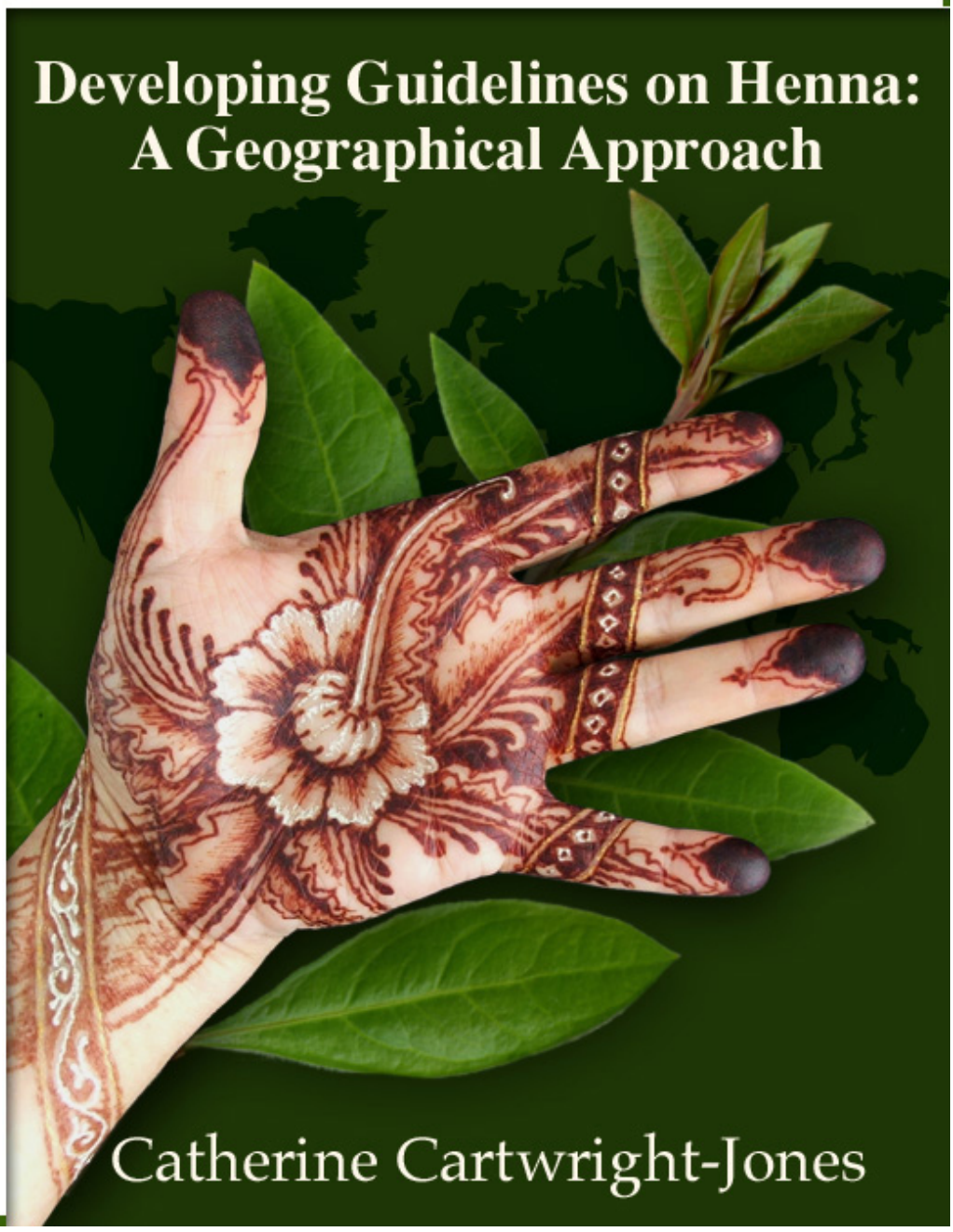
The Henna Page™

ENCYCLOPEDIA OF HENNA

Developing Guidelines on Henna: A Geographical Approach



Catherine Cartwright-Jones

DEVELOPING GUIDELINES ON HENNA:

A GEOGRAPHICAL APPROACH

Chapter II:

Criteria for a Systematic Investigation of Henna

Evidence of henna body art must be based on directly observing henna's characteristics, and extending these observations into the past, to that which we cannot directly observe. We observe that henna leaves a rusty-red stain on skin. Henna's dye is lawsone, the red-orange dye molecule. Lawsone stains skin and other keratin. The initial stain is orange, and that may oxidize to dark red, to brown, and nearly black. Human skin is presumably the same now as it was 8,000 years ago. The henna plant and its lawsone molecule are presumably the same now as it was 8,000 years ago. If henna leaves a brick colored stain on hands and feet now, henna should have left a brick colored stain on hands and feet consistently since the late Neolithic.

The first set of criteria would be to determine whether there are any eliminating factors that would preclude the possibility of the markings being made by henna. The second set of criteria for evaluating the evidence of henna body adornment would be to demonstrate that the henna plant could have been available to make the stain. This is determined by comparing the location of the artifact to a climate zone suitable for henna. The third set of criteria would be that the appearance of the markings would have to be consistent in color and placement with henna body art. Henna stains differently across the geography of the body, and henna markings are usually placed in the optimal stain areas, the hands and feet. Henna stains have a specific color range, and representations would be expected to fall within that range. The fourth set of criteria would be contextual evidence from written accounts of henna use, cultural associations of henna use and other forms of body art that can be used to support or negate henna as the probable source of the body markings.

If there are no "negatives", and there are criteria about the artifact consistent with henna, that sets an artifact in the range of being "possibly henna". Since there are other sources of red-brown body markings, all "possibles" from this list must be further examined to support the probability that the markings were made with henna rather than a cosmetic with similar appearance. Taken together, these sets of criteria should provide a "sieve" for artifacts with body markings that would support or eliminate the interpretation of body markings as either representing henna, or representing another form of body art. The "positives" then can be positioned to construct historical geographies of henna.

The Henna Plant: Lawsonia Inermis

Figure 15: Three-year-old henna plant, 1 m tall; branches (Cartwright-Jones, 2004 and 2005)

Division: Magnoliophyta

Class: Magnoliopsida

SubClass: Rosidae

Order: Myrtales

Family: Lythraceae

To establish criteria for henna, the plant must be defined. Henna, *Lawsonia inermis*, is a tall shrub or small tree, 2 – 6 m high. It is glabrous, multibranched with spine tipped branchlets. Leaves are opposite, entire, glabrous, sub sessile, elliptical, and broadly lanceolate (1.5 – 5.0 CM x 0.5 – 2 cm, acuminate, having depressed veins on the dorsal surface (Kumar, Singh, & Singh, 2005).

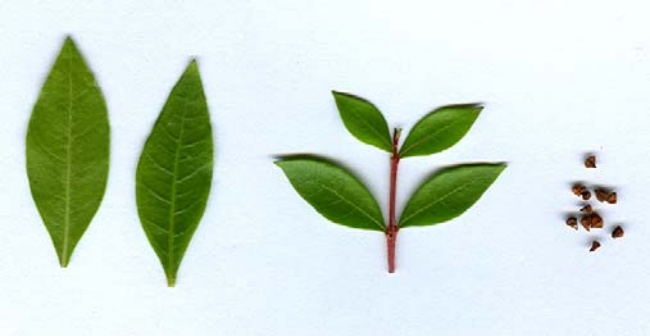


Figure 16: Lawsonia inermis leaves and seeds (Cartwright-Jones, 2005)

Lawsone resides in the leaves and is in the highest quantities in the petiole.

Figure 17: A high-resolution scan of a newly budded henna leaf showing red lawsone concentrated in the petiole (Cartwright-Jones, 2005)

The highest lawsone content is in the new growth of leaves following an extended period of heat and drought, then a brief flush of rain (Roy, Singh, & Tewari, 2005). During the onset of precipitation intervals, the plant grows rapidly; putting out new shoots, then growth slows. The leaves gradually yellow and fall during prolonged dry or cool intervals.

Figure 18: Stages of henna leaf development: new growth, one month old, and three months old (Cartwright-Jones, 2005)

Figure 19: Henna seeds (Cartwright-Jones, 2005)

The seeds are three mm across, angular with a thick seed coat (Kumar, Singh & Singh, 2005). Henna seeds are not difficult to germinate, but require soaking and moisture maintenance during initial growth. In the wild, birds feasting on henna berries at one

wadi or oasis propagate henna when they migrate to another oasis and excrete seed. Henna farmers propagate by rooting cuttings in a riverbank or nursery, a more reliable method than planting seed (Singh, Jindal & Singh, 2005).

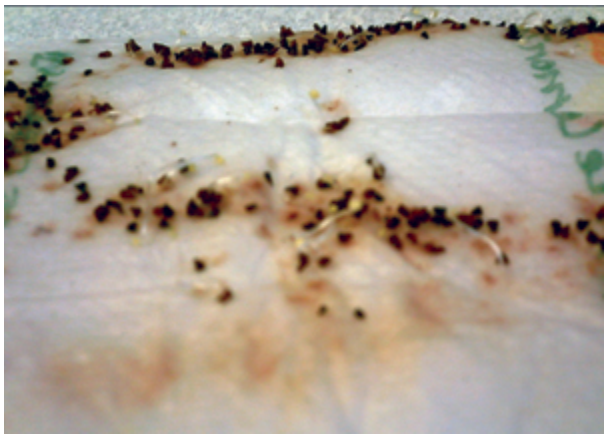


Figure 20: Henna seeds sprouting (Foster, 2004)

Henna flowers have four sepals and a 2 mm calyx tube with three mm spread lobes. Petals are obvate, white or red stamens inserted in pairs on the rim of the calyx tube. Ovary is four celled, style up to five mm long and erect. Fruits are small, brownish capsules, four to eight mm in diameter, with 32 to 49 seeds per fruit, and open irregularly into four splits (Kumar, Singh & Singh, 2005). Lawsone content in leaves is negatively associated with the number of seeds in the fruits (Singh, Jindal & Singh, 2005).

