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Phytochemical Screening of Silk Cotton Tree (*Ceiba pentandra*) Bark and the Lived Experiences of Residents with Odontalgia

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Abstract:

Aim/Background: *The bark of the silk cotton tree (Ceiba pentandra) has been traditionally used in Southeast Asia, particularly in the Philippines and Indonesia, for treating various ailments, including toothaches. However, there is limited scientific research on its effectiveness for dental pain. This study aimed to explore the phytochemical composition of the Silk Cotton tree (C. pentandra) bark and its potential as an alternative treatment for odontalgia*

Materials and Methods: *Bark samples were collected from Silk Cotton trees in Purok 7, Barangay 9, Malaybalay City, Bukidnon. The bark was dried, ground, and subjected to ethanolic extraction. Phytochemical screening was conducted using standard tests to identify alkaloids, tannins, terpenoids, and flavonoids. Additionally, interviews were conducted with residents who have used the bark concoction for tooth pain relief.*

Results: *The phytochemical screening revealed the presence of alkaloids, tannins, and terpenoids in the bark extract. Flavonoids were not detected. The qualitative interviews highlighted the residents' positive experiences with the bark concoction, citing its effectiveness, ease of access, and cost-effectiveness.*

Conclusion: *The study suggests that Ceiba pentandra bark contains phytochemicals with potential analgesic and anti-inflammatory properties, making it a viable alternative for treating odontalgia. Further research is recommended to validate these findings and explore the mechanisms of action.*

Keywords: *Ceiba pentandra, odontalgia, phytochemicals, silk cotton tree*

1. INTRODUCTION

Odontalgia, commonly known as a toothache, refers to pain in and around the teeth and jaws, often caused by tooth decay. It is the most common cause of oral pain, significantly affecting daily activities such as eating, studying, and concentrating on tasks[1]. Odontalgia is the most common cause of oral pain[2]. Although fractured teeth and exposed dentin may produce dentin hypersensitivity and cause dental pain[3], untreated dental decay has been reported as the most important reason for toothache, which can impact routine daily activities such as eating, studying, concentrating on delicate tasks, and so on[4]. Studies have emphasized that oral and facial pain can greatly impact an individual's quality of life, making it essential to explore alternative treatments, particularly in communities with limited access to modern dental care[5]. Despite the extensive traditional use of *Ceiba pentandra* (silk-cotton tree) for medicinal purposes, there is a lack of scientific research validating its effectiveness in treating odontalgia[6-7]. Additionally, the bark of the Silk Cotton tree (*C. pentandra*) has been used in indigenous medicine for various ailments, including mouth problems, diarrhea, and wounds[8]. However, there is a gap in understanding whether the bark's phytochemical properties can effectively alleviate odontalgia[8]. This research aims to bridge that gap by scientifically analyzing the plant's potential in dental pain management[9].

The need to conduct this study is crucial. While the Silk Cotton tree (*C. pentandra*) bark is widely used as an herbal remedy for toothaches, especially in mountain communities where there is a lack of scientific

