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Dyeing with a Coffee Cup? Challenging Recipes from a 19th-Century Dyer's Handbook

Eva Eis

Kremer Pigmente GmbH & Co. KG, 88317 Aichstetten, Germany; eis@kremer-pigmente.de; Tel.: +49-7565-914480

Abstract

A small dyer's handbook in Dr. Georg Kremer's archive presents unexpected challenges. The handwritten recipes can be dated back to the early 19th century. The author must have been an experienced dyer, who wrote down detailed instructions for dyeing or printing on cotton, wool and silk. More than 80 dyed textile samples were sewn or glued into the book. A colourful palette is achieved with natural dyes such as indigo, cochineal, madder, alkanna, annatto, turmeric and quercitron. Furthermore, inorganic pigments like Prussian blue and chrome yellow were used. Unfortunately, the text is characterized by regional accent and inconsistent spelling. Language analysis was able to assign the origin of the author to the Vogtland, a region in Germany that covers parts of Bavaria, Thuringia and Saxony. The spelling or misspelling of the words may leave readers with a smile, but also make it difficult to figure out ingredients, chemicals or dyes. The measurement units given in the recipes are problematic. Additionally, vessels of vague volumes such as hand buckets or coffee cups are used. In this study, the content of the notebook is evaluated, and initial reproductions are carried out to find out how useful these recipes are for further research.

Keywords: dyeing; textile printing; historical recipes; textile samples; indigo carmine; cochineal; redwood; logwood; annatto; turmeric; quercitron

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1. Introduction

Dr. Georg Kremer owns a huge collection of books on pigments and paint making, natural and synthetic dyes, dyeing, and other topics related to colour. In 1977, he founded Kremer Pigmente GmbH & Co. KG, a German company that specializes in the production of historic pigments. Less well known is that Dr. Kremer collects books and has compiled an extensive library over the years. It also includes a few rare, handwritten sources, such as the notebook of a dyer (Figure 1). The book is a collection of recipes, notes and samples and can be dated back to the first half of the 19th century.

Over the last years, several dyer's manuals from the 18th and 19th century from all over Europe have been studied extensively [1–4]. Each of these manuscripts is unique and offers rare insights into the history and technology of textile dyeing in Europe. The small dyer's handbook from Dr. Kremer's collection is a similar source, but dates from later than most of these sources. If these recipes can be made accessible, this manuscript could be a valuable addition to the current existing knowledge on historic dyeing and textile printing technologies.

The dimensions of the small book are 11.5 × 18.3 cm; it is very old and worn. The author is unknown. Unfortunately, the cover has darkened so much that the label has become unreadable. Approximately 53% of the 242 pages were used. The paper is covered

in handwriting, coloured stains and fingerprints. It seems as if this notebook was indeed used in a dyer's workshop. The recipes are only roughly organized according to topics with unused pages in-between. The first part of the book contains recipes for dyeing cotton yarn, followed by instructions for printing on wool and silk. The next part contains recipes for dyeing wool yarn and fabric, followed by recipes for dyeing wool and silk. The final part is about printing and dyeing wool and silk again. Samples of dyed textiles have been sewn or glued to the pages, while others are just loosely inserted into the book and it is somewhat unclear which recipe they belong to. In one case, the dyer even added a recipe by sewing a piece of paper into the book along with the sample, covering another recipe (Figure 2).



Figure 1. Notebook of an unknown dyer from Dr. Kremer's collection.



Figure 2. Dyed cotton samples were sewn into the book (dyer's handbook Folio 18^{v} and 19).

All recipes are handwritten in old German script. The handwriting itself is relatively uniform and easy to read. The letters show peculiarities which indicate that the book was written by one person only. This source poses unusual challenges even for native speakers, because the writer put down his notes using spoken language. The spelling indicates that the author spoke a local dialect. The language was analyzed by Dr. Almut König[1], an expert in linguistics and dialectology. The orthographic variations indicate that the geographical origin of the author lies in the Vogtland, an area in Germany that covers parts of Franconia, Thuringia and Saxony. Some morphological features indicate that an origin in the Upper Saxon area of the Vogtland is more likely [5].

The result of the language analysis is supported by information in the book. A small sketch of a map on the last page mentions the city of Greiz. The small town is located in Thuringia, close to the Saxonian border. Textile production had a long tradition in Greiz. Wool and linen weavers are documented from the 15th century onwards, dyers since the 16th century. By the late 17th century, cotton printing was taken up and at the end of the century, textile production had become the most important business branch in the region. In the early 19th century, the most important woollen products exported from Greiz were textiles called "Camelottes", "Tibets" and "Merinos" [6]. According to Johann Carl Leuchs, these dense cloths were difficult to dye [7] (p. 216). The book contains recipes for dyeing "Merinos" and it is mentioned that these textiles were mainly used for scarves. Thus, samples of these fine cloths in the book seem to point to the same area as the language analysis.