Figure 21: Henna fruits (Abid and Co, 2004)

Figure 22: Henna Flowers (Musselman, 2005)

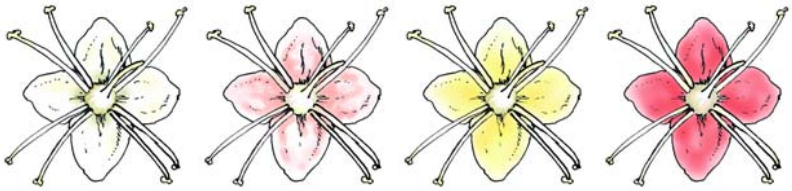


Figure 23: Henna flowers in four colors, white, pink, yellow and dark rose (Cartwright-Jones, 2005)

In Rajasthan, the henna plant flowers during August and September as the monsoons subside. The flowers are intensely fragrant, and are used in perfumery. The Biblical reference to henna, Solomon 1, 14, "My love is unto me as a cluster of Camphire in the Vinyard" (King James Authorized Version) refers to the flowers. Henna flowers come in four colors, bloom asynchronously, and about half of them set into berries (Singh, Jindal & Singh, 2005: 18). In India, the white to yellow flowered plants are called Madayantika, and the deep rose and pink flowered plants are called Kuranaka. The scent manufacturing centers in India for henna flowers are Kannaj and Ujjain. The flowers are crushed in oil to retrieve hina attars, which have scents reminiscent of a combination of chocolate, roses and good cigars. The pungency of scent is from the beta-innone content, which is antifungal and antibacterial (Kumar, Singh, & Singh, 2005)

Henna's Growing Range: Global Regions

Another fundamental criterion for evaluating whether a body marking was made with henna would be to determine whether or not henna was available to make that mark.

Henna is indigenous to North Africa, Arabia, the Middle East and South Asia. There is no henna body art native to the Americas, though American indigenous people had red body paints. Figure 24 is of Amazonian indigenous people ornamenting each other with red pigment. This paint is crushed annatto seed, not henna.

Figure 24: Ngrano applies red pigment from annatto seed (Verswijver, 1996: 64)

Henna was imported into the USA for hair dye as early as the late 1800's, and was popular as a hair dye before para-phenylnediamine dyes were introduced in the 1920's

(Ninety-Sixth Congress, first session, Subcommittee Hearing, 1979) and popularized in the 1930's with the formal registration of cosmetologists (Walrath, 1977). Lucille Ball's famous red hair was maintained with henna; she was naturally blonde (Tannen, 2002). Lower quality henna will suffice for hair dye, but high quality henna for body art was not widely imported into the USA until the early 1990's.

A mature henna tree produces five to seven kilos of henna leaves per year (al-Ashaf, 2002). A single henna tree could be assumed to provide one woman with henna sufficient for a year's worth of hair dye and skin care: based on my experience dying my own hair and skin and selling henna to several thousand regular clients through my business, a woman uses about five hundred grams of lower to medium quality henna to treat waist-length hair once a month, for a total of six kilos per year. She would use an additional 100g of better quality henna to stain her feet, hands, and fingernails each month. She would reserve one additional kilo of the best quality henna for a wedding, circumcision, Id or Diwali party. So, for henna to be available in sufficient quantities for a community of one hundred women to develop and sustain a henna tradition, there would have to be at least one hundred henna plants locally growing wild or under cultivation to sustain regular harvesting and use.

The first henna plants were introduced into the Caribbean through Indian laborers working in the British sugar industry in Trinidad between 1845 and 1917 where the plants were locally known as "Jamaican Mignonette" (Mahabir, 2001). These were cultivated as a hedge plant and appreciated for the flowers, but body art use did not

extend beyond the Indian immigrant community. Other henna-using immigrant communities in the Americas had to import henna where it could not be grown locally, or go without.

Figure 25: Henna package, West Virginia, 1930 (Cartwright-Jones, 2004)

Henna powder becomes stale and loses dye content in about three months unless it is packaged in airtight, climate-controlled packaging. When dried henna leaves are powdered, the lawsone degrades in contact with air or light. Henna kept in loose, porous packaging for more than three months makes pale orange stains, or at one year, little or no stain at all. If henna is packed as dried whole leaves in dark, moisture proof containers, it has a shelf life of six months to a year. Prior to the 1990's henna was packaged in cloth bags, cardboard and cellophane packaging.

This degradation has always limited the geographic extent of henna material culture. When pack animals were the normal transport, traveling henna at 25 km per day, and cloth sacks were the normal packaging, one would expect henna customs to be confined to 1500 km from the henna-growing zone. Henna traveling for more than three months, then brought to market for resale, would be in demise before it could be purchased and applied to hands or hair. Henna couldn't move easily beyond this zone until railroads, trucks and aircraft were available to transport henna more quickly. The henna canister in Figure 25 contains dried henna leaves, and was sold in West Virginia in 1930 as hair dye. If these leaves were harvested and packed in Egypt, they could have been shipped across the Atlantic and arrived in West Virginia in about 60 days in 1930, traveling by cargo ship, then railroad.

Dried henna will retain dye content for over a year if it is kept frozen, in airtight packaging. During the last few years of the 20th century, air freighted henna from India to the Americas became increasingly available, and henna body art became popular in metropolitan areas in the USA. Information available through the internet, particularly through http://www.hennapage.com, the most frequently accessed resource for henna in the English speaking world, has disseminated information about techniques and traditions to areas where henna was previously unknown (icertified.net, 2001 – 2006).

Figure 26: Hennaed hands (Regency Weddings, 1998)

From the 1990's on, airfares dropped low enough that Indian immigrants and their families regularly flew back and forth between India, Canada, and the USA for weddings. Since henna was an important feature of Indian weddings, and the South Asian families were keen to maintain cultural practices in the Americas, Indian specialty shops began stocking henna, and families brought henna with bindis and saris from India to the west. Small Indian bridal businesses, such as Regency Weddings in New Jersey, Figure 26, began in urban areas with South Asian immigrant populations by the late 1990s. This was the first widespread use of henna as body art in the Americas.

Figure 27: Henna body art products available in US Indian specialty markets in 2002 (Cartwright-Jones, 2002)

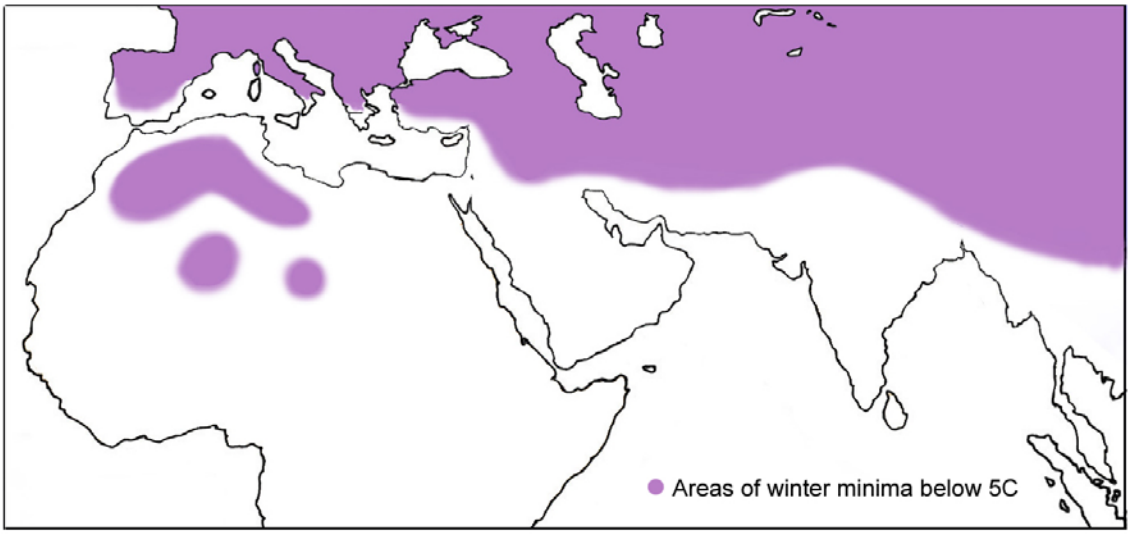
Sumita Batra was a henna artist working out of Zubeda salon on Pico Blvd in Los Angeles in the late 1990's. Madonna wore Sumitra's henna for her appearance in the music video "Frozen", and to the subsequent MTV music awards, instantly familiarizing people across the western world with henna. In 1998, People Magazine and other celebrity-oriented magazines featured Demi Moore, Gwyn Stefani, Sting, and other pop stars were photographed with their trendy, exotic henna done by Loretta Roome and Sumita Batra, and henna suddenly became the most desirable "late Orientalism" cultural consumption product, the exotic trend of the moment (Maira, 2000).

Figure 28: Coshocton Library Teens, Coshocton, Ohio, after a henna class (Harold, 2004).

The demand for henna grew rapidly in the USA after 1998, with its introduction in to major amusement parks and beachside attractions as a “temporary tattoo”. Reddish brown body markings in the west after this time may be considered “possibles” for henna. Reddish brown body markings from the Americas before 1990 (other than hair dye) should be assumed to not be henna, unless the specific instance has other evidence supporting henna, because henna was not available.

Henna's Growing Range: Temperature Minima and Henna

Henna grows best in tropical savannah and tropical arid zones, in latitudes between 15° and 25° N and S, and produces highest dye content in temperatures between 35 C and 45C. It can also occupy frost-free Mediterranean scrub zones, though it doesn't develop maximum dye content without high summer heat. Optimal soil temperatures for germination are 25 – 30C (Rao, Regar & Singh, 2005). It does not thrive where minimum temperatures are below 11C. Temperatures below 5C will kill the henna plant.



Map of current temperature minima lower than 5C

Figure 29: Map of areas too cold for henna to survive (Kartographisches Institut Bertelsmann, 1989: 181-2)

Henna will not grow in the blue areas in Figure 29 because winter minimums will kill the plant. The map in Figure 29 is based on present climate data, and should be adjusted for

different climate periods. For instance, medieval Arab authors believed the island Cyprus was named after the henna (κύπρος) growing there (Parrington, 1935: 457). There are many Cypriot artifacts dating from warm climate periods that depict women with stained hands. When botanists investigated the island during the 1800's, during a cool climate period, they could find no evidence of henna, and believed the island was named after the metal copper, discarding the possibly more accurate Arab history.