proof supporting its effectiveness. If the study confirms the presence of phytochemicals with pain-relieving properties, it could validate traditional practices and offer an alternative treatment for odontalgia. Furthermore, the findings could contribute to the development of plant-based medicine, benefiting communities that rely on herbal remedies due to limited access to modern dental care[9]. In addition, the phytochemical results of *C. pentandra* have shown that it is rich in many components. "The aerial parts of *C. pentandra* are rich in carbohydrates, glycosides, steroids, tannins, flavonoids, saponins, resins, fats and oils" [11-14]. Moreover, some parts of the tree, like the bark, also have different and similar compounds. Studies show that the bark of *C. pentandra* harvested in the centre of Côte d'Ivoire contains alkaloids, flavonoids, saponins, tannins, steroids, terpenoids, and cardiac glycosides[3]. Correspondingly, the *C. pentandra* also has medicinal properties. Each part of the tree treats different illnesses/wounds. The leaves are used to treat fever, cough, hoarseness, and venereal disease[10]. The bark is used for treating fever, asthma, gonorrhea, and diarrhea and as an aphrodisiac, while the root has diuretic and febrifuge properties [8]. One of the goals of the study is to observe the phytochemicals that reside inside the bark of the silk cotton tree and to find out whether those phytochemicals that exist inside can help suppress the pain due to odontalgia. Additionally, the team of researchers wants to find out the varying opinions on the usage of the silk cotton tree bark concoction as a treatment for odontalgia from the residents in Barangay 9, Purok 7, Malaybalay City, Bukidnon. Apart from that, the main goal of the research presented is to ascertain whether the concoction from the *C. pentandra* bark is usable for treating odontalgia. Additionally, it is to observe the phytochemical properties of the *C. pentandra* bark. The team of researchers aims to use the knowledge to ascertain whether a concoction made from the bark of the *C. pentandra* could be used as an alternative to modern medicine for odontalgia.

2. MATERIALS AND METHODS

2.1. Research Design

The study employed a descriptive qualitative design, incorporating descriptive explanations with a focus on the experimental method and thematic analysis for interviews. To determine whether the Silk Cotton tree (*C. pentandra*) was effective for odontalgia, the research team conducted a study on medicinal plants aimed at finding solutions for dental issues. Additionally, the study analyzed the phytochemical properties of the Silk Cotton tree (*C. pentandra*) bark to assess whether its concoctions were suitable for treating odontalgia.

2.2. Locale of the Study

The research was conducted at Purok 7 Barangay 9, located in Malaybalay City, Bukidnon, Philippines. The researchers selected this area for the assessment of the *C. pentandra* due to its dense forestry and large area. The barks were collected behind the homes near the location. Furthermore, the phytochemical testing was conducted in the Wet Laboratory of San Isidro College, Barangay 10, Impalambong, Malaybalay City, Bukidnon. In addition to this, the questionnaires were sent to the locals who lived in Purok 7, Barangay 9, Malaybalay City, Bukidnon, and had experience in using the concoction.

2.3. Participants of the Study

The study had its participants selected by referencing a method with minor revisions [15] three individuals based on the criteria who had experience using the concoction from the bark of the silk cotton tree *(C. pentandra*). The criteria included the age of the individuals, which must range from 16 and above. In addition is the amount of times the individual has used the concoction created from the bark. Moreover, the individual must be familiar with the process of creating the concoction itself.

2.4. Research Instruments

The team of researchers utilized a semi-structured interview guide containing three key questions to assess the individual opinions of the interviewed residents. The process of gathering interview data involved the use of note-taking to ensure accurate data collection. Access to the questionnaire was exclusive to the researchers, ensuring confidentiality. Additionally, all information provided by the participants was handled with the highest level of care and integrity.

The team gathered the necessary materials and used multiple tests to assess the residing phytochemicals within the bark of the silk cotton tree. The search for the alkaloids utilized the Wagners test, which required Wagners reagent and the ethanol extract from the bark. The test for tannins used the ferric chloride test,

which required the ethanol extract from the bark; this was then diluted with distilled water and two drops of ferric chloride. Furthermore, the terpenoid test utilized the Salkowski test; the researchers used 5 mL of ethanol extract and mixed it. Last but not least, the test for the flavonoids utilized the alkaline reagent test, which used 2 mL of 2.0 % NaOH mixture mixed with aqueous plant crude extract; a concentrated yellow color was produced, which became colorless when the team added two drops of diluted acid to the mixture. This result showed the presence of flavonoids.

2.5. Data Gathering Procedures

Preparation of the silk cotton tree bark

The researchers gathered the materials for the study through multiple methods with minor revisions[16]. The bark of the silk cotton tree was collected by peeling it with a sharp knife. After peeling, the bark was left to dry for 3 hours. The bark was then ground into finer pieces by utilizing a blender. After the grinding, the final amount amounted to nearly 80 grams and was then placed inside a beaker [17].

