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Bast, Ferns, and Mud: Experimental Recreation of a Kapa Kaha (Barkcloth)

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Author(s): Avalon Paradea [1] ✉

[1] Independent researcher, PO Box 384182, Waikoloa, Hawai'i, 96738, USA.

Kapa (Hawaiian barkcloth) was the ubiquitous fabric of historic Hawai'i, used for everything from clothing to bedding, from swaddling newborns to enshrouding the deceased, and all things in between. This textile is crafted from the bast (inner bark) of several plant species, most notably *wauke* (paper mulberry tree, *Broussonetia papyrifera*). The laborious process involves harvesting an adequate number of trees, scraping off the outer bark, stripping the bast from the heartwood, and retting the bast in both salt water and fresh water for several

days. Once the bast is adequately softened, it is beaten on a large, flat *kua pōhaku* (rock) using a rounded wooden beater called a *hohoa* to make *moʻomoʻo*, which is a precursor to *kapa*. Several sheets of *moʻomoʻo* are laid on top one another on a *kua lāʻau* (wood anvil) and felted together by beating with an *iʻe kuku* (grooved wooden beater). Once the resulting fabric is deemed completed, it is dried, smoothed, and finally decorated with plant dyes and earth pigments.

> Following Samuel Kamakau's explanation, I was able to recreate a kapa kaha and in doing so learned more about the ingenuity behind the processes involved. However, I did encounter several challenges.

Waves of European and American merchants in the late 18th and early 19th centuries brought countless items to the islands, including cotton and linen textiles. As these fabrics were adopted, the practice of making *kapa* rapidly ceased. It is estimated that by the late 19th century few, if any, active *kapa* practitioners remained. In 1870, Samuel Kamakau lamented, "All are dead who knew how to make coverings... and adornments... that made the wearers look dignified and proud and distinguished" (Kamakau, 1976, p.116).

Beginning in the mid-20th century, a few pioneering Hawaiian women became interested in reviving this traditional craft. Their work towards achieving this goal involved studying historic *kapa* housed in such places as the Bishop Museum, visiting neighboring Pacific island communities where barkcloth is still manufactured, poring over historic texts, and countless hours of experimentation. Thanks to the efforts of Puanani Van Dorpe, Malia Solomon, Marie McDonald, and others, *kapa*-making has enjoyed a comeback with continuously growing interest. I have been fortunate to be a *haumāna* (student) of *kapa* since 2017, under the tutelage of my *kumu* (mentor) Roen Hufford.

I am especially interested in the historic written records of *kapa* production. Though a select few, these texts provide key insight into the terminology, tools, and processing methods significant in *kapa* manufacture. Notable among these sources is "Na Hana a ka Poʻe Kahiko," a compilation of newspaper articles written by the celebrated Hawaiian scholar and historian Samuel Manaiakalani Kamakau between 1869 and 1870. In a chapter dedicated to *kapa* (referred to as "*tapa*" in the printed book) Kamakau discusses several different varieties of *kapa*. For this paper, I chose to recreate a variety referred to as *kaha*, in part due to Kamakau's detailed account of how this variety was produced.

Kaha was used as a *kilohana*, or decorated top sheet, of a *kuʻina kapa*, or bedspread. According to Kamakau, making *kapa kaha* involved three main stages: first, dyeing the bast with *hili* ("juice from the bark of a tree"); second, submerging the bast in *lepo* (mud); and third, dyeing the bast with the indigenous *palaʻā* fern (Kamakau, 1976, p.111). In the following sections, I recount my experiment in making a *kapa kaha* in detail.

Step 1: Dyeing with Hili Kukui

The first step of making a *kapa kaha* requires previously soaked *wauke* bast to be "daubed with *hili*" and allowed to dry (Kamakau, 1976, p.111). I was immediately struck by the fact that Kamakau does not mention the bast first being beaten into *moʻomoʻo* prior to dyeing. Modern-day *kapa* makers usually beat soaked bast prior to any dyeing activities. The act of beating the bast allows the fibers to spread, making them more receptive to colorant penetration. It is possible that Samuel Kamakau may have glossed over this initial step. Applying my knowledge to this situation, I chose to use *moʻomoʻo* (once-beaten bast, pre-*kapa*) for this stage.