Figure 30: Henna shrubs growing wild alongside palms in Ain Gucier, Morocco

(Le Maroq pittoresque: Ain-Guicer Imp. Phototypique A, Gelly Charleville P. Grebert photo, Casablanca, 1906)

Henna grows easily and self-reproduces in alluvial soils along seasonal creeks or near water holes in tropical zone semi-arid and desert regions (Bakshi, 1984) such as seen in

the Figure 30. In Egyptian villages it is sometimes cultivated as a hedge plant, growing alongside rose bushes. (Hepper & Friis, 1994: 195)

Body art from areas too cold to support henna are unlikely to have been created with henna, unless the henna was imported through known trade routes and had cultural connections so strong that people were willing to import henna to serve tradition. Afghanistan is an example of this: though henna can only grow in the southeastern provinces, it is used in weddings throughout the country for the night of the henna, and to dye graying beards and hair (Field, 1958: 105).

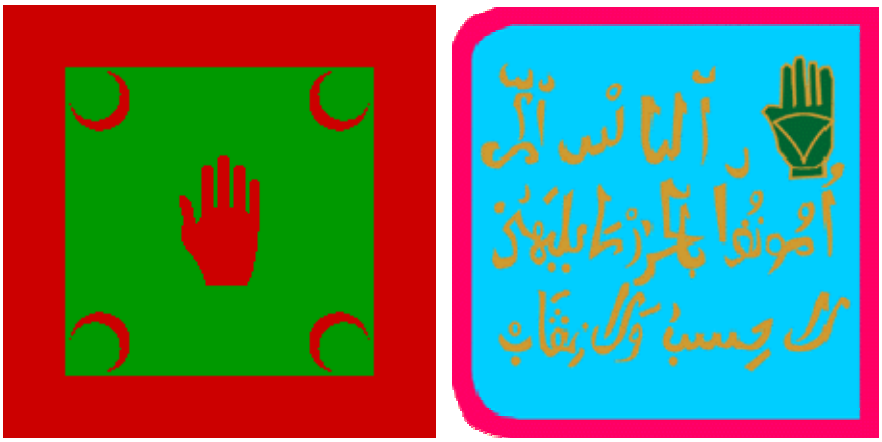


Figure 31: Algerian 19th century Colonial Flags

Left: 4th Battalion, 14th Company, Algeria

Right: 10th Regiment of Tirailleurs, 1st Battalion, Algeria (Crampton, 1990)

Based on the preceding climate map, flags in Figures 31 and 32 with images of a colored hand may be evaluated as potentially representing hennaed hands. The two flags from

Algeria, Figure 31, have hands consistent with the colors of henna, green as “paste on” and red as “paste off”. The Algerian flags are from a climate zone suitable for growing henna. Corroborating evidence shows that the hand of Fatima, the symbol of a hennaed hand, a symbol of luck and protection, was a common device for Algerian units of the French Army (Crampton, 1990).

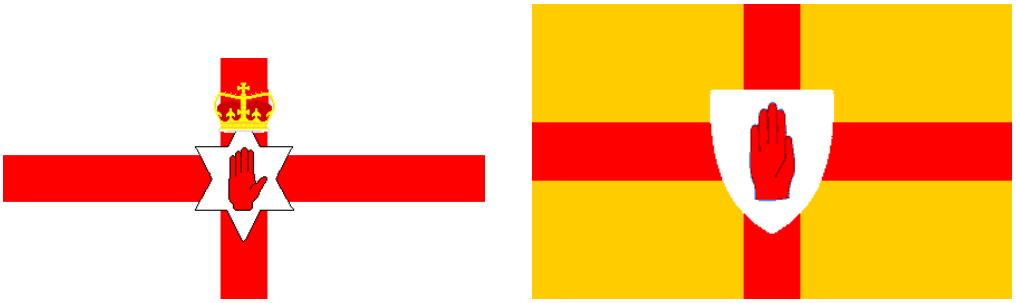


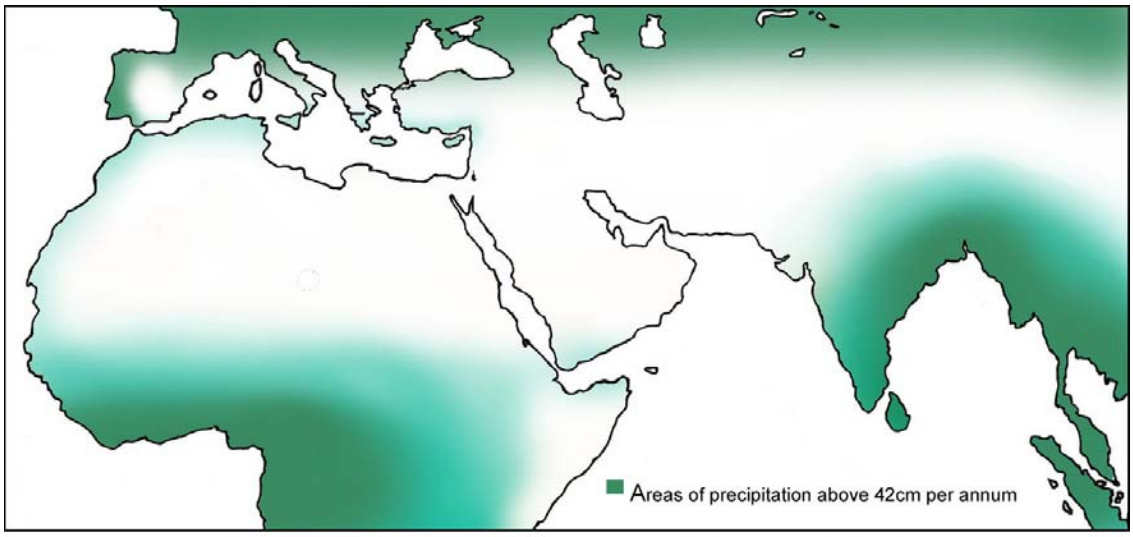
Figure 32: Irish Regional Flags

Left: Civil Flag for Northern Ireland prior to Belmont Assembly 1973

Right: Flag for Province of Ulster established 1922

The Irish flags in Figure 32 are from northern latitudes, unsuitable from growing henna. The previous map shows that red hands from Irish flags such as the “Red Hand of Ulster” could not have represented a hennaed hand, because winter minimums in Ireland would kill henna. Corroborating evidence shows that the Red Hand of Ulster is a severed hand traditional symbol of the O'Neill clan, not a hennaed hand.

Henna's Growing Range: Precipitation and Henna



Map of precipitation over 42 cm per annum during present climate

Figure 33: Areas of heavy precipitation that would impair lawsone content and favor plant diseases that attack henna (Kartographisches Institut Bertelsmann, 1989: 181-5)

Henna thrives in low-latitude semi-arid to arid zones, (Singh, Regar, Rao & Jangid, 2005). Pali district, the most intensive cultivation area of henna in the world, is on the fringes of the Thar Desert, and the rainfall was between 400 and 420 mm per annum at between 1968 and 2004. Marwar province, also a henna-growing region ranged from 460 to 500 m per annum in 1980 to 2004 (Singh, Regar, Rao & Jangid, 2005). Eighty five percent of the annual rain falls between August and September, with little rain between monsoons. These areas have sandy loam soil, and little ground water. The plants thrive in a region of chronic drought.

In areas of high precipitation, or in heavy, damp soil, henna is vulnerable to scale insects, aphids, and root rot, and the dye content is lower than in areas with prolonged droughts.

Figure 34: Aphids on henna

(Singh, Lodha, 2005)

In tropical rainforest areas, other red substances are more likely to be used than henna. In central Africa, indigenous people use camwood, *Baphia nitida*, also known as African sandalwood, to create red body art; a red dye soluble in alkali can be extracted the heartwood and bark (Speedy, A. 2004). Luluwa brides are ornamented with camwood, as are sculpture images representing fertile young women.

Figure 35: Lulua Bride ornamented with camwood (author's collection)

Much of India has precipitation above 50 cm per annum. Though henna grows throughout the subcontinent, it only achieves high dye content in the dryer western region with rainfall around 40 cm per annum. There are several other materials used for red body markings in India, particularly in the high precipitation zones, which are preferred over henna because they give a more vivid red, which is considered auspicious.

Alkalized turmeric, kumkum, lac, vermillion, alta and sandalwood powders have a vivid red color associated with luck and fertility. Married Indian women mark their foreheads and the center part of their hair with vivid red cosmetics, and tint their feet red with pigments other than henna. In older paintings, it is easy to confuse these red cosmetics with henna, so interpretations must be cautious. Evidence of red body art in moderate to heavy rainfall tropical climate zones, must be evaluated with additional information from cultural context before one can conclude that they were created with henna or other cosmetics with a similar appearance.

Figure 36: Feet painted with vermilion, Ahraura, Uttar Pradesh, India (Leen, 2006)

Figure 37: Slaked lime turns yellow turmeric red (Cartwright-Jones, 2003)

Turmeric is a plant root that is often used for ritual cosmetics in India, particularly for the Pithi ceremony (Desai, 2006: 25). Turmeric powder is mixed with slaked lime, the color changes to vivid red.