Preparation for Phytochemical Screening

The bark extract was mixed with 250mL of ethanol, which was macerated for 72 hours. After the maceration process, the ethanol mixed with the silk cotton tree bark was placed through filter paper for further purification to collect the ethanol extract [18]. The tests occurred in an enclosed room. The testing used multiple tools to acquire our results.

Ferric Chloride Test: The team utilized the ferric chloride test to determine the state of tannins in the bark. This test required us to mix 1 mL of the ethanol extract, which was then diluted with distilled water and added two drops of ferric chloride.

Wagner's Test: This test was done to determine whether the bark contained alkaloids. Two drops of Wagner reagent were added to 2 mL of the silk cotton bark ethanol extract, and the solution was mixed well.

Salkowski Test: Another test conducted by the team of researchers was the Salkowski test, which provided information on whether the bark contained terpenoids. The process of the Salkowski test involves 5 mL of the ethanol extract being mixed with 2 mL of chloroform and 3 mL of conc H_2SO_4 being added along the sides of the test tube.

Alkaline Reagent Test: The last test, the alkaline reagent test, was done to determine whether flavonoids reside inside the bark. 2 mL of 2.0 % NaOH was mixed with aqueous plant crude extract; a concentrated yellow color was produced, which became colorless when the team added two drops of diluted acid to the mixture. This result showed the presence of flavonoids.

Adding on to the objectives of the study, the team of researchers conducted a guided interview that utilized a questionnaire containing three (3) in order to find out the varying opinions of the residents who have had the concoction applied to them and whether they had they agree on the effectiveness of using the bark of the silk cotton tree as medicine. The simple questions guided the researchers to a conclusion and found a general agreement among the informants of the interview.

2.6. Ethical Consideration

To ensure adherence to ethical conduct, all interviewees' privacy will be respected and treated with the highest respect throughout the study. Before data collection, letters of consent were sent to the school principal, the researchers' parents, the interviewees, and the captain of the barangay. The researchers also employed responsible assessment techniques and followed strict safety protocols to guarantee the integrity and accuracy of the data and keep the interviewees' responses safe.

3. RESULTS

3.1. Phytochemical Screening Results of the Silk Cotton Tree

The team of researchers has analyzed that the ethanol extract of the *C. pentandra* bark contains multiple phytochemicals that are utilized for various medicinal practices; the tests have proven, and based on the data that the team of researchers has collected, the usability of the concoction created from the simple tree bark of the Silk cotton tree (*C. pentandra)* is a viable alternative as a pain reliever for odontalgia.[18-19] Multiple of the phytochemicals present have the necessary capabilities to suppress inflamed gums.

According to a study[20], Tannins are critical bioactive compounds used as anti-inflammatory agents and possess wound-healing potential. It has become widely acknowledged within the medical field that tannins are anti-inflammatory agents. The terpenoid-rich essential oils exert anti-inflammatory and antinociceptive activities in vitro and in vivo, which vary according to their composition[21-24]. In conclusion, the phytochemicals present within the ethanol extract of the Silk cotton tree (*C. pentandra)* bark have the necessary variables for the concoction to be used as an alternative to modern painkillers[25-31].

Table1. *Phytochemical screening of the ethanol extract from the silk cotton tree (C. pentandra)*

Phytochemical and Tests used	Trials	Results	Remarks
Alkaloids using the Wagner test	1	Reddish-brown	+
	2	Reddish-brown	+
	3	Reddish-brown	+
	4	Reddish-brown	+
	5	Reddish-brown	+
Tannins using Ferric chloride test	1	Greenish-black	+
	2	Greenish-black	+
	3	Greenish-black	+
	4	Greenish-black	+
	5	Greenish-black	+
Terpenoids using the Salkowski test	1	Reddish-brown	+
	2	Reddish-brown	+
	3	Reddish-brown	+
	4	Reddish-brown	+
	5	Reddish-brown	+
Flavonoids using the Alkaline reagent test	1	Black-Orange	-
	2	Black-Orange	-
	3	Black-Orange	-
	4	Black-Orange	-
	5	Black-Orange	-

