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PHYTOCHEMICAL ANALYSES OF ARTOCARPUS HETEROPHYLLUS (LANGKA) UNRIPE FRUIT TEA

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Abstract
The crude ethanolic extract of *Artocarpus heterophyllus* unripe fruit can lower high blood sugar among white mice *(Mus musculus).* In this work, evaluating phytochemicals present in *A. heterophyllus* unripe fruit tea was done. The study used color formation and frothing methods. The results exhibited that *A. heterophyllus* unripe fruit tea contains phytochemicals such as flavonoid and terpenoid. The formation of white color solution indicated the presence of flavonoids. Terpenoid was present because of the formation of red-violet solution. Other compounds were tested in the tea but not present were tannin, steroid, saponin, and glycoside. Tannin was not present because the green-black solution was not seen. Steroid was absent because no bluish-green color was noted. Saponin was also absent because there was no emulsion formation noted. Glycoside was absent because there was no reddish-brown color was observed and no bluish-green color in the upper layer was formed. Phytochemical analyses confirmed the presence of flavonoid and terpenoid in *A. heterophyllus* unripe fruit tea. The study provided the basis of the future medicinal uses of *A. heterophyllus* unripe fruit tea subject for further research.

Keywords-Artocarpus heterophyllus, color formation and frothing methods, phytochemical analyses

1. INTRODUCTION

Artocarpus heterophyllus (langka or jackfruit) of the Moraceae family, is an evergreen tropical fruit tree known to possess various medicinal uses scientifically [1]. Its phenolic wood compound has an anti-cancer effect. Its root, bark (butanol fractions), and fruits can kill bacteria [2]. Its leaf has an anti-oxidant, anti-hyperglycemic,and anti-hyperlipidemic activities [3]. The tegmen of its seeds have polyphenolic exhibiting anti-tumor activity [4]. The leaves of *A. heterophyllus* were scientifically proven to heal wounds [5].The crude ethanolic extract of *A. heterophyllus* unripe fruit showed anti-hyperglycemic activity at 15mg/20-gram body weight of mice.It revealed a 36% inhibition of fasting blood sugar in white mice [6] with no genotoxic activity when compared to a known drug for diabetes in the market [7].
Based on those studies, no study conducted on the phytochemical analyses of *A. heterophyllus* unripe fruit tea. Evaluating the phytochemicals of medicinal values present in *A. heterophyllus* unripe fruit tea was conducted. This study gives new information about the phytochemicals of medicinal values found in *A. heterophyllus*

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unripe fruit tea, such as flavonoid and terpenoid. Both compounds have many scientifically proven medicinal uses.

2. MATERIALS AND METHODS

Plant Identification and Collection
The book of Quisumbing (1978)[8]and Orwa*et al.* (2009) [9] served the basis of preliminary identification of *A. heterophyllus.* Correct identification confirmed by the Department of Agriculture, Region 6, Philippines. Collection of the unripe fruit was done in the Philippines from Barangay Piapi, Hamtic, Antique.

Preparation of Tea
The unripe fruit of *A. heterophyllus* was washed with tap water and rinsed with distilled water.The unripe fruitwere chopped and ground after its peelings were removed.Air drying of the unripe ground fruit in a shady area for three days was done [10]. Preparation of tea was done by adding 2 grams of dried *A. heterophyllus* unripe fruit in 100ml boiling water. The flame was off, and the dried ground unripe fruit was allowed to stay for 10 minutes. Filtration of the mixture followed. Phytochemical analysis was performed to the tea.

Phytochemical Analyses
The following tests were conducted based on the procedures of Edeoga*et al*. (1995) [11], Tariq *et al.* (2012)[12],and Tiwari *et al*.(2011)[13].

Test for Flavonoid
One milliliter of lead acetate solution was added to the two milliliters of the tea. A white color solution showed the presence of flavonoid.

Test for Terpenoid
Mixing of four milliliters of tea with 0.5 milliliter of acetic anhydride and 0.5 milliliter of chloroform were done first. Slowly, the addition of concentrated sulfuric acid solution followed. Identification of terpenoid was by the presence of a red-violet pigment.

Test for Steroid
Four milliliters of tea and 0.5 milliliter of acetic anhydride were mixed. Addition of five drops of concentrated sulfuric acid solution followed. Detection of steroids was by the presence of bluish-green color.

Test for Gallic Tannin
A 0.5 milliliter of tea and 2 drops of ferric chloride solutionwere blended. Gallic tannin was present if a blue color was seen.

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Test for Catecholic Tannin
A 0.5 milliliter of the tea and 2 drops of ferric chloride solution were mixed. A green-black color showed the presenceof catecholic tannin.

Test for Glycoside
Four milliliters of tea and two milliliters of glacial acetic acid were combined and thoroughly blended. Added to the mixture were few drops of ferric chloride and concentrated sulfuric acid. The positive outcome was the reddish-brown coloration at the junction of two layers and the bluish-green coloration in the upper layer.