Henna's Present Growth Range

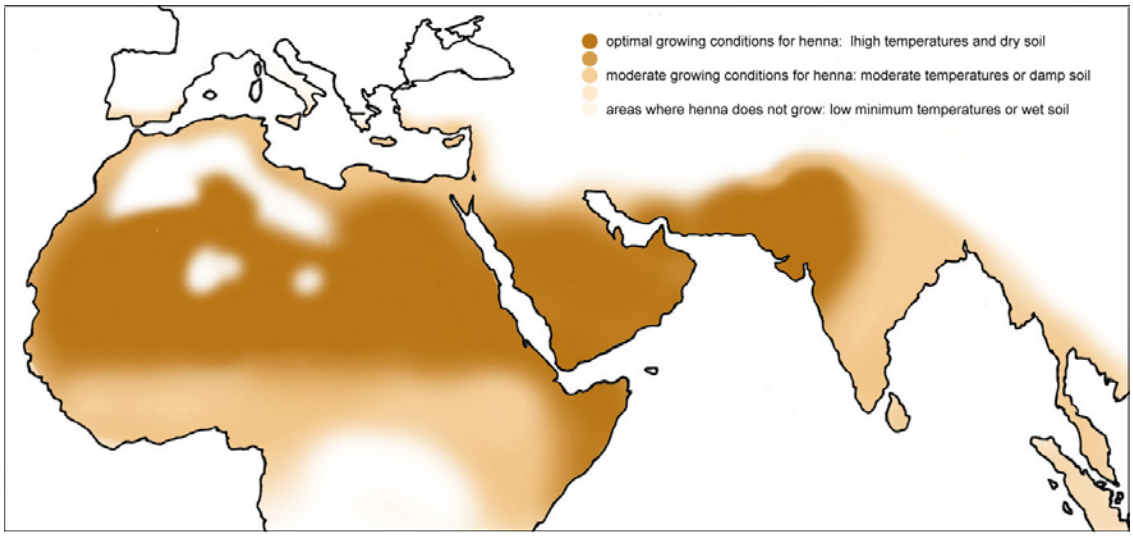


Figure 38: Map of henna growth range during present climate (Kartographisches Institut Bertelsmann, 1989, 181-85)

This map is based on present climate data, and should be adjusted for different climate periods. At present, henna grows naturally in Algeria, Bahrain, Burkina Faso, Chad, Cyprus, Egypt, Eritrea, Ethiopia, Indonesia, Iran, Iraq, Israel, Jordan, Kenya, Kuwait, Lebanon, Libya, Liberia, Malaysia, Mali, Mauritania, Morocco, Niger, Nigeria, Pakistan, Philippines, Oman, Qatar, Sahara, Saudi Arabia, Singapore, Somalia, Sudan, Syria, Tanzania, Tunisia, Turkey, Western Sahara, Yemen and Zanzibar (Kuram, Singh and Singh, 2005: 11). During warm climate periods, henna also grows in Sicily, Greece, Spain, and Crete. Henna has been recently introduced in North America and Europe as a

houseplant and semi-tropical zone shrub through Companion Plants in Athens, Ohio (companionplants.com), Richters (richters.com), Sand Mountain Herbs (sandmountainherbs.com), and other specialist garden suppliers.

Henna is cultivated as a commercial crop in Egypt, Somalia, Sudan, Morocco, Iran, Yemen, Niger, and Pakistan. Nigeria exports most of its henna to Algeria, and Yemen exports most of its henna to Saudi Arabia. India is the biggest producer of henna, growing an estimated 10.500 tons of henna in 2003-4. Seventy percent of that crop was sold within India, and thirty percent was exported to Middle Eastern, clients, with most of the rest going into the European and American hair dye market (Narain, Singh, Roy, Chand, Jangid and Singh, 2005: 1).

Body markings that appear consistent with henna, and are on people living within henna's cultivation and trade range should be considered as possible evidence for henna. Body markings that are not within henna's growth range or on export routes from that growth range cannot have been made with henna, and must be excluded as possible evidence of henna. Once a body marking is considered to be possibly henna, additional criteria can be applied which could support or negate the probability that a marking was made with henna.

The Color of Henna

Figure 39: Henna releases lawsone as the leaves are wetted and pulverized. Skin is stained orange within moments of contact (Cartwright-Jones, 2004)

One criterion for henna would be that the markings would have to be in a color range consistent henna stains on skin, nails and hair, unless some aspect in the representation precludes such. Very old sculptures may have once had surface paint that has since worn away. Old paintings may once have had body markings consistent with henna, but the color of paint may have changed over time. Black and white illustrations may show body markings without color reference. Such artifacts would have to be examined with corroborating evidence to determine original color intent.

The Basis of Henna Color: Lawsone

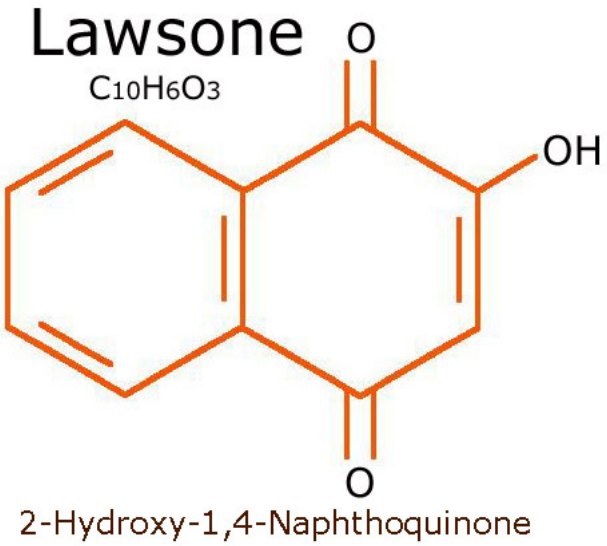


Figure 40: Lawsone, the dye molecule in henna (Bonev, Cartwright-Jones, 2004)

Henna stain color is created by the presence of Lawsone, the dye molecule in henna. Lawsone is a red-orange molecule, 2.54 Angstroms, about the size of an amino acid (Aldrich Chemical Database; Bonev, 2004. It is small enough to breach, penetrate and stain skin cells. Lawsone is released from the henna leaf cells if they are crushed to a pulp with lemon juice, rainwater, or other acidic liquid. Henna leaves contain lawsone, 2-hydroxy-1, 4-napthoquinone in amounts between .5% and 4%, the range of commercially grown henna being usually between 2 and 3%. The lawsone molecule is about the size of an amino acid and is small enough to easily breach a skin cell. Once it has penetrated the skin, lawsone binds easily with keratin molecules, and needs no mordant, fixative, or additional heat to make a permanent brick-colored stain that will not

fade with washing or in light. Lawsone will dye hair, hands, feet, fingernails, beards, and animal hair (Khandelwal, Gupta, Sahu, 2002: 67).

Figure 41: Henna application, paste removal, initial stain, matured stain (Cartwright-Jones, 2003)

In the sequence in Figure 41, dark green henna paste is applied to the skin and allowed to stay in place for several hours. When the paste flakes off, an orange stain is left in its

place. This stain darkens to red, then brown over the next forty-eight hours. The stain will gradually disappear as the outer layer of skin is shed over a period of three weeks. Henna stains the outermost layer of the skin and new skin regenerates daily in inner layers. The henna gradually disappears as the stained skin cells rise to the surface and exfoliate as seen in Figures 42 and 43.

Figure 42: Henna two days after application (Cartwright-Jones, 2002)

Figure 43: Henna twenty-one days after application (ibid)

Figure 44: The color range of henna stains on keratin (Cartwright-Jones, 2006)

Henna stains skin and fingernails range from pale orange to vivid red-orange to shades of brown and black, depending on the level of lawsone saturation and oxidation in the keratin. Low saturations and little oxidation produce the colors in the pale end of the lawsone spectrum. Intense saturations and strong oxidation produce colors in the dark end of the lawsone spectrum, such as seen in Figure 45.

Figure 45: Stains from high lawsone content Yemen henna summer crop (Cartwright-Jones 2004)

Figure 46: Stains from lower lawsone content Yemen winter crop (ibid)

Henna with lower dye content, such as from the Yemen winter crop henna in Figure 46, does not give as dark a stain.

Figure 47: Henna darkened with ammonia (Cartwright-Jones, 1999)

If a saturated henna stain is treated with heat or alkali such as perspiration or urine, the stain oxidizes to dark brown to black as seen in Figures 47, 48, and 49.

Figure 48: Henna stain darkened with heat (Cartwright-Jones 2003)

Alkali and heat will blacken henna within 20 minutes to 24 hours after contact, though this technique only effective on highly saturated stains and on heavily keratinized skin.

Figure 49: Blackened henna stains on Rendile woman, Kenya (author's collection)

When henna paste is applied to the skin, lawsone molecules gradually migrate into the skin, just as brown pigments migrate from a wet teabag left on a white tablecloth. Lawsone molecules can migrate into the skin so quickly that henna paste can leave a

visible stain when left on skin for as little as one minute. Longer contact permits more pigment migration. Brief contact permits minimal pigment migration. Henna is frequently applied in the evening and left on the skin overnight to facilitate intense saturations and darker stains. Henna applied and removed in less than 15 minutes gives less saturation and lighter stain. The result of short and long duration application is illustrated in Figure 50.

Figure 50: In areas of dark stain, the henna paste was applied for 12 hours and then removed. In the areas of light stain, henna paste was applied for 10 minutes and then removed. (Cartwright-Jones, 2003)

Henna stains fingernails, because they are composed of keratin, and lawsone easily binds with the keratin. The stain remains on fingernails as they grow outward from the root. Figures 51 and 52 show the typical stain color and outward growth of henna on fingernails, as opposed to exfoliation of fingertip skin.

Figure 51: Henna stains on fingernails and fingertips, one day after application

(Cartwright-Jones, 2004)

Figure 52: Henna stains on fingernails and fingertips, two weeks after application (ibid)

More henna is presently used to dye hair than for any other purpose, and this may have been the case since henna was first discovered. Caucasians begin graying in their twenties, and are often more than 50% gray by the time they're in their forties (Tobin, D.J.; Paus, 2001: 30). When graying people wished to keep a youthful appearance, they turned to henna to mask the gray. Henna gives a translucent red strain on hair, staining gray hair red-orange, blonde hair rich red, and brunette hair auburn. Henna gives black hair a red or slightly purple shimmer in the sunshine.

Figure 53: Henna on graying dark brown hair before and after henna (Cartwright-Jones, 2004)

Henna is a permanent dye, so does not fade, but new growth from the roots is the original color.

Figure 51: Henna on gray hair before and after henna (Cartwright-Jones, 2005)

Egyptian mummies, such as Ramses II, often have white hair colored with henna. (Ceccaldi, P. F, from Balout, et al, 1985: 254-257) When a mummy has dyed hair, the length of growth unstained with henna can be used to determine when henna was applied: prior to, or at the time of death.