While the use of spoken language is not unusual [3], this writer also constantly changes the spelling of the words. This is unrelated to the dialect; the spelling of simple and common words varies or is wrong. One can only speculate whether this is due to a limited school education or general spelling difficulties. These inconsistencies in the spelling may leave readers with a smile, but this also complicates the identification of some of the ingredients, chemicals or dyes. While words like "Jndigo" (indigo) or "Orilan" (orlean, annatto) can be easily identified, others are more difficult to understand. For instance the dyer uses the terms "Gorkeme", "Gorkemehl" or "Gurkemehl", which a native speaker might interpret as cucumber (=Gurke) powder. But this is likely a misspelling of the word "Curcume" or "Gurcumey", which refers to turmeric [8]. The different meanings of "Gall" "Gali", "Galj" and "Galÿ" are also challenging. In some cases, only the context provides an indication on the actual substance in use, such as sumac, potassium bichromate or potassium cyanide. The inconsistent spelling occurs with common German words as well as with foreign words. At least ten variations of the word cochineal can be found in the notebook, "Cockenille", "Gochonilie", "Kunschelle" are easy to identify, while the word "Cohele" is barely recognizable. In addition, the writer does not use any punctuation in most parts of the text, and the inconsistent use of uppercase and lowercase letters makes the whole text hard to read and puts common editing rules to the test.

All of this makes working with this source difficult, but the contents of the book with its detailed recipes and textile samples can be a valuable technological source from a region where textile industry had a long tradition. The transcript of the text is now completed, which is essential for any further use of the source. This study aims to evaluate the contents of the notebook and examine if the recipes can be reproduced and used for further research.

2. Materials and Methods

2.1. Contents of the Book

While the inconsistencies in spelling may suggest an uneducated author, the contents of the book convey a different message. The book contains 168 recipes. Some are just short notes, but others are detailed recipes with precise amounts of the ingredients, times for the

mordanting and descriptions of the dyeing process. More than 80 dyed textile samples were sewn or glued into the book and demonstrate the results of the recipes (a few examples are shown in Figure 3a–c). Although not all of the samples are neatly arranged—some of them are even loose and out of context—the outline of the book itself is quite clear. The recipes are sorted according to topics. The first part of the book contains recipes for dyeing cotton yarn, followed by instructions for dyeing and printing wool and silk. The last part of the book contains recipes for dyeing wool yarn, wool and silk fabric.



(**a**) (**b**) (**c**)

Figure 3. The book contains various pieces of woven fabric as well as samples of wool and cotton threads. (**a**) shows a loose scrap of printed cotton which cannot be ascribed to a certain recipe, (**b**) is a wool thread dyed "Saxon Blue" with indigo carmine and (**c**) shows a wool sample dyed "Lemon Yellow" with quercitron and turmeric (dyer's handbook Folio 20, 59^{v} and 61^{v}).

A colourful palette is achieved with natural dyes such as cochineal, madder, alkanet, annatto, weld, buckthorn berries, turmeric and quercitron. The dyer also uses logwood, redwood, fustic, orchil, lac, safflower and salvia leaves. By treating indigo with oleum (fuming sulfuric acid), the dyer produces indigo carmine and uses it for dyeing cotton and wool. Furthermore, inorganic pigments like Prussian blue and chrome yellow are used or produced in the printing recipes.

Detailed descriptions in the recipes indicate that this author was an experienced dyer. Some of the recipes are step-by-step instructions with the samples showing exactly which colour is required (Figure 4). The way the reader is addressed gives the impression that these instructions were written for a person in particular. It seems as if the dyer wanted to pass on his knowledge to another person, whom he addresses directly, for example by writing "but you have to boil this a day before" or "I cannot tell you how much to use". In these cases the dyer did not mention the quantities of the ingredients but included a sample of the required colour.

2.2. Dating

Although the book is undated, it is possible to narrow down the time frame by the ingredients and measures used in the text. One of these ingredients is Quercitron. The yellow dye Quercitrin was extracted from the bark of the Black Oak, *Quercus velutina* Lam. This tree is common in North America, but the dye was introduced in Europe by Bancroft in the late 18th century and became a popular yellow dye in the early 19th century [9]. However, it can be assumed that Quercitron only became more readily available in Germany after the Continental Blockade which lasted until 1813 [10].

In the printing recipes, the dyer also produces chrome yellow. Although chrome yellow was introduced as an artist pigment in the early 19th century [11], it found more widespread use in textile printing around 1820 [12].



Figure 4. These samples show how the cotton is dyed in steps. The yarn is first dyed pale blue with indigo, then overdyed with quercitron and yellow wood and finally shaded with indigo carmine (dyer's handbook Folio 6).

The writer gives another very important hint by mentioning that all measures are Saxonian units of measurement. Until the early 19th century, measures and weights differed regionally in Germany. Every small state and every town had its own units of measurement. It is not clear which weights were applied in the recipes, unless the origin of the source is mentioned. In the early 19th century, the German states started to negotiate a customs union. In 1834, the "Zollverein", the German Customs Union came into effect [13], but it took until the middle of the 19th century to introduce a uniform measuring system. Saxonia introduced the "Zollpfund" (German Customs Pound) with a weight of 500 g as early as 1840 [14,15]. It is possible that the Saxonian measuring units were still in use for a couple of years [14,15] (§ 1), but most likely, the book was written between 1820 and 1840.