Kamakau simply refers to the dye material as "*hili*," which is defined as: "bark used in dyeing, as *hili kukui*, *hili* kōlea, *hili* noni" (Pukui and Elbert, 1986, p.175). *Kukui*, *kōlea*, and *noni* are three different tree species found in the islands. I chose to work with the bark of *kukui* (candlenut, *Aleurites moluccanus*), a Polynesian-introduced tree that is commonly seen in both cultivated landscapes and wild spaces.

Historically, the outer bark of the *kukui* tree would have been harvested using a *koʻi* (stone adze) or a similar tool. For the sake of simplicity, I used a modern metal hatchet and carefully chipped about two cups of bark material from several *kukui* trees.

Hili kukui could be made using the inner bark of either the trunk or roots of the *kukui* tree (Krauss, 1993, p.66). The dye was prepared by pounding the bark and mixing it with water (Handy, et al., 1972, p.231). This activity would likely have been executed using a mortar and pestle, both made of stone (Krauss, 1993, p.67). I decided to use a *pōhaku kuʻi ʻai* (basalt stone pounder weighing 2 to 3 pounds, used for making poi, a staple starchy food), which I made several years ago, to pound the bark. For ease of retaining the dye liquid, I performed this activity in a stainless-steel pot (See Figure 1).

I have worked with *hili kukui* in the past, extracting the rich tannins from the bark by simmering in water on the stove for several hours. Within the first few minutes of pounding the bark, I had a much richer, more concentrated dye than modern methods had previously achieved. Every few minutes, I added a bit more water as the bark gradually broke down. Within a half hour, I had just over a cup of red dye (See Figure 2). I applied this dye to three separate sheets of dry *moʻomoʻo*. This was done using a hala brush, a paintbrush I made by scraping the waxy outer layer from a ripe hala (*Pandanus tectorius*) fruit, revealing brush-like inner fibers. These brushes were traditionally made either by actively scraping or by allowing the ripe fruits to naturally decay until the fibers were exposed (Buck, 1957, p.190; Krauss, 1993, p.69). I soon discovered I had watered down the *hili kukui* more than anticipated. *Hili kukui* should result in a brown or reddish-brown dye (Abbott, 1992, p.57; Handy, et al., 1972, p.231; Krauss, 1993, p.66), and the color I achieved was very light on the *moʻomoʻo* (See Figure 3). After a day of drying, I applied a second coat of *hili kukui* to each sheet of *moʻomoʻo*. The

resulting color was a rosy brown on two of the sheets, and a dusky reddish-brown on the third (See Figure 4). The differences in color can be attributed to differing degrees of absorption by each *moʻomoʻo*, as there can be variability from one material source to another.

Step 2: Immersion in *Lepo* (Mud)

In the second stage of making a *kapa kaha*, the dyed, dried bast is immersed in *lepo*, or mud (Kamakau, 1976, p.111). Kamakau provides no specifics on this step, in terms of location or duration of immersion. During a trip to Oʻahu in 1834, biologist Frederick Debell Bennett briefly recorded several *kapa* dyestuffs, noting, "a peculiar dull-gray, or slate colour, is also produced, by immersing the cloth in the black mud of the taro fields" (Brigham, 1911, p.50). Communicating with other *kapa* makers, the consensus is that *kalo* (taro, *Colocasia esculenta*) fields, known as *loʻi kalo*, are the preferred location for mud immersion. As for duration, the time spent soaking probably varied from place to place, season to season, and would have depended on the personal preference of the *kapa*-maker. Most of my mentors agree that one to three days is usually adequate (Roen Hufford and Mary Sakamoto, personal communication).

Due to restrictions owing to the COVID-19 pandemic, I was unable to visit any *loʻi kalo* on island. Fortunately, my friends with Hui Aloha Kīholo and The Nature Conservancy were happy to provide me with a bucket of rich, black *lepo* from the *loko iʻa* (fishpond) at Kīholo. I soaked the three sheets of *moʻomoʻo* in the *lepo* for just over two days. Upon removal, the *moʻomoʻo* were coated in mud and smelled almost sulfuric due to the anaerobic environment. After gently rinsing off the superficial layer of mud, their color proved to be grey, suggesting they had truly taken up color from their immersion (See Figure 5).

It is worth noting here an observation of William T. Brigham, that the "double dyeing with *hili*... and then with iron-saturated mud" is a mordanting process wherein the tannins of the *hili* interact with the salts (and tannins from decomposing plant matter) in the mud (Brigham, 1911, p.173). This ingenious technique would have made for a more permanent color than if only one or the other dye method was used alone.