Figures of mature people with red or auburn hair streaked with red should be considered as "possible" for use of henna. To examine a proposition that these people naturally have dyed their brunette, dark blonde or graying hair red, one can compare the number of children depicted with brunette, dark blonde or red hair to the number of mature individuals with brunette, dark blonde or red hair, and see if the proportion of red haired individuals increases with maturity.

Figure 55: The sarcophagus of Seianti Hanunia Tlesnasa. Etruscan, 150-140 BCE, found at Poggio Cantarello, near Chiusi, Tuscany, Italy

Figure 53, an Etruscan sarcophagus in the British Museum, is a portrait of a mature woman with dark red hair. True red and dark red hair is genetically uncommon, occurring in only four percent of people (MC1R, found on the 16th chromosome) (Rees, 2004), and occurring most frequently in Scotland and Ireland, not in the Mediterranean. Scientific testing of the woman's teeth indicates that she was probably about 50 to 55 years old at the time of her death. Assuming that the present color of paint is close to the original color, it appears very similar to henna dyed graying brunette hair on a woman of the same age, in Figure 56. Since it is genetically improbable that the Etruscan woman had

naturally red hair at a mature age, it is more likely that the sarcophagus portrays an older woman who covers her graying brown hair with henna.

Figure 56: Henna over graying brunette hair (Cartwright-Jones, 2005)

To support or negate evidence of henna use as a hair dye, one can also compare hair color between genders and across age groups. For instance, wall paintings in Pompeii show the majority of female sex workers as having red hair. In comparison, no children and no males have red hair. This evidence supports the probability that these women dyed their hair with henna.

The Geography of Skin and Henna: Henna Stains on Skin

Skin has geography: a variable terrain with differing characteristics across the epidermal surface. Henna stains differently across that surface, and changes as that surface is replenished.

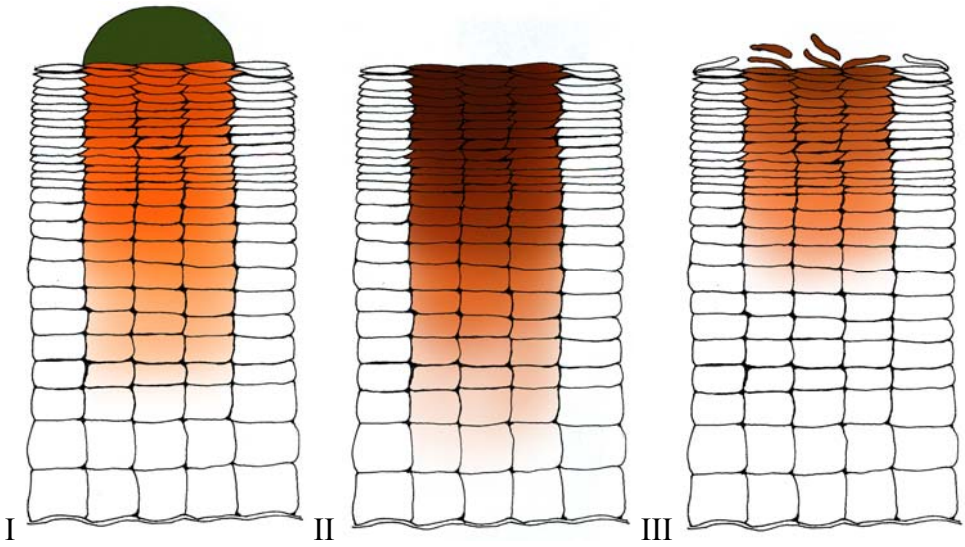


Figure 57: Diagram of epidermal henna staining and exfoliation process (Cartwright-Jones, 2006)

- Image 1: Lawsone migrates from henna into the stratum cornuem
- Image II: Lawsone oxidizes and the stains become dark brown
- Image III: Lawsone stained skin exfoliates and less saturated areas rise to the surface through exfoliation, appearing as "fading"

Henna body art is created when henna paste is placed on the skin and lawsone dye migrates from the henna paste into the upper epidermal layer of the skin, breaching cells and saturating them. After paste removal, the henna stain darkens in the 48 hours, though oxidation by contact with air or alkaline. The stained skin is exfoliated during the following days, and the stain appears to be "fading" as skin cells less saturated with lawsone rise to the surface.

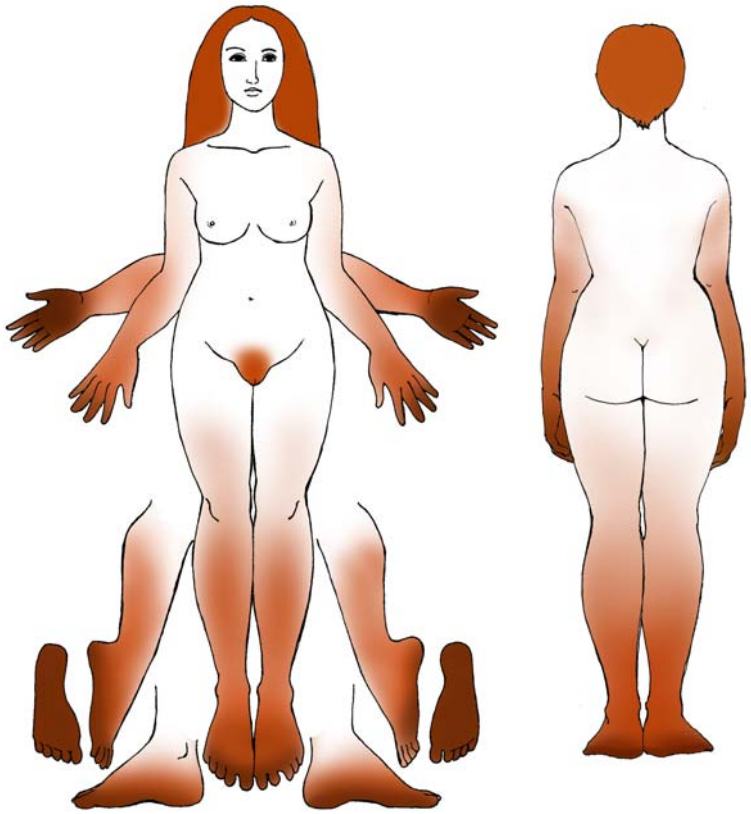


Figure 58: Diagram showing areas most frequently hennaed, and comparative stain color (data derived from Ya-Xian, Suetake, & Tagami, (1999); illustration by Cartwright-Jones, 2006)

The outer epidermal layer is of different depths and characteristics across the geography of the body, and henna stains differently across this geography. Palms have, on average, 50 cell layers of stratum corneum. Soles also have an average of 80 cell layers. People who go barefoot build up deeper layers on their soles, and people who do manual labor develop deeper corneal layers on their palms to protect the living tissue underneath. These areas absorb the greatest amount of lawsone, and attain the darkest color. Henna also stains fingernails and knuckles easily. Though henna also stains knees and elbows, it is rarely used there because the paste falls off when the joint is flexed, and the pattern is distorted. Henna was often used in the pubic region following depilatation, to soothe irritated skin, and deter bacterial growth (Bassano da Zara, 1545).

Figure 59: This photograph shows darker henna stains on thick palm skin, lighter stains on the thinner skin on arms, and the lightest stain on thinnest skin protected by a watch band (Cartwright-Jones, 2004)

Skin not abraded by physical activity tends to develop a shallower corneal layer. The thinnest skin is on the penis, where the stratum corneum is only 6 layers of cells deep. (Ya-Xian, Suetake, & Tagami; 1999)

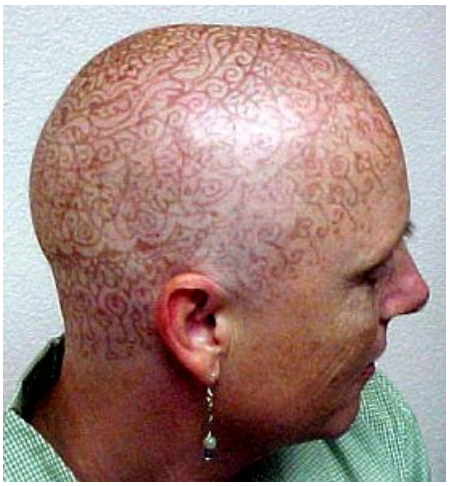


Figure 60: Henna stains on the cranial skin of a chemotherapy patient (author's collection)

Very thin stratum corneum will never take henna stain as well as very thick stratum corneum. In thin areas of stratum cornum, cells go quickly from being living, flexible skin cells to shedding from the surface as dead cells. Eyelids have very thin stratum corneum, and that skin is soft and flexible. Cranial skin is also thin, and is often oily as well. Henna does not get dark in these areas, as seen in Figure 60, and the pattern exfoliates in three to five days.

Heels have a very thick layer of stratum corneum, averaging 86 cell layers with some people having over 120 cell layers. That area often becomes hard, dry and rigid. Henna

can penetrate farther into these dead layers, and can saturate more completely. Henna stains on soles can be nearly black, and last for nearly two months.

Figure 61: Henna stains on young athlete's back (Cartwright-Jones, 2003)

Shoulder, chest, back, buttock, back, belly, and upper arm have stratum corneum of medium depth. These areas have, on average, 12 to 14 cell layers of stratum corneum. Henna stains in these areas will last 7 to 10 days, and are a medium rusty color.

Figure 62: Henna application showing darker stains on thicker foot skin and lighter stains on thinner thigh skin (Cartwright-Jones, 2003)

Thighs, lower legs and lower arms have moderately thick stratum corneum layers on average 14 to 18 cell layers deep. Henna stains on backs will last 10 days to two weeks and are a range of rust and chocolate colors as seen in Figure 61. The backs of hands and tops of feet have thicker layers of stratum corneum, averaging 25 to 30 cell layers deep. Henna stains on the dorsum of hands and feet may get to a dark chocolate color, and last nearly three weeks.

Figure 63: Henna stains on the nails and backs of the hands (Cartwright-Jones, 2002)

Though there are historical records of full body henna applications, henna is most commonly applied only to arms, legs, feet, and hands, because those can be kept still while the person is comfortably seated, and applications rarely take longer than a person can remain sitting as is the bride in Figure 64.