Test for Saponin
A 0.5 milliliter of distilled water was added to 0.5milliliter of tea. The presence of saponin was noted by the consistency of the frothing whenthe mixture was vigorously shaken.

3. RESULTS

The tea from the unripe fruit of *A. heterophyllus* contains flavonoid and terpenoid. The formation of white color indicated the presence of flavonoids. While terpenoid was present because of the red-violet color formation.

Other compounds were tested in the tea but not present were tannin, steroid, saponin, and glycoside. Tannin was not present because the green-black color was not seen. Steroid was absent because no bluish-green color was noted. Saponin was also absent because there was no emulsion formation noted. Glycoside was absent because there was no reddish-brown color was observed and no bluish-green color in the upper layer was formed(Table 1.).

Table 1.

Phytochemical Analyses of *A. heterophyllus* UnripeFruit Tea

Phytochemicals	Results
Flavonoid	+
Terpenoid	+
Steroid	-
Gallic tannin	-
Catecholic tannin	-
Glycoside	-
Saponin	-

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4. DISCUSSION

Phytochemical analyses of *A. heterophyllus* unripe fruit tea showed the presence of flavonoid and terpenoid using color formation test of Edeoga*et al*. (2005)[11], Tariq *et al*. (2012)[12] and Tiwari*et al.*(2011)[13]. They are easy and economical tests that can detect the different phytochemicals of medicinal importance present in the plant extract.

Flavonoids are known to possess several medicinal values. *Polygonatumodoratum* flavonoids, including total flavonoids, were anti-diabetic in STZ and alloxan-induced diabetic rats. The existence of a C-2-C-3 double bond and a C-4 ketonic group are two important structural features in flavonoids' bioactivity, especially their anti-diabetic properties [14]. Plants with flavonoids also have anti-cancer chemoprevention and chemotherapy. Flavonoids inactivate carcinogens, prevent the division and spread of cancer cells. They also have cell death and stoppage of differentiation effects and stop the formation of blood vessels during tumor formation. Other impacts of flavonoids include reversal of multi-drug resistance [15]. Flavonoids can also lower cardiovascular mortality rate [16]. It has anti-asthma [17].

Flavonoids are anti-inflammatory since they inhibit the development of isoforms of inducible nitric oxide synthase, lipoxygenase, and cyclooxygenase. These isoforms produce a large amount of nitric oxide, prostanoids, and leukotrienes. They are inflammatory mediators such as cytokines, chemokines, or adhesion molecules [18]. Flavonoids have anti-oxidant properties because they possess radical-scavenging ability [19].

*A. heterophyllus*has flavonoid content like in fresh and heat-treated pepper [20]. Flavonoids that have been scientifically proven to have hypnotic or sedative activity are also present in the semen of *Zizipyhlus jujube* (red date) [21]. Other plants with flavonoids include cotton *Gossypiumhirsutum*(upland cotton), *Caryocarcoriaceum*(pequi), *and Aconogononтortuosum*twisted knotweed). Our local fruits like *Averrhoabalimbi* (kamyas) and *Sandoricumkoetjape* (santol).

Another compound present in *A. heterophyllus* unripe fruit tea was terpenoid. In the study made by Fan *et al*. [22], it was discovered that terpenoid compounds 1-17 were obtained for the first time from the genus *Heteroplexis*. It demonstrated selective cytotoxicity against human gastric cancer cell lines (BGC-823). Potent neuroprotective and anti-inflammatory activities were shown by 12 and 2, respectively. Pycnanthuquinones A and B are the first representatives of a novel terpenoid-type quinone skeleton[23].

Terpenoids were found in plants such as *Cannabis sativa* (marijuana) *[24], Pinusdensiflora*(Japanese red pine), *Pinuskoraiensis*(Korean pine), *and Pinusrigida*

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(pitch pine) [25]. Cannabis has been used as a medication and recreational intoxicant by millennials*. Pinusdensiflora* (Japanese red pine*), Pinuskoraiensis* (Korean pine)*,* and *Pinus rigida* (pitch pine) are trees found in the Korean mountains of Mt. Worak, Mt. Gumsung, and Mt. Jiri*. Pinusdensiflora* (Japanese red pine) has antiseptic and diuretic properties*. P. koraiensis* (Korean pine) can lower triacylglycerol and very low-density lipoprotein concentrations and thus have a potential benefit in lowering cholesterol. It has antifungal properties too.

5. CONCLUSION

The phytochemical analyses confirmed the presence of flavonoid and terpenoid in *A. heterophyllu s*unripe fruit tea. The study provided the basis of the future medicinal uses of *A. heterophyllu s*unripe fruit tea subject for further research.

6. RECOMMENDATIONS

The evaluation of other phytochemicals such as alkaloids and other compounds of nutritional values is recommended. It is also recommended to conduct a study on the quantification of phytochemicals present in *A. heterophyllus* unripe fruit tea. Anti-inflammatory, antibacterial, antiviral, antifungal, anti-lipidemic, anti-cancer, anti-tumor, anti-oxidant, and other bioactivities are suggested to be performed.

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