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Comparison of Staining by *Sophora japonica* L. and *Phellodendron amurense* Ruprecht

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Abstract. *Sophora japonica* L. of 10-20 m tall is a popular ornamental tree in Europe, North America and South Africa, grown for its white flowers, borne in late summer after most other flowering trees have long finished flowering. *Phellodendron amurense* Ruprecht commonly called the Amur cork tree is a major source of huáng bò used in traditional Chinese medicine as a painkiller. In this study, staining patterns for the silk fiber by two natural stainers of *Sophora japonica* L., and *Phellodendron amurense* Ruprecht were compared and analyze. An analysis was made as to how various mordants changed the colors of the silk. Aluminum potassium sulfate induced a very shiny and distinct yellow color. Interestingly, two mordants of copper acetate and Iron II sulfate induced different colors of brown and khaki, respectively. Dried *Phellodendron amurense* Ruprecht was dark brown in the outer peel but was a distinct yellow inside the peel. Interestingly, copper acetate induced very different colors of khaki. Compared with *Sophora japonica* L. and *Phellodendron amurense* Ruprecht, copper acetate, as a mordant, had an effect on big color changes as compared with original and other mordants. Both natural plants of *S. japonica* L. and *P. amurense* Ruprecht are of interest for biomedical applications and fiber areas but they are not well studied. *S. japonica* L. and *P. amurense* Ruprecht will be very good candidates for biomedical approaches and become dyes for other fibers in the future.

Keywords: *Sophora japonica* L., *Phellodendron amurense* Ruprecht, dye, mordant

1 Introduction

Sophora japonica L., Pagoda Tree is a species of tree in the subfamily Faboideae of the pea family and uses traditional Chinese medicine [1]. The species of *Styphnolobium* differ from *Sophora* in lacking the ability to form symbioses with rhizobia (nitrogen fixing bacteria) in their roots. The leaves are pinnate, with 9-21 leaflets, and the flowers in pendulous racemes similar to those of the Black locust [2]. The tree at 10-20 m tall is a popular ornamental tree in Europe, North America and South Africa, grown for its white flowers, borne in late summer after most other flowering trees have long finished flowering. Due to its fine grain and strong wood, it

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can be used as material for construction and for creating sculptures [3]. *S. japonica* contains five main flavonoids of rutin, quercetin, isorhamnetin, isorhamnetin, genistein and kaempferol [4].

Phellodendron amurense Ruprecht commonly called the Amur cork tree is a major source of huáng bò used in traditional Chinese medicine as a painkiller [5]. As mentioned above, *Sophora japonica* L., and *Phellodendron amurense* Ruprecht have been used in traditional Chinese medicine. However, it has not been reported that they would be suitable for the staining of materials like silk. *Sophora japonica* L., and *Phellodendron amurense* Ruprecht show similar colors under raw conditions of dried natural staining solutions. In this study, staining patterns for the silk fiber by two natural stainers of *Sophora japonica* L., and *Phellodendron amurense* Ruprecht were compared and analyzed as to how various mordants changed the colors of the silk.

2 Main Text

Our research targeted the staining of silk, using *Sophora japonica* L., and *Phellodendron amurense* Ruprecht, and tracked the changes of silk colors using a variety of mordants. Among important procedures, pH was considered and acid pH of 5.5 was applied according to our previous report [6] because the acidic conditions can induce high absorption of staining materials into the silk. In brief, the natural staining solutions extracted from the two plants above were mixed with water of 50℃~60℃ and the silk fiber was simultaneously put into the mixtures. Staining was periodically observed to be distributed to the silk fiber on the whole and it was performed for 30 min.

In our results, *Sophora japonica* L., showed very light yellow when raw, but changed into other colors by using mordants (Fig. 1). Dried *Sophora japonica* L., were yellow and same stayed the same color. When treated with the mordants: sodium tartrate plus citric acid and potassium dichromate, the silk fiber was stained a light yellow, although brightness was slightly different, and shine was very similar. Interestingly, two mordants of copper acetate and Iron II sulfate induced different colors of brown and khaki, respectively as compared with its original, sodium tartrate plus citric acid and potassium dichromate.

Dried *Phellodendron amurense* Ruprecht was dark brown in its outer peel but a distinct yellow inside the peel (Fig. 2). Original silk without a mordant and other silks treated by the mordants of aluminum potassium sulfate, sodium tartrate plus citric acid, Iron II sulfate and potassium dichromate showed a distinct yellow with no difference. Very interestingly, copper acetate induced very different colors of khaki. Compared with *Sophora japonica* L. and *Phellodendron amurense* Ruprecht, copper acetate as a mordant had an effect on big color changes as compared with original and other mordants. This suggests that copper ion, in solution, could play an important role in color changes.