2.3. Weights and Measures in the Recipes

Since the dyer uses Saxonian measuring units, the amounts mentioned in the recipes can be calculated. The most common measuring units were the pound and the Loth. A Saxonian trade pound weighed 467.009 g. A pound was always divided into 32 Loth, and the Loth was further divided into four Quentchen. The dyer uses two official liquid measures, a bucket and a jug. A Saxonian jug had 935 mL, and a "bucket" had a volume of 67 L or 72 jugs [16] (pp. 57–58).

But in addition, this dyer also uses several vessels of unknown volumes. A hand barrel is frequently mentioned for measuring the amounts of dye decoction. Sometimes a small glass or a beer glass is used, but one of the most frequently used measures in the recipes is a coffee cup. Unfortunately, the sizes and shapes of the coffee cups in the early 19th century varied as much as today. Thus, the volume of the cup this dyer used will always be an unknown factor when reproducing these recipes.

The amounts this dyer worked with range from 1 to 64 pounds of yarn. The majority of recipes is for 20 pounds of yarn, which would correspond to 9.34 kg. According to a description of the dye vat in the book it was ¾ Ell high and had 4 Ells circumference at the bottom and 4.25 Ells at the top. If the dyer also referred to Saxonian measuring units,

the dye vat would have been 43 cm high and had a diameter of 72–76 cm [16] (p. 75). According to the above figures the vat volume amounts to approximately 187 L.

2.4. Reproduction of the Recipes

The recipes differ in complexity. Some take only few working steps, while others are quite labour intensive and can take several days. The mordanting and dyeing process for cotton is usually more laborious than for wool; some recipes require more than one mordanting and several dyeing steps. For instance, a recipe for a violet on cotton yarn describes five mordant baths (one with sumac, four with tin mordant) and four logwood dyebaths[2]. Several recipes for dyeing cotton and wool were reproduced in this study. Two of these reproductions will be described and compared below.

2.4.1. Reproduction of Rose Red

An example for a rather simple recipe is "Rose Red" on wool dyed with cochineal and tin (Figure 5). A transcript of the text as well as a translation into English can be found in Appendix A. No separate mordanting step is required in this recipe. The wool is washed with black soap and rinsed before dyeing. The ingredients, 30 Loth of cochineal (2.34% WOF (weight of fibre)), 3 pounds of cream of tartar (7.5% WOF) and 3 pounds of tin liquor (7.5% WOF) are put into a kettle and boiled for a while. Then, it is cooled down by adding more water and the wool is added. Now it is brought to the boil again, the wool is boiled for one hour and turned over every 15 min. After that, it is thrown out and washed.

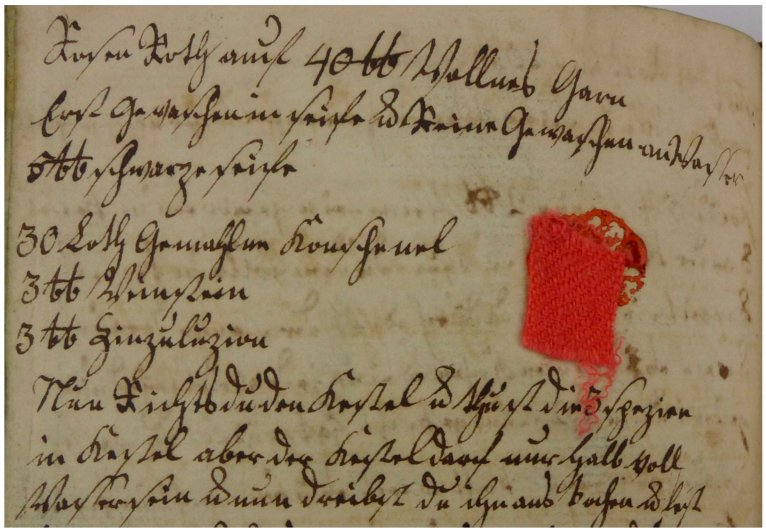


Figure 5. The recipe for Rose Red is for 40 pounds of woollen yarn, but the sample shows a dense woollen fabric (dyer's handbook Folio 60^{v}).

The ingredients, measures and weights in this recipe are clear. The main problem in the reproduction of the Rose Red is the use of tin liquor. While the dyer used weights for measuring the tin liquor, the notebook contains five different recipes for preparing this ingredient. It is not stated which of these is to be used in this case and the ratios differ in each recipe (Table 1). Four of the recipes use hydrochloric and nitric acid along with the tin, while the fifth contains ammonium chloride and nitric acid. This is not unusual and equally confirmed by the contemporary literature. Johann Carl Leuchs wrote that there are countless instructions for preparing tin liquor, all of which differ in their quantity ratios [7] (p. 362). And indeed, Sigismund Friedrich Hermbstädt, Jean Baptiste Vitalis as well as Leuchs offer several recipes that vary in their ingredients and mixing ratios [7] (pp. 365–368) [17–19].

