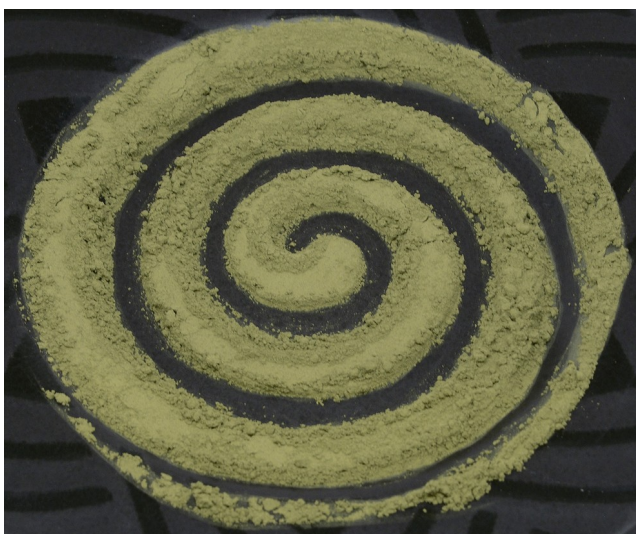
Hair dyed dark brown with  $\frac{1}{4}$  Ancient Sunrise® Henna and  $\frac{3}{4}$  Ancient Sunrise® Indigo



Hair dyed with henna, and then dyed again with indigo within 48 hours.

When hair is dyed first with henna and then over-dyed with indigo, the hair will be as black as a black cat, even when dyeing over blonde or graying hair. If the indigo fades after many shampoos, and the black color softens, re-dye the hair with henna and indigo to build up the color saturation.

Indigo does not condition and strengthen hair, nor does it have the health benefits as henna. Allergies to indigo are very rare, but they do occur. Most sensations of itching after using indigo are related to hay fever, a general mild allergic response to plant particles and pollens.<sup>4</sup> Serious allergic reactions to indigo are very rare but they do occur. Some people also dislike the smell of indigo paste. Mixing indigo powder with instant vanilla pudding powder before adding water masks and relieves this smell. Even when well sifted, the texture of indigo powder is not as easy to apply as henna. Half a teaspoon, or 2 grams of CMC powder, carboxymethyl cellulose powder,<sup>5</sup> added to indigo powder before mixing in water improves the texture of indigo paste.



Ancient Sunrise® Indigo Powder

Indigo is not as easy to use to dye hair as henna, because the indoxyl molecule is fragile and finicky, easily oxidizing from indoxyl to insoluble indigo. The process is time consuming. When customers demand fast, cheap, reliable results, manufacturers sell PPD powder as ‘black henna,’ often without labeling the chemical or the amount of chemical used. Ancient Sunrise® indigo powder is always tested to insure that there are no added chemicals, adulterants, contaminants, or pesticide residue, and that the pH is neutral.

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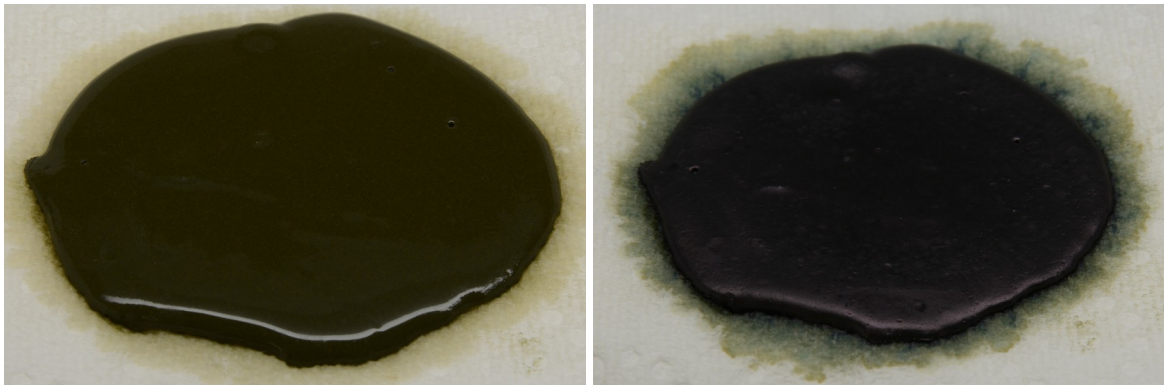
<sup>4</sup> I have a mild sense of warm itchiness after using indigo, and after working in the garden. Both are generalized plant allergies, from pollens and plant materials. The indigo itch subsides after a few shampoos, and the gardening itch, after a shower or two.

<sup>5</sup> Carboxymethyl cellulose powder is a cellulose gum processed from cornstarch. It is used in salad dressings to give them a creamy texture and keep them from separating.



Hair dyed black with Ancient Sunrise® Henna and Indigo Powders

Ancient Sunrise® sells two qualities of indigo, Zekhara and Sudina. Zekhara is more finely sifted than Sudina. Zekhara indigo is the better choice for fragile or damaged hair, very thick hair, resistant gray hair, locks, or hair with a dense curl pattern. Sudina costs less than Zekhara. If you don't mind rinsing a little longer and if you're not trying to cover resistant gray, Sudina is a perfectly adequate indigo.



Do you want to test your green powder to be certain that it is indigo? Make a small amount of indigo paste with water and powder. The paste should be dark green. Put the paste on a white paper towel, and leave it there for an hour. In one hour, you should see a dark navy blue color on the surface, and blue-green dye seeping out into the paper.

There are many products which claim to be 'black henna' masquerading as indigo. These will be black when you mix them up, and black stain will spread out on the paper towel; these contain para-phenylenediamine, often at dangerously high levels



## **Ancient Sunrise® Henna for Hair, Chapter 5, Plants that Dye Hair**

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