Figure 64: Tunisian Bride at her night of the henna (Stannard, 1997: 82)

Differentiating Henna from Other Forms of Body Art: Tattoos

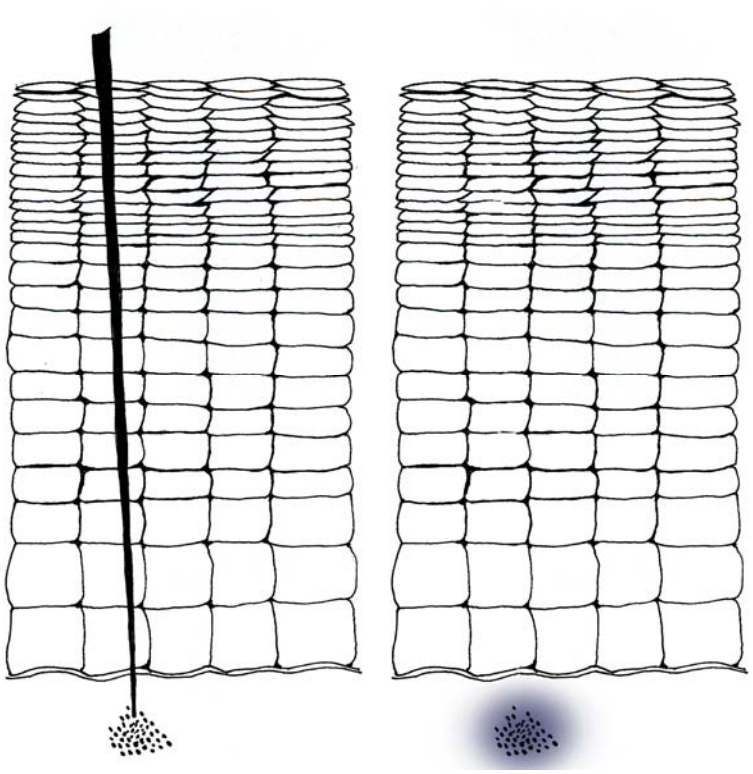


Figure 65: Diagrams of tattoo creation and aging in the dermal layer underneath the epidermis: the tattoo does not exfoliate (Cartwright-Jones, 2006)

A tattoo is created when pigment is inserted with a needle, razor cut, or other sharp instrument into the dermal layer of skin below the epidermis. Though the pigment stays in the basal layer and is not exfoliated, over a period of years, the pigment "drifts" in the basal layer and the tattoo becomes blurred. Tattooing is done most easily on thin epidermal areas so the skin is easily pierced, and the pattern visible. Tattooing is rare in very thick epidermal areas such as palms and soles. Carbon, easily available as soot, is

most widespread material for tattooing. In indigenous cultures, carbon was mixed with breast milk to deter infection. Plant dyes were less used, because they are not sterile and are apt to fester, spoiling the pattern.

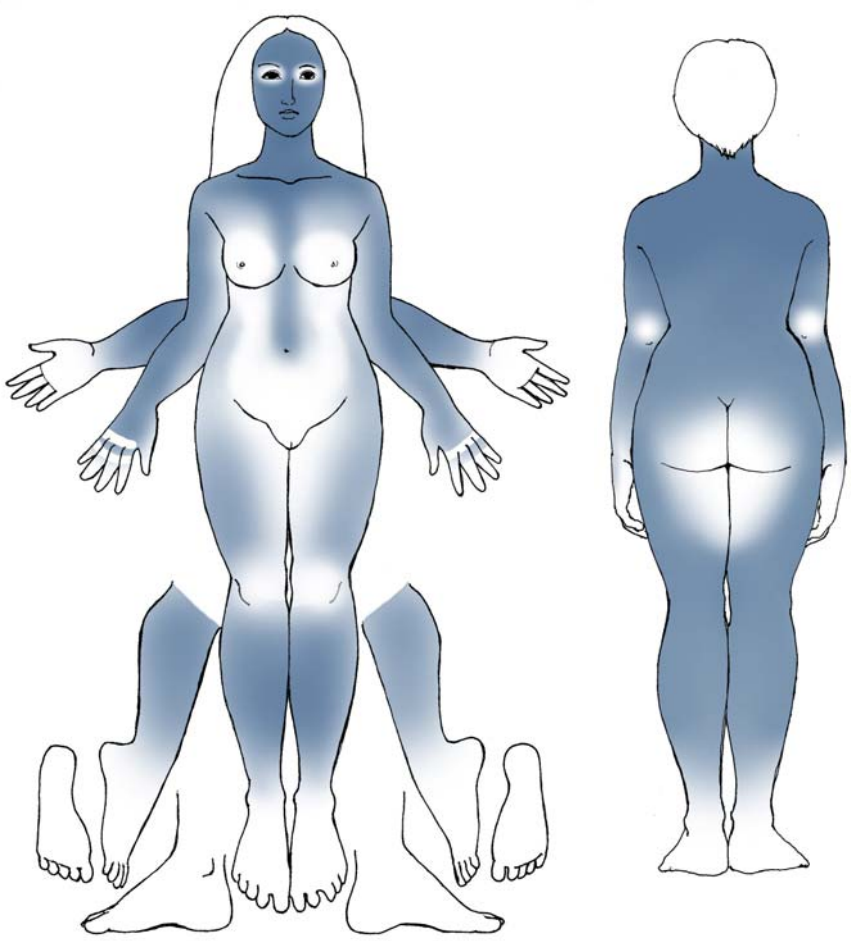


Figure 66: Diagram of skin areas most commonly tattooed (data derived from Ya-Xian, Suetake, & Tagami, (1999); illustration by Cartwright-Jones, 2006)

Tattooing is more frequently done on skin areas that are stable over time, such as arms, backs, thighs, and shoulders, so the design will remain as intended. Tattoos are less

common on areas where the skin will deform during aging and pregnancies, such as breasts and bellies. They are also uncommon on areas where the fresh tattoo may become infected through contact with urine or feces. Though the skin near the eyes and genitals is thin, tattoos are rarely done there, probably in consideration of the discomfort, and the potential damage from infection or swelling. Knuckles are rarely tattooed, and soles of hands and feet are very difficult to tattoo.

Figure 67: Tattoo on upper shoulder, 5 cm x 5 cm (Cartwright-Jones, 2005)

Full back or chest tattoos, upper arms and thighs are an optimal for tattooing technique, because the person can lie down for long periods to allow the tattoo artist to work large, intricate patterns into relatively thin skin, with relatively few nerve endings. Endorphin release (trauma response to tissue injury) comes quickly after the onset of tattooing (Van der Kolk, 1988: 1: 273-290), so many people do not find tattooing unbearably painful, even during prolonged sessions, and even may find the experience enjoyable.

Figure 68: Postcard: Lady Viola, tattooed woman, 1920 – 1930

Present professional tattoos deposit pigment between 1.5 mm to 3.5 mm into the skin (O'Donnell, Mulvaney, James & McMarlin; 1995: 601-603.) The pigment-bearing dermal cells are not shed, so a tattoo is permanent. The most easily tattooed areas are those with a shallow epidermal layer that the needle doesn't have to pierce deeply to reach the dermal layer. Palms and soles are rarely tattooed because of the difficulty of piercing the thick skin. In North Africa, the Middle East and western India, women often have tattoos and henna on complimentary parts of the body (Field., 1958)

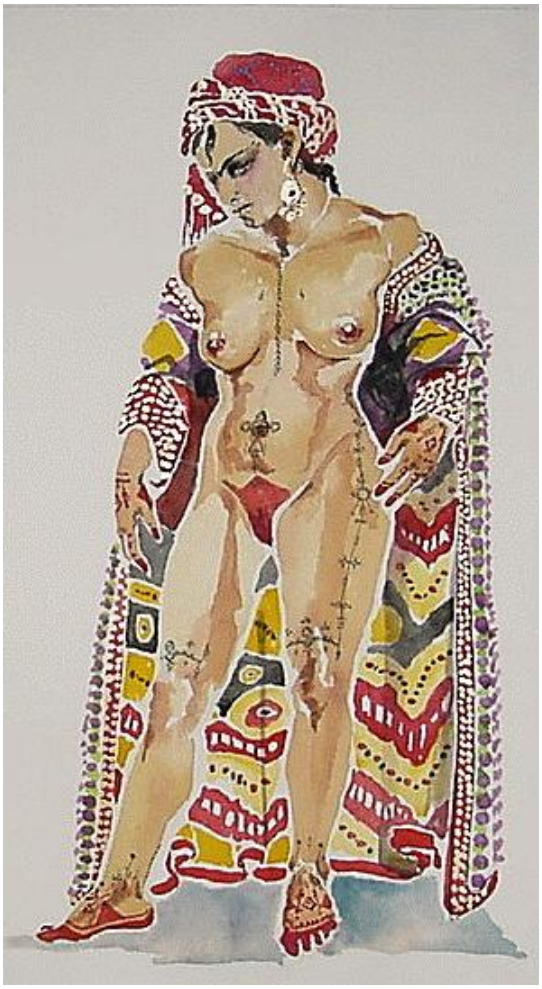


Figure 69: Turkoman woman with henna and tattoos (Data from Field, 1958; illustration by Cartwright-Jones, 2002)

Since the tattoo is permanent, the application can be done over many brief sessions over a period of years to create an accumulated larger pattern, unlike a henna pattern that must be completed in a day or two. The subject may have additional work done ceremonially at ritually significant events, or whenever an hour or two of leisure is available.