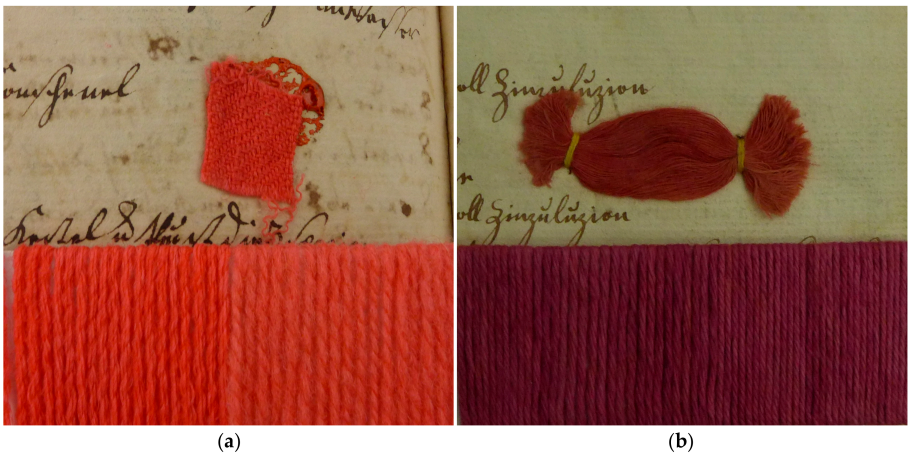
Table 1. Tin liquor recipes in the dyer´s handbook.

	Recipe 1	Recipe 2	Recipe 3	Recipe 4	Recipe 5
Hydrochloric acid	4 lb	12 lb	0.5 lb	20 lb	
Nitric acid	2 lb	3 lb	5 lb	10 lb	12 lb
Tin	1 lb	1 lb	1 lb	2 lb	4 lb
Ammonium chloride					1.5 lb
Water			10 lb		
WOF *	4%	1.78%	1.73%	0.89%	1.63%

* WOF of tin calculated for the Rose Red recipe.

All five recipes from the source were reproduced to determine which one is the matching tin liquor for this particular Rose Red. In the recipes 1, 2 and 4, the tin powder dissolved completely. Recipe 5—the one with the ammonia, differed. Mixing the ingredients caused a very strong reaction, the mixture started to boil and released fumes, but the result was a greyish cloudy solution. Recipe 3 did not work at all. This recipe contains too much water and too little hydrochloric acid and the solution is not strong enough to dissolve the tin. For the reproduction, tin liquor recipe 3 was replaced by calculating the equivalent amount of tin-II-chloride for the 1 pound of tin in the recipe[3].

The Rose Red was reproduced using 2 × 10 g of two different types of wool yarn[4]. The wool was washed and rinsed before dyeing. Since the dyer did not specify how long to boil the ingredients, the ground cochineal, cream of tartar and the tin liquor were boiled for 15 min. After filtering the decoction, the wool was immersed into the dyebath, brought to the boil and boiled for 1 h. During the boiling process, it was observed that the wool absorbed more and more of the dye. At the end, only a pale liquid was left over while the wool had turned bright pink. When the wool was washed with cold tap water afterwards, none of the dye came off again. The uncertainty regarding the tin liquor recipe was the main obstacle in the reproduction. The recipe itself was easy to follow and in the end, the five reproductions all showed a very similar colour if the same substrate is used (Figure 6a).



(**a**) (**b**)

Figure 6. Examples for the reproductions: (**a**) reproduction of Rose red on two different types of wool, reproduced with tin-II-chloride (Recipe 3); (**b**) reproduction of Bonsi Red on cotton.

2.4.2. Reproduction of Bonsi Red

One of the more complex recipes is the recipe for “Bonsi Red”. The name “Bonsi” is a misspelling by the dyer that likely refers to the French word “Ponceau”. The original sample shows an intense, deep red on cotton yarn (Figures 6b and 7). This recipe is very detailed, it provides precise times for the boiling of the dyewood, the mordanting and

the dyeing process; the dyer even noted how often and how strong to wring out the yarn. The full recipe can be found in Appendix B. The dyeing process is labour intensive and requires at least 35 h (time for the mordanting and dyebath as given by the dyer, without the additional handling steps). The long mordanting and dyeing time of up to 12 h are evidence for the long working hours in 19th century manufactories and factories, which are also reported for other dyehouses [20].