Step 3: Dyeing with Palaʻā Fern

In the third and final dye stage of making a *kapa kaha*, the bast is "balled up and put into a container with *palaʻā* fern and left for a long time" (Kamakau, 1976, p.111). *Palaʻā* (Hawaiian lace fern, *Sphenomeris chinensis*), an indigenous fern, is noted for producing red to brown colors, often dark in hue (Brigham, 1911, p.219; Krauss, 1993, p.66). According to notable Hawaiian historian David Malo, *palaʻā* dye was traditionally prepared by baking the fronds (often with the *kapa* material that was to be dyed) in an *imu*, or underground oven (Malo and

Emerson, 1903, p.74). Kamakau's mention of a "container" is therefore confusing, as there appear to be no other written sources detailing the use of vessels for dyeing with *pala'ā*.

If a container was in fact used, is almost certainly would have been a wooden calabash bowl. Wooden bowls, generally referred to as '*umeke*, were not an uncommon item in historic Hawai'i. These vessels were crafted out of various woods and could be very large in size (Krauss, 1993, pp.22-23). Various types of '*umeke* existed for a variety of utilitarian purposes, from holding foodstuffs to storing everyday items. There is a mention of '*umeke* holding liquid dyes (Brigham, 1911, p.219), but this does not answer the question of how the *pala'ā* dye was processed for coloring *kapa kaha*.

Unfortunately, I was unable to test cooking *pala'ā* in an *imu* due to quarantine restrictions which limited my ability to interact with the few acquaintances I know who have *imu*. Instead, I took a very modern approach to this final dyeing step. For the past several months, my kumu Roen had allowed dried *pala'ā* ferns to ret in water in a 5-gallon plastic bucket. In that time, the water had turned a rich red color. I took about a gallon of this dye liquid home in a bucket and, after gently rinsing the *mo'omo'o* from their mud immersion, placed them into the *pala'ā* bath (See Figure 6).

Kamakau cryptically says that the bast soaked "for a long time." Uncertain as to just how long would be long enough, I decided to try eight days of submersion. Upon removal, I was pleasantly surprised at their appearance. Kamakau states that the bast turns dark after this procedure, and indeed, each *mo'omo'o* had turned a dark coppery-brown (See Figure 7). After thoroughly rinsing and scraping them, they were ready to be beaten into a finished *kapa*.

Final Kapa Kaha

To transform the dyed bast into *kapa*, I layered the three sheets atop one another and beat them together using an *i'e kuku* (grooved wooden beater). Kamakau does not explicitly state that the bast was layered to make *kapa kaha*; this is how I was taught to make *kapa*, and I therefore drew upon my own knowledge for this final step. My general method of making *kapa* involves taking two to four *mo'omo'o*, moistening them, laying them perfectly stacked atop one another on a *kua lā'au* (wood anvil), and beating them into a single *kapa* (See Figure 8). This action is performed by striking the material with the *i'e kuku*, the grooves pierce and felt the wet fibers together while simultaneously spreading them horizontally. This action results in a finished product that is wider than the starting material, though the length does not change.

Kamakau does mention that to lengthen a *kapa kaha*, "one piece was united to the end of another by beating the sections together" (Kamakau, 1976, p.111). Given the small amount of bast I had on hand, I chose instead to simply beat one single example sheet, rather than making and connecting multiple *kapa*.

I laid the finished *kapa* on a table and weighed the edges with stones to dry. Kamakau mentions that the dried *kapa kaha* was "gently beaten until nice and shiny" (Kamakau, 1976, p.111). I performed this action with the *mole* (flat, uncarved) side of my *iʻe kuku*. For extra smoothness, I rubbed a large cowry shell across the surface of the *kapa*. Together, these actions softened the fabric and gave it a polished look. The final *kapa kaha* measures 31 cm x 76 cm (12 in x 30 in) and is a dark reddish-brown color (See Figures 9 and 10).

Conclusion

Overall, I felt this experiment was a success. Following Samuel Kamakau's explanation, I was able to recreate a *kapa kaha* and in doing so learned more about the ingenuity behind the processes involved. However, I did encounter several challenges which I explore below.