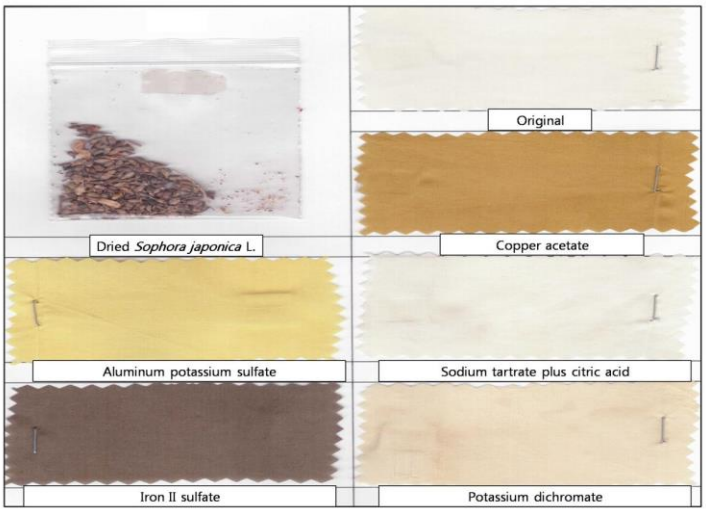

Fig. 1. Staining patterns by *Sophora japonica* L. with silk fiber by various mordants.

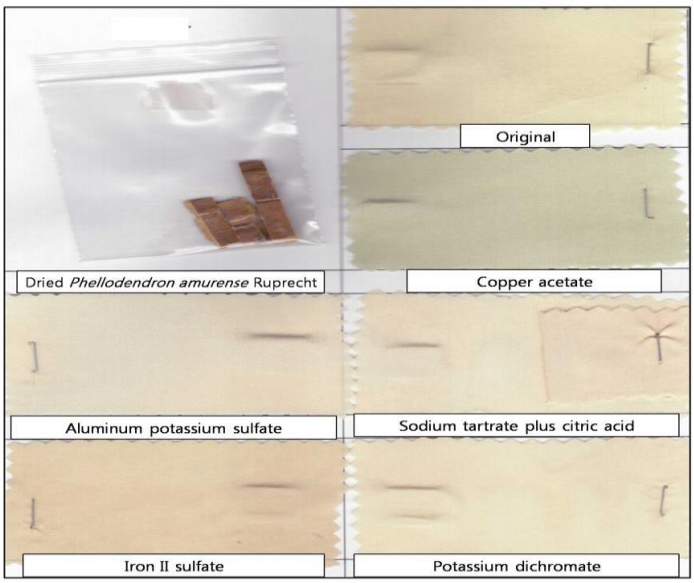

Fig. 2. Staining patterns by *Phellodendron amurense* Ruprecht with silk fiber by various mordants.

3 Conclusion

In the report, potassium dichromate cannot be used as a mordant effectively. However, potassium dichromate changed light brown into dark brown when stained by the green walnut fruit husk. In this study, potassium dichromate showed similar effects in *Phellodendron amurense* Ruprecht as compared with the green husk of walnuts above. However, *Sophora japonica* L. showed light color changes of bright yellow to dark yellow by potassium dichromate.

The term, natural dye, covers all the dyes derived from natural resources such as; plants, insects and animals [7]. Natural dyes are mostly indirect or non-substantive, but can be used with mordants [7]. Natural dyes are better for their soft and lustrous pastel colors, which can be used with silk fibers. Our area of interest should move into the natural products to prevent side effects and contamination. *S. japonica* L. and *P. amurense* Ruprecht will be very good candidates for biomedical approaches and become dyes for other fibers in the future.

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References

1. Tang, W., Eisenbrand, G.: Chinese Drugs of Plant Origin. 945--955 (1992)
2. http://en.wikipedia.org/wiki/Styphnolobium_japonicum
3. http://www.cha.go.kr/korea/heritage/search/Culresult_Db_View.jsp?mc=NS_04_03_02&VdkVgwKey=17,01080000,ZZ
4. Kim, J.M., Yun-Choi, H.S.: Anti-platelet Effects of Flavonoids and Flavonoid-Glycosides from *Sophora japonica.* Arch. Pharm. Res. 31, 886--890 (2008)
5. John, B., Kingo, M.: Ainu Economic Plants. Transact. Asiatic Soc. Japan. 51, 198--240 (1893)
6. Hwang, J.S., Park, S.Y.: Application of Geen Husk of *Juglans regia* Linn and Effect of Mordants for Staining of Silk. J. Converg. Inform. Tech. 8, 279--283 (2013)
7. Sharma, A., Grover, E.: Color Fastness of Walnut Dye on Cotton. Indian J. Nat. Pro. Res. 2, 164--169 (2011)