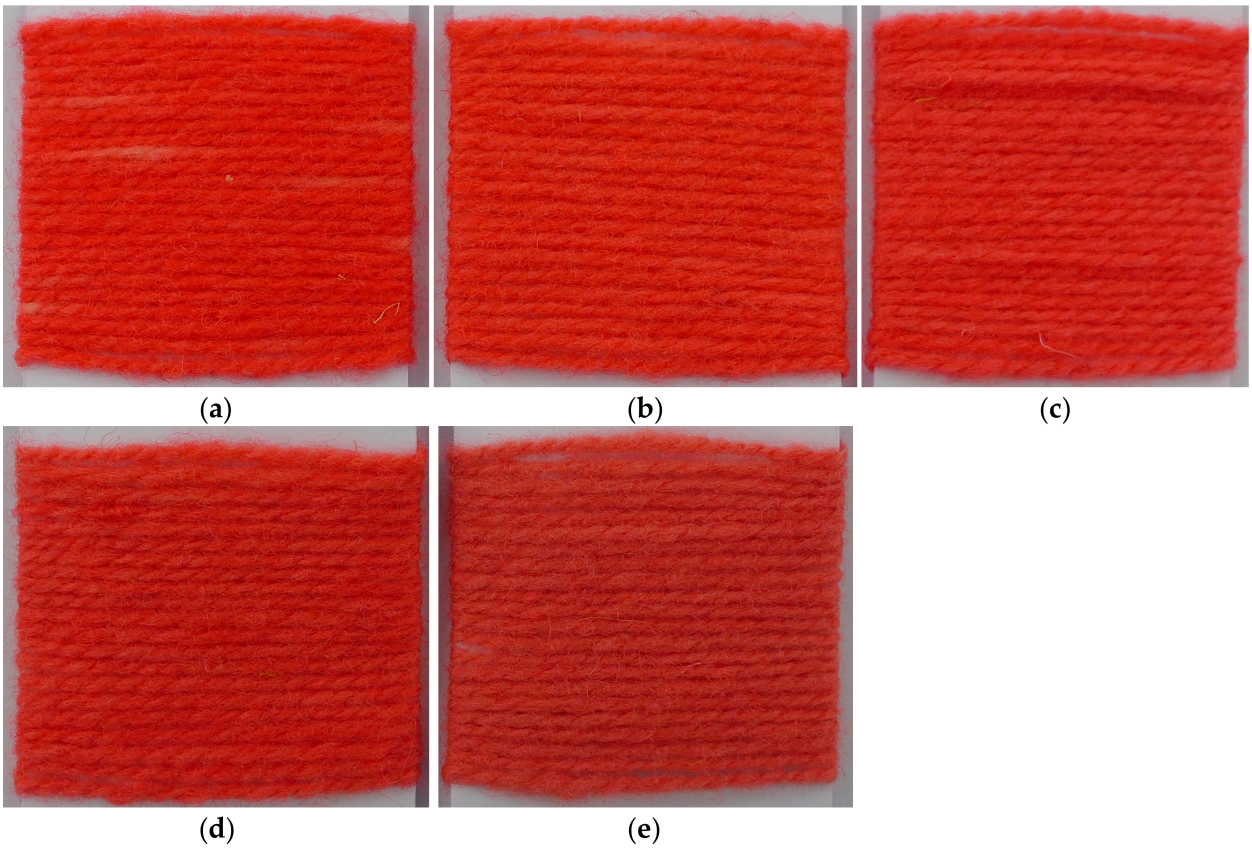


Figure 7. Rose Red reproductions, (**a**) with tin liquor recipe 1, (**b**) with recipe 2, (**c**) with recipe 3, (**d**) with recipe 4 and (**e**) with recipe 5 (the tin liquor recipes can be found in Table 1).

Before dyeing, 20 pounds of cotton yarn are washed and boiled. For the first mordant bath, 2 pounds of sumac (10% WOF) are boiled for 15 min and once it has cooled down and is only lukewarm, the fibre is left to soak in this mordant for 12 h. Then, a second mordanting bath is prepared with 1.5 pounds of alum (7.5% WOF), 0.5 pounds of tin chloride (2.5% WOF) and, in addition to that, four coffee cups of tin liquor. The fibre is mordanted in that cold bath for another 8 to 12 h.

A redwood decoction is prepared by boiling 14 pounds of redwood (70% WOF) in 18 hand barrels of water for half an hour. This is supposed to be done one day before use, so that the decoction can be used cold. The yarn is then dyed in three steps. First the yarn is dyed in half of the redwood decoction for 6 h. Afterwards, the redwood decoction is replaced by the second half of decoction and the fibre is immersed for another 3 h. Then, half a pound of turmeric (*Curcuma longa* L., 2.5% WOF) is stirred into hot water and added to the dyebath along with one last coffee cup of tin liquor. Finally, the fibre is dyed for another hour, before it is wrung out three times and dried.

While the weights of the ingredients in this recipe can easily be calculated, the volumes of the liquids are difficult or impossible to estimate. The dyer states how many hand barrels of water to use, but since the size of this vessel is unknown, it is impossible to use equivalent

amounts. For the reproduction, the amount of water required for producing the redwood decoction was calculated from experience in other reproductions [21].

The five coffee cups of tin liquor in the recipe posed a bigger problem. The coffee cup is crucial in this recipe, since it is used for measuring one of the most important ingredients—the tin liquor. For the reproduction described here, a cup volume of 140 mL was assumed. This corresponds to the volume of a very common coffee cup produced by the famous porcelain manufactory in Meissen. The city of Meissen is located north-west of Dresden and approximately 140 km from the Vogtland. Founded in 1710, this was the first porcelain manufactory in Europe and this specific cup type has been available since the mid-18th century [22]. Like in the other recipe, the dyer did not define which one of the five recipes to use for the tin liquor. Because the ratios differ in each recipe, the same volume of tin liquor would still result in different quantities of tin chloride. But reproductions of the Rose Red recipe showed that the colour difference caused by using these five different tin liquor preparations is minimal. For the production of Bonsi red, Recipe 4 was chosen and reproduced; then, the required volume was weighed and used for calculating the corresponding quantity of tin chloride for the reproduction.