Table 1 shows the phytochemical tests with five trials for each test. The testing of alkaloids was done utilizing the Wagners test, and the procedure goes as two drops of Wagner reagent were added to 2 mL of extract and mixed well; the mixture then exhibited a reddish-brown color, which indicates in the table that the silk cotton tree (*C. pentandra)* was positive for the presence of an alkaloid[26]. It may be due to particular toxins that help produce antimicrobials, deter herbivores, and protect the plant from being eaten.

Moreover, the ferric chloride test for tannins was utilized. The procedure involves mixing 1 mL of the ethanol extract, which is then diluted with distilled water and two drops of ferric chloride. The test was successful, as the ethanol extract changed from its original bright orange to a greenish-black. The change in this color shows that the *C. pentandra* bark contains tannins [11].

Furthermore, the ethanol extract was screened for terpenoids using the Salkowski test. The test procedure involved mixing 5 mL of the ethanol extract with 2 mL of chloroform and adding 3 mL of conc H2SO4 along the sides of the test tube. The experiment was successful, as the ethanol extract showed positive reactions to the chemicals applied for the test. The ethanol extract turned reddish-brown, far from its original orange hue[25].

Just as important is the usage of the alkaline reagent test. The test was utilized in order to search for flavonoids within the ethanol extract of the *C. pentandra* bark. The test procedure goes as 2 mL of 2.0 % NaOH mixture was mixed with aqueous plant crude extract; if it were a success, a concentrated yellow color would have been produced, which would become colorless if the team added two drops of diluted acid to the mixture. Still, it had come out negative as the ethanolic extract did not change into the color that showed signs of flavonoids[10].

Views on Using the Concoction from the Silk Cotton Trees' Bark

This section explores the views of residents who have used the concoction themselves and their use of the concoction from the silk cotton tree bark.

Emerging Theme 1: Family traditions

The view on the usage of the concoction created from the silk cotton tree bark was continued due to the usage of the concoction with the older generations and has influenced the ideals of the newer ones.

The following responses from the key informants supported this theme:

"Dugay naman gyud mi nag gamit ani kay sugod pato katong bata pami among lola gyud ang nag hatag samoa og tabang kung ga sakit among ngipon ug mao napud ni ginagamit samong pamilya." Key Informant 1

"I've used this for a long time, ever since I was a child, our grandmother was the one who'd given it to us whenever we had toothaches, and it has been the remedy of my family since." *Key Informant 1*

"Akong mama ang nagtudlo unsaon pag gamit ani katong bata pako ug dali raman pud sha magamit gyud so wala nako nag lahi kay dali ra sha himuon." Key Informant 2

"My mother taught me how to use this when I was a child since it was easy to use, so I didn't replace it due to that." *Key Informant 2*

The theme "Family traditions" shows how beliefs, customs, and knowledge passed down from previous generations continue to shape and influence the present and future. These traditions connect the past and the present and ensure that important skills, values, and ideas are not lost but instead shared with future generations[32].

Emerging Theme 2: Ease of Access

This theme oversees the information on how the key informants view one reason they choose to utilize the concoction from the silk cotton trees' bark.

This theme is supported by the following responses of the key informants:

"*Dugay ko na ni sha nagamit kay naa rmn sha sa likod samong balay ug dali ra sha magamit." Key Informant 2*

"I've been using it for a long time since it's in the backyard of our house, and it's simple to prepare." *Key Informant 2*

The responses to the theme "Ease of Access" show how important availability is when it comes to remedies for pain. The possibility of a toothache can never be easily predicted, and ease of access could allow the individual to relax due to the close proximity of an easy-to-make remedy.

Emerging Theme 3: Functional

This theme discusses the functionality of the silk cotton tree and what the key informants think about its effectiveness.