Differentiating Henna from Other Forms of Body Art: Paints

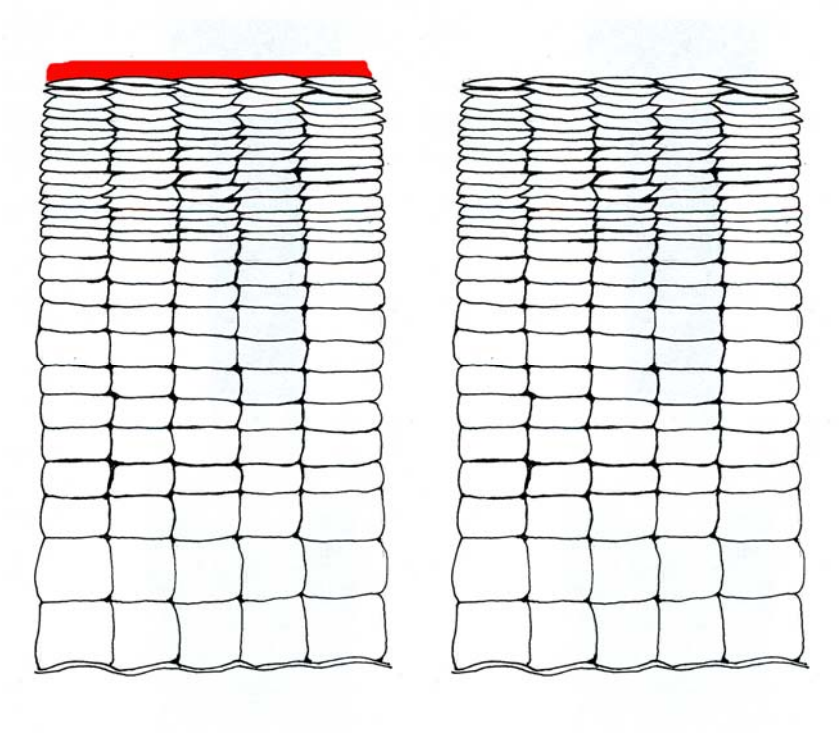


Figure 70: Diagram of paint on skin: Paint does not penetrate the epidermal layer, and can be washed away (Cartwright-Jones, 2006)

Skin painting may be the oldest body adornment, and it is certainly the most widespread. Late Paleolithic figures of women such as "Woman Holding a Bison Horn" from Laussel cave in the Dordogne, and Middle Magdalenian Vénus Impudique presently in the Musée de l'Homme, Paris, are marked with red ochre. Most indigenous cultures use some colored pigments to ornament their skin for ceremonial occasions, or to mark hierarchy. Naturally occurring mineral pigments are the most common body paints, carbon black, calcium white, iron red, ash gray, copper green and blue. These are supplemented with

paints made from plant-based colors: pollen yellow, grain pastes, flower, fruit or vegetable pulp, and insect pigments such as lac or cochineal.

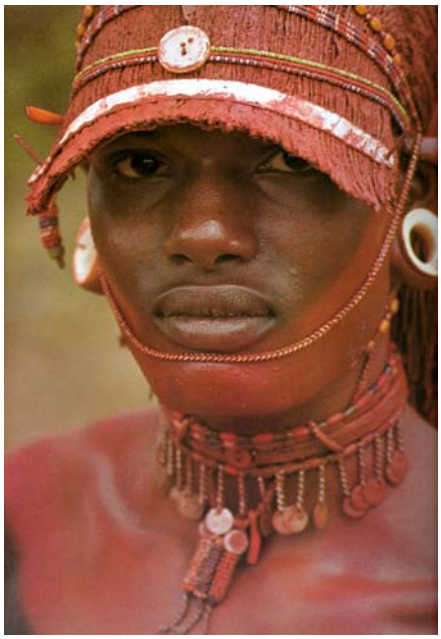


Figure 71: Turkana young male, painted with ochre (Fisher, 1984:34)

Most paints smear, a limiting factor for clothing and movement. A nude body may be almost completely covered with paint for a ceremonial occasion. If the body is clothed, only the exposed skin will be painted, to avoid smearing and staining clothing. Areas such as insides of thighs or upper arms may be less frequently painted, as a person's motion smudges patterns. Though ochre occurs naturally in the same color range of henna, it can be differentiated from henna by the position on the body. Ochre smears and rubs off the body easily, which limits use: palms and soles are not ochred because touching, washing, eating, walking and dancing spoil ochre patterns, and ochred hands would soil food and drink.

Figure 72: Muslim bride from Salé, (Besancenot, 1988: 10)

Henna, paint and tattooing optimize in different areas of the skin's geography: Figure 72 shows how henna, paint, and tattooing may be combined in a coordinated ceremonial body adornment. Most Moroccan women of the late 19th or early 20th century had tattoos on their faces, arms and chest. The woman in Figure 70, a Muslim bride from Salé, has had her face painted, her hands and feet hennaed, and presumably there would be tattoos on her face, arms, legs and chest (Seawright, 1984).

Differentiating Henna from Other Forms of Body Art: Scarification

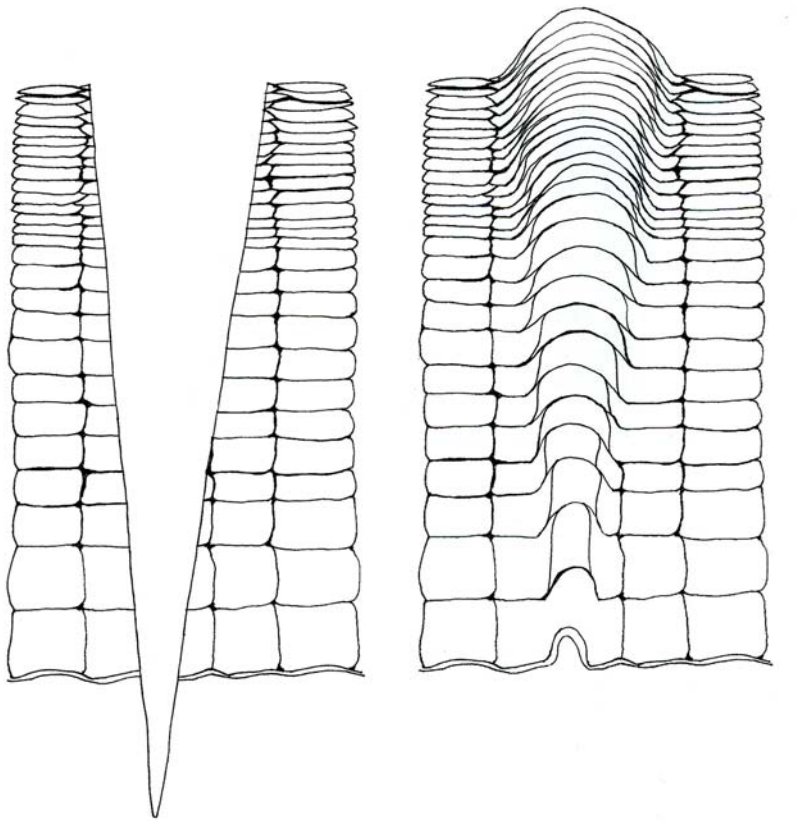


Figure 73: Diagram of Scarification: skin is cut into dermal layer and irritated to form hypertrophic or keloid scar tissue (Cobbold, Sherratt, 2000; illustration by Cartwright-Jones, 2006)

Scarification is the process of cutting the skin through to the dermis and rubbing irritants into the wound to create a decorative hypertrophic or keloid scar. This body art form is presently most frequently practiced in sub-Saharan Africa, in populations that have a genetic predisposition to keloid scar formation. Scarred areas are often oiled to enhance

the beauty of the patterns for ceremonial occasions. Scarification is done on relatively thin skin, which is easily cut through, not on palms or soles. Scarification is also less common on body areas where contact urine or feces could cause serious infection.

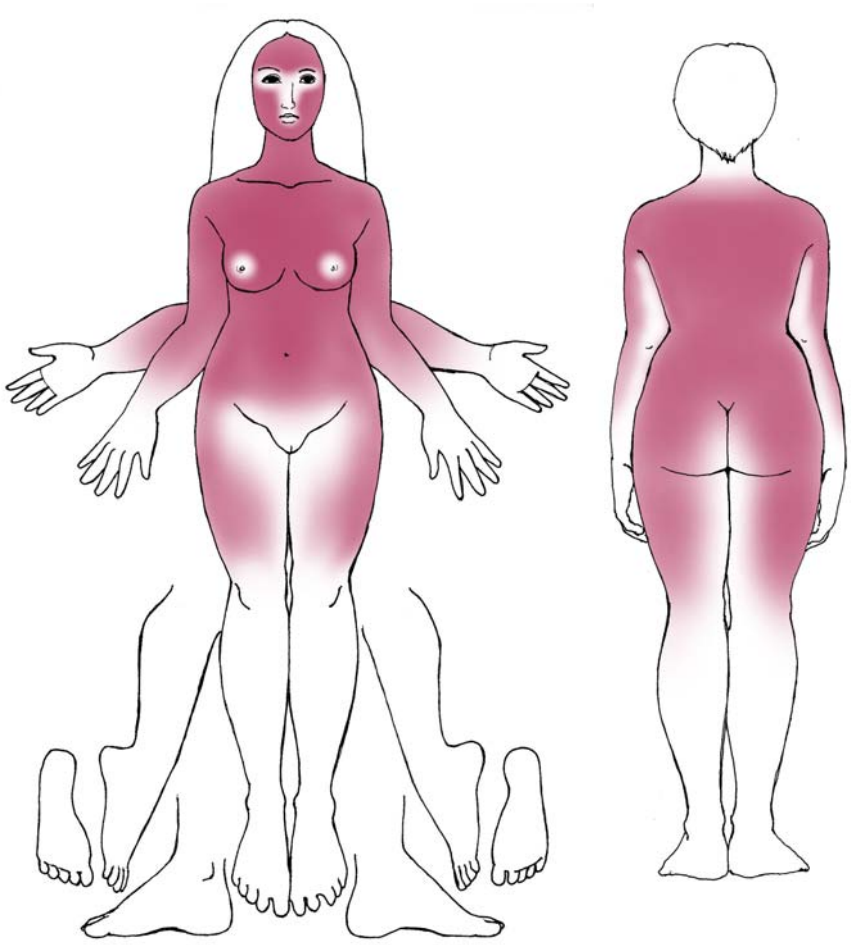


Figure 74: Areas most frequently ornamented with scarification (Cartwright-Jones, 2006)

Scarification is a painful and bloody process, but the areas of the body most frequently cut are not the most sensitive areas, and the body responds to the trauma of injury by releasing endorphins: naturally occurring opiates. The participants in a scarification

ceremony more often feel euphoria, or an altered state, rather than excruciating pain. (Ferentz, 2001)

Figure 75: Nuba scarification technique, Sudan (Thevoz, 1984: 38)

Figure 75 shows the scarification process. In this picture, you can see scarification on the face finished and scarred over, the back area in the process of healing, and the upper arm area being newly cut. The recipient calmly observes the process and may be enjoying the endorphin response.