Bonsi Red was reproduced several times, using two different kinds of cotton fibres[5], two different sources of sumac (*Rhus coriaria* L.) and two different kinds of redwood (Sappanwood, *Biancacea sappan* (L.) Tod. and Brazilwood, *Paubrasilia echinata* Lam.)[6]. Although the dyeing process was more laborious, it went as smoothly as the one for the Rose Red. However, none of these reproductions matched the colour of the original (Figures 6b and 8).



(**a**) (**b**) (**c**)

Figure 8. Reproductions of Bonsi Red with sappanwood (**a**) and brazilwood (**b**,**c**). (**b**,**c**) were made with two different types of sumac.

3. Results

The five reproductions of the Rose Red recipe were constantly producing a similar colour, no matter which tin liquor recipe was used (Figure 7). Slight differences in intensity may be explained by the different quantity of tin mordant (between 0.89 and 4% WOF), but the differences can barely be detected with the naked eye. The sample made with ammonium chloride is a bit duller and paler than the others (Figure 7e). This is confirmed by Leuchs, who mentions that the ammonia in the solution damages the colours [7] (p. 366). An obvious colour difference was achieved with the different types of wool used (Figure 6a), which might depend on the processing of the wool. It also needs to be considered that although the recipe in the book is for 40 pounds of yarn, the dyed sample is on wool fabric. For future reproductions, a more similar textile would be desirable, but sourcing a similar wool cloth has been unsuccessful so far.

The reproduction of Bonsi Red was more complex and did not lead to the desired result. None of the three dyed samples correspond to the colour of the original (Figure 6b). The results on the different cotton yarns look very similar and the two different types of

sumac used in the first mordanting step also do not seem to have much influence on the end result. However, the reproduction with sappanwood turned out to be much too pale and the reproductions with brazilwood were darker and more intense than the original sample. The addition of turmeric causes a slight colour shift to a warmer, more yellow hue. Since the turmeric and all other ingredients (alum, tin chloride) were the same for each reproduction, the main issue seems to be the quality of the dyewoods.

4. Discussion

The notebook contains a lot of recipes using a wide range of materials. The dyer worked with cotton, silk and wool yarns and woven textiles of various kinds. The recipes mention a wide variety of natural dyes which are applied in dyeing as well as printing techniques. This demonstrates the versatility and expertise of the dyer and turns out to be a valuable source of information about textile dyeing and printing technology of that time which could complete the picture presented in previous studies on related manuscripts. While a precise dating is not possible, it can be narrowed down by the materials and techniques used in the recipes. Since the dyer pointed out the use of Saxonian measuring units, most of the weights and measures in the recipes can be calculated. However, the use of vessels with unknown volumes like a coffee cup will always be an uncertainty that has to be taken into account when reproducing the recipes.

The experiments have shown that a reproduction of the recipes is possible in general, but both reproductions revealed many factors that must be considered. The Rose Red recipe as well as other reproductions on wool have shown that the type of fibre, its treatment and the weave can influence the result. Therefore, a more thorough research on the original substrates is needed prior to further reproduction of these recipes. While the influence of the amount of tin mordant seemed to have less impact on the result, finding a similar quality of raw materials, especially regarding the dyewoods, will pose another challenge for the future.

One of the most important questions that arose during this study was if the colours of the samples in the book have changed during ageing. Some of the samples look quite pale and a brownish discoloration of the paper can be observed in contact with some of the cotton yarn samples. Especially the samples dyed with annatto look pale, but doubts also arose with some samples that were dyed with redwood. The colour of the Bonsi Red sample shows a deep, but not very bright red which makes one doubt if this can really be described as “Ponceau” red. In addition, the blank page opposite this sample shows a brown discoloration where it was in contact with the bundle of yarn (Figure 9). While the samples in the book are fairly protected from light, chemical reactions of the materials used and possible colour changes in the samples during ageing cannot be ruled out. In addition, it is not known how the book was stored or whether it was treated with pesticides at some point (there is insect damage on a few pages and wool samples). Such a treatment might affect dyes or mordants and cause irreversible colour changes [23]. This could influence any further colour matching experiments or colour measurement on the samples. Thus, it would be desirable to pursue this question in future research, since it is not only essential for the further evaluation of this source, but might also be considered when examining similar collections.

For now, the little notebook of this unknown dyer raises more questions than answers and turns out to be an inspiring source for further research.