This theme is supported by the following responses of the key informants:

"Gi gamit ko ni sa ako ug uban sakong pamilya tungod kay mo gana sha ug libre rapud." Key Informant 3

"Me and my family used it since it worked for us and it's free." *Key Informant 3*

Informants emphasized that the silk cotton tree is both usable and practical, as highlighted by Key Informant 3. They shared that its bark can be easily prepared into a concoction, making it a simple yet effective home remedy for toothaches. The practicality of using a natural, locally available treatment reinforces its role in traditional medicine [33].

Emerging Theme 4: Uncomfortability

This theme details the uncomfortability that the key informant observes and the difference in comfort between the concoction and modern medicine[34].

This theme is supported by the following responses by the key informants:

"Naa shay gamayng deperensha medjo lain sa pamati inig tulon kay ga lisud ko ug tulon ug mga pills or tabletas." Key Informant 1

"There's a tiny difference since I don't always feel well when swallowing pills or tablets." *Key Informant 1*

The responses to the questions expressed that **s**wallowing pills or tablets was difficult and uncomfortable, making them seek alternative treatments like the silk cotton tree. Key informant 1 shared that they preferred

herbal concoctions over conventional medicine due to the discomfort of taking pills. This highlights how ease of consumption influences treatment choices.

Emerging Theme 5: Disagreement

The theme "Disagreement" tackles whether modern medicine or concoctions differ in terms of their use.

This theme is supported by the following responses of the key informants:

"Murag wala ramay naka lahi kay kapariha raman sila maka ayo sa sakit sa ngipon." Key Informant 2

"There isn't much difference for me, since they both get rid of the pain in my teeth."

One key informant stated that there is no difference between modern medicine and the silk cotton tree concoction, as both serve the same purpose and are equally effective in relieving odontalgia. This suggests that traditional remedies can be just as beneficial as commercially available treatments, reinforcing their continued use in specific communities.

Emerging Theme 6: Difficulties in consumption

This theme discusses the difficulties in consumption. Modern medicine, compared to concoction, is mentioned to have challenges, mainly in consumption. Just like pills or tablets, some people have problems with it because they can't swallow it [34].

This theme is supported by the following responses from the key informants:

"Para sa ako mas ganahan jud ko aning kapok kay ga lisud man jud ko ug tulon ug pills o tabletas." Key Informant 3

"For me, I prefer the Kapok more since I have difficulty swallowing the pills or tablets." *Key Informant 3*

Informants expressed a preference for the silk cotton tree concoction over pills and tablets, as they found swallowing solid medications difficult. One key informant shared that they opted for herbal remedies due to the discomfort and struggle of taking pills, reinforcing the appeal of liquid-based treatments.

Emerging Theme 7: Cost-effectiveness

The theme tackles the cost-effectiveness of using the silk cotton tree and discusses its responses from the informant.

This theme is supported by the following responses of the key informants:

"*Oo ganahan pud kog gamit ani kay mo gana jud sha. isa pud kay dili naka kailangan mag gasto. Samot na kung naa ray kapok nga kahoy duol sainyo.* " Key Informant 1

"I do like using it since it does work, another is that I don't have to spend much, especially if the tree is near you." *Key Informant 1*

The key informant's responses to the theme "Cost-effectiveness" discuss how the cost can be reduced to 0, especially if a silk cotton tree is nearby, and that it is both practical and cost-effective.

Emerging Theme 8: Quick effect

The theme "Quick effect" highlights how long it will take for the concoction to take effect. It tackles its speed in effectiveness, whether it is fast or slow.

This theme is supported by the following responses from the key informants:

"Ma recommend jud ni sha kay isa pud sa rason ngano gagamit pud mi ani kay dali rasha ma gamit ug dali rapud ang iyang pag pa ayo sa ngipon." Key Informant 2

"I do recommend it since one of the reasons I use it is the simplicity and ease of use, especially for removing pain in toothaches." *Key Informant 2*

The key informant's responses mention the concoction's quick and efficient effects and recommend it. The concoction is also easy and fast to prepare or make.