Figure 76: Une Femme tatouée de race Bangala (Nels, 1910, postcard in author's collection)

Figure 76 shows an early 20th century Bangala woman's arm and belly scarification patterns. African scarification may have pattern elements similar to henna patterns, and the patterned area has some overlap with henna and tattooing. If a line drawing or incised sculpture were made of this woman, and viewed out of context, it would be difficult to be certain whether the arm patterns represented henna, tattooing or scarification. However, viewed in the context of the Sub-Saharan region, the interpretation would be clear: the woman's belly patterns are unique to sub-Saharan Africa. Several dark skinned keloid-forming groups scar women's bellies before puberty in anticipation of stretching during pregnancy. When the belly distends in late

pregnancy, the stretch marks align with the cuts, so stretch marks form attractive, culturally significant patterns rather than random gashes.

Understanding the technique and processes of henna, tattooing, paint and scarification can assist in interpreting images of adorned bodies so ancient that only minimal context is available. In Figure 77, a Neolithic rock painting in Algeria, the body is marked.

Figure 77: Sahara Rock Painting, 5th millineum BCE, Tassili N'Agger, Algeria (Thevoz, 1984: 8)

The person depicted is probably a dark-skinned person, as the low latitude sunshine would injure an unclothed pale-skinned person. The markings on the breasts are unlikely to be paint, because women needed to keep their breasts available for on-demand nursing. Henna stains would be a low contrast marking on a dark woman's back and breasts, and

this painting implies that the markings were a high color contrast against the skin. Tattooing is possible, but carbon-based tattooing is more common on light skin than dark skin, again because of the low color contrast. Scarification is the most plausible source for these body markings, done to enhance stretching in breast development, and weight gain in the hips and buttock area, with complimentary patterns on her back and upper arms. These patterns are intriguingly similar to the Sudanese patterns in Figure 75.

Differentiating Henna from Other Indian Body Adornments That Resemble Henna: Impatiens Balsamica

Figure 78: Nails stained red-orange with the lawsone from impatiens balsamica (Bookish Gardener, 2004)

The Bhils of Rajasthan have a tradition of hennaeing fingernails and palms with crushed *timadia* (Impatiens balsamina) flowers, which contain lawsone as henna does. The flower grows wild in the Udaipur district. The stain is not as intense as that from henna, and stays red-orange, which is culturally a more auspicious color than henna stains which can oxidize to near black. (Kumar, 1997)

Differentiating Henna from Other Indian Body Adornments that Resemble Henna: Lac

Figure 79: Lovers with Lac-painted hands and feet, Orissa, 19th century (Comfort, 1997: 53)

Historical records of Indian cosmetics indicate that lac was used to stain palms and soles vivid red, and to paint a red line around the edge of the foot (Auboyer, 1965: 181). Lac is a red cosmetic derived from the scarlet resinous secretion of the *Laccifer lacca*, a scale insect. Thousands of these tiny insects colonize branches of red dye containing Acacia catechu trees, and their excretions are a vivid red resinous pigment. People harvest the *Laccifer* infested branches, and refine the vivid red resin and dye. Lac production has long been established in Northern India, Bangladesh, Myanmar, Thailand, Laos, Vietnam and parts of China. One of the centers of lac production in India is Orissa.

Older artifacts in northern and eastern India showing vivid red palms and soles might be depictions of henna, but may be more likely to be depictions of lac. One possible clue as

to a determination of whether a particular subject's red soles are lac or henna would be the appearance of footprints: when a woman with lac-stained feet walks across a floor, she leaves red footprints (Auboyer, 1965: 270).

Figure 80: Krishna and Radha, Jaipur School, 1810: red toes and feet may be either henna or lac

Henna, sandalwood and lac were used simultaneously as cosmetics in India from the Gupta period (Auboyer, 1965) and probably as early as the Vedic period. Henna was used to clean and dye hair, and was used for skin, particularly as a coolant in hot weather. Henna possibly grew throughout India, except in areas of high precipitation or low temperature minimums. Lac was the preferred vivid red skin paint in northern and eastern India, where it was naturally available or through trade connections. Sandalwood was used on the body and face where it was naturally available in Southern India, or through trade connections. One can propose which cosmetic was being used in a particular instance, based on the geography of skin and the geographic location in India, though absolute judgment between lac and henna on feet and palms may not be possible without corroborating evidence from other sources. In Figures 79 and 80, the semi-arid climate of Jaipur would favor henna as a source for red body markings whereas the high precipitation area of Madhuban would favor lac as a source of body markings.

Figure 81: “Lakshmi” Madhubani Folk Art (Devi and Jha, 2006)

Indian paintings from about 1750 forward show red patterns on women’s hands and feet. These are not the patterns we presently associate with “traditional Indian henna”. They are mostly simple line and dot patterns, and may have been created with lac rather than henna. The complex henna patterning currently popular in India is a very recent innovation did not begin before the 1960’s when stone burr mills were installed in Sojat region henna processing industry. Improved hammer mills were introduced in 1980, and were improvised and improved during the 1980’s including air-cooling towers to preserve henna quality during the milling process. Pulverizers introduced in the 1990’s

brought the quality of henna powder to its present state where it can be easily mixed and manipulated into fine, delicate patterns (Chand, Jangid, Roy and Singh, 2005, 51).

Cultural Carriers of Henna

The earliest text evidence of henna body art is from the 15th century BCE Ras Shamra texts, the Ugaritic Myth of Baal and Anath, according to the Version of Ilimilku (De Moor 1971: 85). The fragment of CTA 3:B.2-3, "kpr . šb . bnt . rh . gdm w'anhbm ." is translated as "henna of the seven girls, scent of saffron and purple snails". In context this refers to a springtime event of young women adorning themselves with henna to seek mates, coinciding with harvesting the murex dye-bearing snails, the gathering of fragrant wild crocus, and the appearance of the Pleiades in western sky at sunset. This event was a fertility, feasting and sacrifice event that was the predecessor of Passover, Id al-Adha and Easter. Images of young women with red marked hands, presumably related to and illustrating this myth, can be found around the Mediterranean region throughout the bronze age, and into the early Roman period, in areas of Minoan, Syrian, Mycenaean, Punic and Phoenician colonization. The fertility religion of Baal and Anath, interlocking with a grain-dairy based agro-ecological system was a strong early carrier of the bridal henna tradition.

When Jews migrated into Palestine between 1700 and 1200 BCE, they entered a region where the Baal and Anath myth was the dominant belief system, and where henna was strongly associated with young women, sexuality, fertility, celebration, and sacrifice. Early texts show that the Jews were unfamiliar and uncomfortable with the henna markings on young women (Adam and Eve XX: 31), but by the time the Song of Solomon was written; they had become fond of henna (Song of Solomon, I: 14). As Jews

immigrated out of the region after the fall of Jerusalem, they carried the bridal henna traditions with them into North Africa (Rubens, 1967), the Arabian Peninsula, Yemen, India, and the Levant (Brauer (1993), where they continued until the present era. When Jews immigrated outside of the climate zone for henna, the traditions were not maintained.

The earliest Christians probably continued the same bridal and seasonal henna traditions as were common Jerusalem at the beginning of Christianity. “Hanging with Christian Images”, from 6th century Byzantine Egypt, presently in the Cleveland Museum (accession number 1982.73) shows three people with red markings on their raised hands. This may be evidence of early Christian used of henna. Coptic Christians and Armenian Christians hennaed for weddings until the present era. Christian women in medieval Spain and Sicily used henna during periods of Arabic cultural influence. Christians further north could not keep up the practice outside of the climate zone.

The cultures of the Arabian Penninsula were strong carriers of henna. There are Arabic records of hennaed hands being strongly associated with marriage (Sunan Abu Dawud, 33: 4153 and 4154: Aisha, Ummul Mu'minin). In Yemen, there are records of henna being associated with celebration according to the description by Ibn Habib al-Baghdadi’s Kitab al Muhabbar (Mernissi, 1987: 71). Henna was associated with cleanliness and health in the medical texts of 13th century Ibn Qayyim Al-Jawziyya. Henna was carried with the Arab culture as it expanded westward across North Africa, into Spain, and eastward through the Middle East, India and into Malaysia. The Night of

the Henna reinforced henna traditions where they previously existed and spread the tradition into areas where it had not been. Hajj brought Muslims together in Mecca each year, and henna from Mecca was a favorite gift as pilgrims returned to their homes. The spread of Islam matched the climate zone for henna closely enough that henna was available to maintain the traditions. Henna is part of the celebration of Ids, marriage, circumcision, and many other joyous holidays, as well as daily grooming.

In India, devotional paintings of Hindu goddesses Kali, Lakshmi and Durga typically have red hand and foot markings, and had at least since the Gupta period. Some male deities, particularly Ganesha, also have these marking. However, it is uncertain where and when these red markings may have been henna and where and when they may have been henna, if there is a clear division between these, or whether they were interchangeable.

At present, henna is used for Diwali and other auspicious occasions in western India (Sharma, 2006). Henna has been used for weddings in the Punjab since at least 1700 CE, in the Muslim communities. Eyewitness reports, as recently as 1940, indicate that henna was a part of Indian Muslim weddings, but not Indian Hindu weddings. In the last thirty years, the Punjabi style wedding traditions, with a "night of the henna" and sangeet, have spread into a "pan-Indian" wedding tradition, carried by motion pictures and women's magazines. The motion picture "Devdas" (2002) is credited by henna artists (Bahar, 2006) as setting the style for bridal henna across the subcontinent and into immigrant communities by videotape and DVD. Popular magazines such as Viya, Asian Bride, and

Asiana advertise henna artists and their work, making bridal henna currently a lucrative and competitive business in India, as well as US and UK immigrant communities.

Sikhs in India and immigrant communities celebrate weddings and Diwali with henna (Sahib, 2006). Zoorastrians celebrate weddings with henna (Dalal, 2006). Figures of the Buddha and other Buddhist deities in India, Nepal and Tibet frequently have red palms and soles, but this could be lac rather than henna.