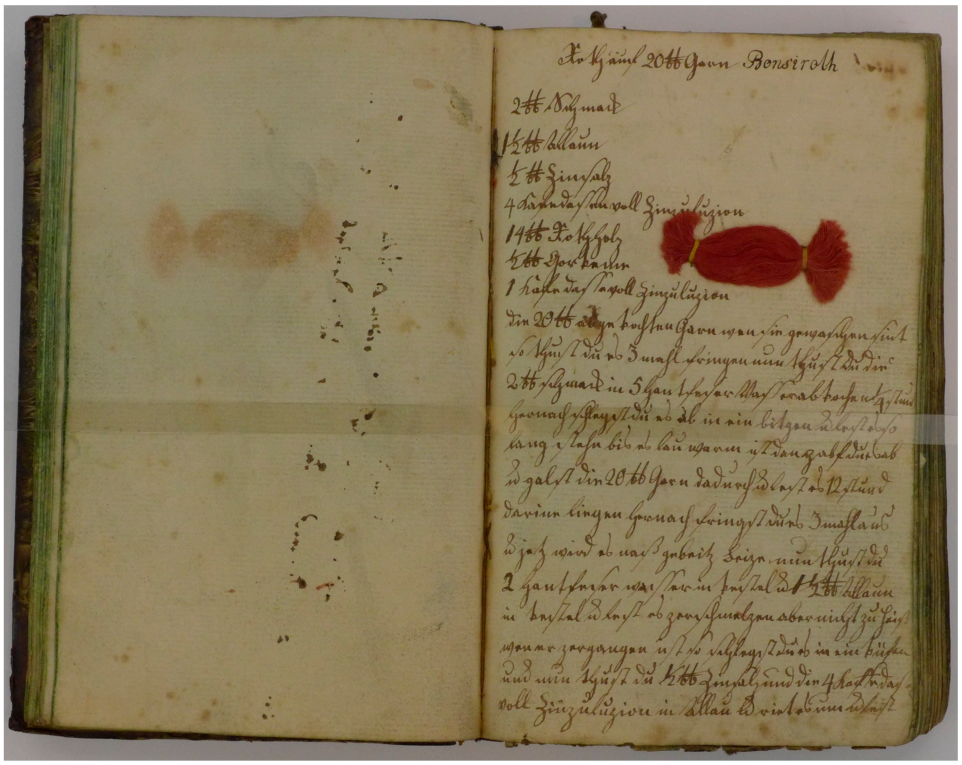


Figure 9. The recipe for Bonsi Red. The page opposite the red yarn sample shows a brown discoloration where it was in contact with the textile (dyer's handbook Folio 18).

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Data Availability Statement: The raw data presented in this study is available on request from the author. It is planned to publish a book that will contain all the data resulting from this research.

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Conflicts of Interest: Eva Eis is employed by Kremer Pigmente GmbH & Co. KG. The author declares no conflicts of interest.

Appendix A. Recipe for Rose Red

Rosen Roth auf 40 lb wollnes Garn
Erst gewaschen in Seife und reine gewaschen an Wasser
5 lb schwarze Seife
30 Loth gemahlen Konschenel
3 lb Weinstein
3 lb Zinzuluzion
Nun richts du den Kestel und thust die 3 Spezien in Kestel aber der Kestel darf nur halb voll Wasser sein und nun dreibst du ihn ans Kochen und lest es ein wenig dadurch kochen und nun bomst du noch Wasser in Kestel das es lauwarm ist und nun gest du mit der War hinein und immer umgezogen bis ans Kochen und nun 1 Stunt kochen lassen und ein jede ¼ Stund umgekert und wenn er eine Stund gekocht hat dan ausgeworfen und gewaschen <60′ | 61>

Rose Red on 40 lb of woollen yarn
First washed in soap and rinsed clear with water
5 lb black soap
30 Loth ground cochineal
3 lb cream of tartar
3 lb tin solution
Now you prepare the kettle and put the 3 species in kettle but the kettle should only be half full of water and now bring it to the boil and let it cook for a little while and now pump more water into the kettle so that it is lukewarm and now you add the goods and now pull it through until it boils and now let it boil for 1 h and turn over every ¼ hour and when it has boiled for an hour then thrown out and washed