Emerging Theme 9: Agreement

This theme, "Agreement," dwells on whether the concoction should be recommended as a medicine to others.

This theme is supported by the following responses of the key informants:

"Oo ma recommend jud sha kay effective sha ug dali ra himuon." Key Informant 3

"Yes, I really do recommend it since it's effective and easy to make." *Key Informant 3*

The key informant's response to whether it should be recommended is a yes. The informant agrees that it should be recommended because it is practical and easy to make.

4. DISCUSSION

Phytochemicals found in the bark of the Silk Cotton tree (*Ceiba pentandra*)

Studies mention that the existence of herbal medicine with phytochemicals that contain anti-inflammatory properties will help in acting as a pain remedy [10-11]. These studies mention how tannins, alkaloids, and terpenoids are massive indicators of the anti-inflammatory activities of a plant, tree, or any herbal medicine[25, 30]. Moreover, in such cases as toothaches, these would greatly help remove the pain as the phytochemicals present are of great help whenever inflamed gums are the problem[1-2]. Overall, the paper's findings align with the necessary medical properties needed for the bark of the Silk Cotton tree (*C. pentandra*) to work. Through the usage of a number of tests, such as the Ferric Chloride test, Wagner's test, Salkowski test, and Alkaline Reagent test, the paper found the existing phytochemicals in the bark, which were alkaloids, tannin,s and terpenoids. Although flavonoids were absent, these are still great indicators of anti-inflammatory activity [10-11,25,30].

Interview with Key Informants

The informants shared their overall experience with the Silk Cotton tree (*C. pentandra*) bark concoction and opinions. Family traditions played a major role amongst the informants as the knowledge they had was passed down from the past generation. Furthermore, Ease of access and convenience make it a practical alternative[33]. Moreover, the informants found the concoction functional in relieving toothaches. Some preferred it over modern medicine due to difficulties in swallowing pills, but others saw no difference between the concoction and modern medicine[34, 36]. Overall, the informants agreed on its effectiveness, but further research is recommended.

5. CONCLUSION

From the screening done, the phytochemicals present within the silk cotton tree (*C. pentandra)* bark were alkaloids, tannins, and terpenoids.

The presence of these phytochemicals is a sign that the concoction made from the silk cotton tree bark can be used as a remedy for odontalgia, as these phytochemicals are anti-inflammatory agents. The obtained results show that the phytochemicals that responded positively can aid in alleviating the pain from odontalgia, as all of the phytochemicals present have the ability to act as anti-inflammatory agents.

The interview guide given to the interviewees was a simple questionnaire that contained three questions. The team of researchers was able to assort the provided responses. It came to the conclusion that all of the interviewees agreed on the effectiveness of the concoction created from the silk cotton tree bark. The major theme that emerged during the interview process is that using the silk cotton tree was mainly due to familial influence and ease of access for the interviewees.

As per the previous statements, the alignment with both the phytochemicals and the interviewees' responses exists and proves the viability of utilizing silk cotton tree bark as an alternative medicinal option for odontalgia.

Furthermore, the researchers recommend creating a larger pool of individuals who have experience using the bark concoction to interview. They suggest bringing an experienced individual with you when collecting samples and creating the bark concoction.

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SUMMARY

This study explored the phytochemical composition of *C. pentandra* (Silk Cotton Tree) bark and its potential as an alternative treatment for odontalgia (toothache). Bark samples from Malaybalay City, Bukidnon, were analyzed through phytochemical screening, revealing the presence of alkaloids, tannins, and terpenoids, which are known for their anti-inflammatory and analgesic properties. Flavonoids were not detected. Additionally, interviews with local residents confirmed that the bark concoction was effective, accessible, and cost-efficient for tooth pain relief. These findings align with existing research on herbal medicine for inflammation and pain management. While the results are promising, further studies are needed to validate its effectiveness and understand its exact mechanisms of action.

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