It is important to note that I was relying on an English translation of "Na Hana a ka Poʻe Kahiko" for my source material. Kamakau's writings were originally published in a series of articles by the *nupepa* (newspaper) *Ke Au ʻOkoʻa* between 1869 and 1870. These publications were translated in 1934 by scholar Mary Kawena Pukui and ethnographer Martha Beckwith. Though I do not doubt the care taken by these esteemed women in faithfully translating this work, there is always the chance for a second opinion or fresh interpretation of the original text. This would require improvement on my skills in *ʻŌlelo Hawaiʻi* (Hawaiian language) or the aid of a fluent reader. I feel it would be well worth the effort to understand Kamakau's description in his own words. It bears mentioning that, to the best of my knowledge, Kamakau himself was not a *kapa* maker. The knowledge preserved in his writings is invaluable, though certain facts may have been abbreviated or omitted altogether due to limitations in written space, time spent recording such information, and Kamakau's own understanding.

Although Kamakau never refers to the bast as being beaten prior to the dye processes, I chose to use beaten *moʻomoʻo* for this experiment. In my experience, beating the bast prior to dyeing allows the fibers to take up and retain more color. However, it would be interesting to attempt this experiment again with soaked, unbeaten bast, to determine whether there is a difference in the appearance of the finished product.

There were moments when I had to rely on modern tools to execute certain steps, such as using a stainless-steel pot while processing the *hili kukui* and plastic buckets for both the *lepo* and *palaʻā* dye. In the future, I feel it would be more appropriate to use materials that would have been available in historic Hawaiʻi (e.g. a stone mortar or *ʻumeke* in place of the stainless-steel pot). The COVID-19 pandemic and quarantine restrictions stymied my access to a *loʻi kalo* or *loko iʻa* for *in situ* mud immersion. While I am extremely grateful to my friends who brought me mud from Kīholo, I am left wondering whether immersing the bast in a more dynamic outdoor setting might yield different results.

Of the three dye steps outlined, the *pala‘ā* dye presented the greatest uncertainty. David Malo’s text and modern *kapa* makers suggest this dye was usually prepared by cooking the fronds in an *imu*, yet nowhere does Kamakau mention this technique. His explanation of placing the bast in a “container” with the *pala‘ā* fern remains baffling. Was the *pala‘ā* first prepared in an *imu* and then removed to an *‘umeke* or similar vessel? If so, how did it impart color to the balled-up bast that was placed within? Was it instead prepared by retting the fronds in water inside the container, in a manner similar to how my kumu has prepared *pala‘ā* in plastic buckets? Additionally, Kamakau is not explicit on the amount of time recommended for leaving the bast in the dye. I chose eight days, which yielded a nice, dark color, but I wonder how much darker it may have been had I doubled or even tripled that time. Further experimentation with *pala‘ā* dye is required to answer these lingering questions.

Kapa kaha was used as a *kilohana*, or decorated top covering, of a *ku‘ina kapa*, sleeping *kapa*. These bedspreads would have been large enough to cover a sleeping person, measuring upwards of 2.5 meters in both length and width. Due to time and resource limitations, I only made a single example sheet measuring 31 cm x 76 cm. I would like to make several sheets similar in size and, as per Kamakau’s description, felt these together at the edges to create a single large *kapa*. To make a true *ku‘ina kapa* would involve making four more undyed *kapa*, each matching the finished *kapa kaha* in size, and stitching the whole together at one end – a truly laborious undertaking, which would take several weeks, possibly even a couple of months!

Ultimately, this experiment allowed me to gain an in-depth appreciation for the many actions needed to create this type of *kapa*. From initial *wauke* harvest to processing each of the dye materials, to beating the completed fabric, a great amount of forethought and planning would have been necessary to create a large, attractive *kapa kaha*. Much trial and error undoubtedly occurred before perfecting the dye stages. The combination of tannins in both the *hili kukui* and *pala‘ā* dye and the various elements found in the *lepo* work together to produce a rich, beautiful color. Making this *kapa* was a humbling experience, a potent reminder that the *kapa* makers of old were skilled crafters who poured both body and soul into their creations. Experimental work such as this is vital in keeping alive such knowledge and skills.