Appendix B. Recipe for Bonsi Red

Roth auf 20 lb Garn Bonsiroth	Red on 20 lb yarn Bonsired
2 lb Schmack	2 lb sumac
1 ½ lb Allaun	1 ½ lb alum
½ lb Zinsalz	½ lb tin salt
4 Kafedassen voll Zinzuluzion	4 coffee cups full of tin solution
14 lb Rotholz	14 lb redwood
½ lb Gorkeme	½ lb turmeric
1 Kafedasse voll Zinzuluzion	1 coffee cup full of tin solution
die 20 lb abgekochten Garn wen sie gewaschen sint so thust du es 3 Mahl fringen nun thust du die 2 lb Schmack in 5 Hantfeser Wasser abkochen ¼ Stund hernach schlegst du es ab in ein Bitgen und lest es so lang stehn bis es lauwarm ist dan zabf du es ab und galst die 20 lb Garn dadurch und lest es 12 Stund darine liegen hernach fringst du es 3 Mahl aus und jetz wird es naß gebeitz Beize nun thust du 2 Hantfeser Wasser in Kestel und 1 ½ lb Allaun in Kestel und lest es zerschmelzen aber nicht zu heiß wen er zergangen ist so schlegst du es in ein Küfen und nun thust du ½ lb Zinsalz und die 4 Kaffedas voll Zinzuluzion in Allau und rirt es um und lest $^{<18\,|\,18'>}$ *½ Stunden stehn so ist es zum Beizen nun und auf etwa*[s] *Wasser darzu so das du Rot hast beitz du die nassen gegalten Garn dadurch aber es muß immer gut umgerirt werden und nun lest du es 8 bis 12 Stunden darinne liegen nun fringst du es 2 Mahl aber ganz loß und auf halbe gemaht nun must du aber die 14 lb Rotholz in 18 Hantfeser Wasser abkochen und ½ Stund kochen lassen aber das Rotholz muß du schon eine Tag vorher abkochen damit es kalt ist nun zabf du das Rotholz ab und thust 7 Hantfeser Rotholzbrie in Küfen und noch 2 Hantfeser Wasser nun thust du den gebeiz Garn auf Umdrecker machen und setz es auf das Küfen und drek es um und lest es 6 Stund darauf stehn hernach frinst du es 3 Mahl aus und schiet du die Brie weg und nimt die zweite Brie nun thust du die andern 9 Hantfeser Rotholzbrie in Küfen und setz das Gan auf und lest es umdrecken und lest es 3 Stund darauf stehn hernach schmeiß du es auf und nun thust du 1 Kaffedasse voll Zinzuluzion in die Brie und ½ lb Gorkeme in etwas heisen Wasser dadurch gerirt und giest es auch noch dazu nun thust du den Garn* $^{<18'\,|\,19>}$ *wieder darauf umdrecken 1 Stund hernach fring du in 3 Mahl aus und hengst es auf so ist es ferdig*	The 20 lbs of boiled yarn, once washed, you wring it 3 times now you boil the 2 lbs of sumac in 5 handbuckets of water for ¼ hour afterwards you put it into a vat and let it stand until it is lukewarm then you draw it off and mordant the 20 lbs of yarn through it and let it lie in it for 12 h afterwards you wring it out 3 times and now it is mordanted wet now you put 2 handbuckets of water and 1 ½ lbs of alum into a vat and let it melt but not too hot when it has melted you put it into a vat and now you put ½ lb of tin salt and the 4 coffeecups full of tin solution in the alum and stir it and let $^{<18\,|\,18^{v}>}$ it stand for ½ hour, then it is ready for mordanting and now add some water so that you have red mordant the wet, mordanted yarn through it, but it must always be stirred well and now you let it lie in it for 8 to 12 h now wring it out 2 times but completely loose and half-wrapped now you must boil the 14 lbs of redwood in 18 handbuckets of water and let it boil for ½ hour but you must boil the redwood a day in advance so that it is cold now draw the redwood off and put 7 handbuckets of redwood decoction into the vat and add another 2 handbuckets of water now you put the mordanted yarn on a reel and put it on the vat and turn it over and let it stand on that for 6 h afterwards you wring it out 3 times and discard the decoction and take the second decoction and now you put the other 9 handbuckets of redwood brie into the vat and put the yarn on and let it turn and let it stand for 3 h afterwards you throw it up and now you put 1 coffee cup full of tin solution into the vat and ½ lb Gorkeme in some hot water stirred through and pour that in as well now you turn the yarn $^{<18^{v}\,|\,19>}$ on it again for 1 h afterwards you wring it out 3 times and hang it up then it's finished

This transcript is as close to the original spelling as possible. Uppercase and lowercase letters were adjusted to modern rules to improve the readability of the text. The original text is transcribed in italics, additions by the editor are not italicized. If a letter was unclear, it was put in square brackets in the text. Vertical lines within the text mark page changes, the superscript numbers before and after that line are the page numbers within the book.

Notes

1 Bayerische Akademie der Wissenschaften, München; Friedrich-Alexander-Universität, Erlangen-Nürnberg.

2 Recipe, Violet auf 20 lb Garn" (Violet for 20 lb of yarn), Fol. 21^{v}–22 in the dyer's handbook.

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[3] The materials for the tin liquor and the Rose Red reproduction were supplied by Kremer Pigmente GmbH & Co. KG, 88317 Aichstetten, Germany, Reference Numbers: 64500 Hydrochloric Acid 37 %, 64520 Nitric Acid 53 %, 54500 Tin Powder, 64024 Ammonium Chloride, 64300 Tin (II) Chloride Dihydrate, 36040 Cochineal and 64170 Cream of Tartar.

[4] Undyed Organic Wool Supplied by Schäfereigenossenschaft Finkhof eG, 88410 Bad Wurzach, Germany, Reference Numbers 1300101100 and 1000101100.

[5] Gründl Cotton Fun, Colour 001, Ref. No. c762-01, Max Gründl e.K., 85055 Ingolstadt and Wenco Baumwollgarn 4x twisted, 100% organic cotton, colour 1055, Wenco-Service Marketing GmbH & Co. KG, 45329 Essen.

[6] The sumac for the Bonsi Red Reproduction was supplied by Atlas Ingredients GmbH, 10589 Berlin, Germany. Sappanwood was purchased from Maiwa Handprints, Vancouver BC V6H 3S3, Canada. The ingredients were from Kremer Pigmente GmbH & Co. KG, 88317 Aichstetten, Germany, Reference Numbers: 36150 Brazilwood, 37220 Turmeric, 64100 Potash Alum.

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