Sincerest mahalo nui loa to my *kumu* Roen Hufford for generously teaching me over the years (and for providing the *pala‘ā* dye), my friends at the Donkey Mill Art Center for allowing me to harvest *kukui* bark, and my friends with The Nature Conservancy and Hui Aloha Kīholo for providing me with *lepo* from the *loko i‘a*. *‘A‘ohe hana nui ke alu ‘ia*. It takes a community to perpetuate the life of this land so that this *‘ike* may persist into the future.

Keywords textile
dyeing

Country Hawaii

Glossary

Hili: tannin-rich dye obtained from the bark of several tree species. In this experiment, I used *hili kukui* (obtained from the bark of the kukui tree, *Aleurites moluccanus*).

Hohoa: rounded wood beater, used during the initial stage of preparing *wauke* bast to make *kapa.*

Iʻe kuku: four-sided wood beater, used to beat and felt bast fibers together into *kapa*.

Imu: an underground earth oven, most commonly used to cook food, though also used to prepare certain dye materials.

Kaha: a type of *kapa* described by Samuel Kamakau as being used to make *kuʻina kapa*, a bedspread. This type of *kapa* is the main focus of this experimental study.

Kapa: Hawaiian barkcloth, made using the bast (inner phloem) of certain tree species, with *wauke* (*Broussontia papyrifera*, paper mulberry) being the most common species used in Hawaiʻi.

Kilohana: decorated top sheet of a *kuʻina kapa* (bedspread kapa).

Kua lāʻau: wood anvil upon which *kapa* is beaten.

Kua pōhaku: flat rock used as an anvil in the initial stage of beating *kapa*.

Kuʻina kapa: a bedspread consisting of a *kilohana* (top sheet of decorated *kapa*) and several undersheets of undyed kapa.

Kumu: mentor or teacher.

Lepo: soil, dirt, mud. Used for dyeing *kapa kaha*.

Moʻomoʻo: bast that has been soaked and beaten once, but not yet turned into *kapa*; essentially, a precursor to *kapa.*

Palaʻā: Hawaiian lace fern (*Sphenomerous chinensis*), a fern indigenous to Hawaiʻi, used for dye.

Pōhaku kuʻi ʻai: stone pounder used to make *poi*, a common starchy food made by pounding the corm of the *kalo* (taro, *Colocasia esculenta*) plant.

Tapa: Tahitian word for barkcloth, now the most commonly recognized word for Pacific barkcloth in general.

ʻUmeke: wooden calabash most commonly used for storing food or items, though also used to contain liquid dyes.

Wauke: *Broussonetia papyrifera*, paper mulberry tree, the bast of which is used to make *kapa*.

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Corresponding Author

Avalon Paradea
Independent researcher
PO Box 384182
Waikoloa
Hawai'i, 96738
USA
E-mail Contact

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FIG 1. PŌHAKU KU'I 'AI (STONE POUNDER) IN STAINLESS-STEEL POT WITH KUKUI BARK. PHOTO BY AVALON PARADEA

FIG 2. HILI KUKUI DYE MADE FROM POUNDING KUKUI BARK MIXED WITH WATER. PHOTO BY AVALON PARADEA

FIG 3. MOʻOMOʻO (BEATEN WAUKE BAST) DYED WITH HILI KUKUI, WHICH WAS APPLIED USING A HALA BRUSH. WHILE WET, THE COLOR APPEARED SATURATED, BUT THIS LIGHTENED UPON DRYING. PHOTO BY AVALON PARADEA

FIG 4. SECOND APPLICATION OF HILI KUKUI TO THREE MOʻOMOʻO. PICTURE TAKEN WHILE BAST WAS STILL DAMP. PHOTO BY AVALON PARADEA

FIG 5. MOʻOMOʻO DISPLAYING GREY COLORATION AFTER REMOVING FROM LEPO (MUD). PHOTO BY AVALON PARADEA

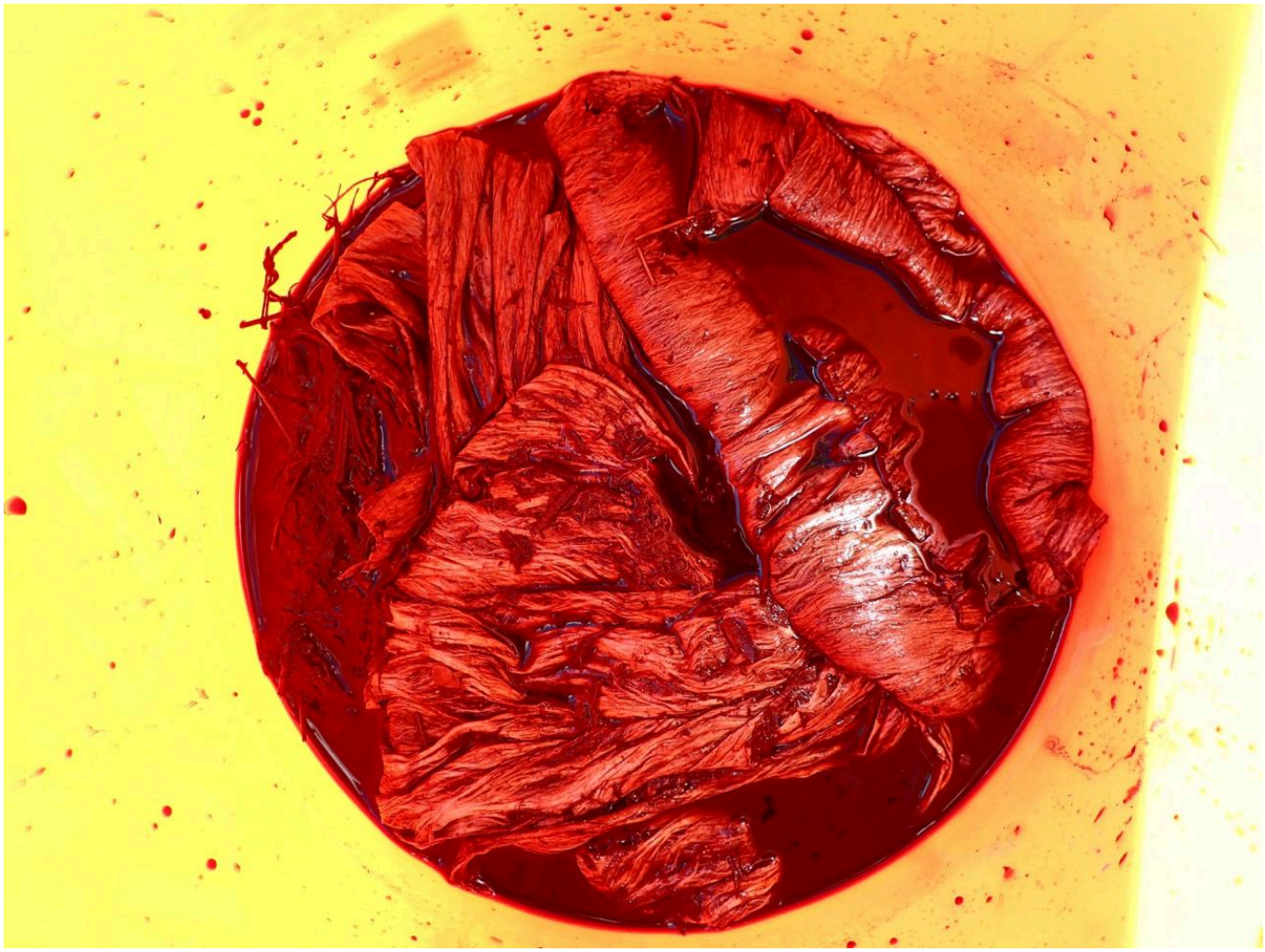

FIG 6. PLACING MOʻOMOʻO IN THE PALAʻĀ DYE. PHOTO BY AVALON PARADEA

FIG 7. THE THREE MOʻOMOʻO AFTER REMOVAL AND RINSING FROM THE PALAʻĀ IMMERSION. PHOTO BY AVALON PARADEA

FIG 8. BEATING THE THREE MOʻOMOʻO INTO A SINGLE KAPA SHEET. PHOTO BY AVALON PARADEA

FIG 9. THE AUTHOR WITH THE FINISHED KAPA KAHA. PHOTO BY AVALON PARADEA

FIG 10. THE FINISHED KAPA KAHA WITH VARIOUS TOOLS USED IN THE PRODUCTION: KUA LĀʻAU (WOOD ANVIL), IʻE KUKU (CARVED WOODEN BEATER), PŌHAKU (STONES, FOR WEIGHING EDGES WHILE DRYING), AND COWRY SHELL (FOR POLISHING THE DRIED KAPA). PHOTO BY AVALON PARADEA