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Morphological characterization and chemical composition of Lubeg (Philippine Cherry)

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Abstract

Lubeg or Philippine Cherry is a fruit tree that grows on the west side of Luzon. It is abundant in the municipality of Lal-lo. This fruit tree has been declared as the municipal tree of the town and its by-products are registered as the official "One Town One Product" (OTOP). Its by-products are wine, candy, vinegar, jam and jelly. Lubeg tree remains to be not fully characterized especially the Lubeg trees that inhabit Lal-lo,Cagayan. Exploration of its morphology, classification and chemical composition are greatly considered. Thus, this study was conducted. Profiling and collection was done in the municipality of Lal-lo. The leaves were dried and extracted. Phytochemical analysis was conducted using tree solvents: aqueous, ethanol, and methanol using its leaves and fruits. Morphologically, lubeg tree is medium in size with a height of 5-7 meters. Its leaves have smooth leathery texture, simple, opposite, lanceolate, pinnately netted, entire and with acute apex. The flower is bisexual with white color and in cluster. Lubeg fruit is white to red to purple when ripe; is a berry fruit with brittle rind, ovoid and with one seed per fruit. Lubeg tree belongs to Family Myrtaceae under Phylum Magnoliophyta. The chemical composition of Lubeg leaves was high in steroids, tannins, and coumarins while its fruits was highly positive in quinones and flavonoids. It has anti-oxidant property, and anti-inflammatory. It can lower cholesterol level and reduce risks of heart disease.

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Introduction

Lubeg is an indigenous fruit tree that thrives in the municipality of Lal-lo, Cagayan Valley. It is estimated to have anti-oxidant and anti-cancer potentials. Its chemical composition has yet to be established and based on its chemical composition its medicinal potentials may be deduced. The municipality of Lal-lo is looking at its potentials as a major commodity for the development into an industry considering its abundance of the tree in the municipality.

Some media practitioners, regional directors, teachers as well as students recently planted Lubeg trees at the town park and in a tree planting site in the municipality in support to the nutrition and environmental protection program. Lubeg tree planting is also a "MUST" to all household in the municipality. Thus, sustainability and management of Lubeg trees in the area had been established.

Lubeg is an erect, medium fruit tree usually 5-7 meters in height. Leaves are simple, flowers are in cluster, fruits when ripe turn red to violet and are eaten fresh. It can be processed into jam, jelly, candy, wine and vinegar. Lubeg is a seasonal crop, usually bearing fruit only three months in a year, from July to September but sometimes extending up to October.

This study aimed to determine the morphology and taxonomic identification of Lubeg and to determine the chemical composition of Lubeg leaf and fruit extracts using three solvents.

Materials and methods

Collection of Samples

The leaves and fruits of Lubeg were collected in Cagayan State University, Lal-lo Campus. The collection areas were geo-tagged for purposes of similarities in case of recollection activities. Three collections were done on the leaves and one collection for the fruits because it only bear fruits once a year. The collected samples were morphologically characterized. For extraction and analysis, the leaves and fruits were dried in the laboratory.

Preparation of Various Extracts

Ten grams of dried plant materials were soaked in 30mL volume of solvent (water, 70% ethanol and 80% methanol). 30mL of solvent was added if the plant sample absorbed all the solvent. Then, these were placed in hot plate at 50^{o}C for 2 hours at constant stirring. These were refrigerated overnight at 4^{o}C. These were cooled at room temperature prior to decantation. Centrifuged and stored in glass bottle. This procedure was used three times in each solvent.

Qualitative Phytochemical Analysis

Test for Tannins - Ferric Chloride Test. Three to five (3-5) drops of Ferric Chloride solution was added to 0.5mL of the extract. Formation of greenish brown, brown and black solution indicates the presence of tannins.

Test for Saponins – Froth Test.

A 0.5mL of the extract and 1mL of distilled water was separately boiled in a water bath for 10min. While hot, the mixture was filtered and cooled at room temperature. 1.5mL of the filtrate was diluted with 5mL of distilled water. It was vigorously shaken for 2min. Frothing indicates the presence of saponins in the filtrate.

Test for Flavonoids.

A 0.5mL of the extract was boiled with 2.5mL of distilled water for 5min and was filtered while hot. Few drops of 20% sodium hydoxide solution were added to cooled filtrate. The change from yellow color to colorless solution upon addition of acid (10% HCL) indicates the presence of flavonoids.

Test for Combined Anthaquinones.

A 0.5mL of sample was boiled with 1mL of 10% HCL for 5min. While hot the mixture was filtered and the filtrate was allowed to cool. The cooled filtrate was added with equal volume of chloroform. The chloroform layer was transferred into a clean dry test tube using a clean a pipette. Equal volume of 10% ammonia solution was added into the chloroform containing test tube. The mixture was shaken and allowed to separate. The separated aqueous layer was observed for any color change; delicate rose pink color indicates the presence of anthraquinones.

Test for Alkaloids.

A 0.5mL of the extract was evaporated to syrupy consistency. At 2.5mL of 2% HCL, 0.25g of powder NaCl was added. The mixture was stirred and filtered. The residue was washed with 2% HCl to achieve volume of filtrate to 2.5mL. Dragendorrf's reagent or Mayer's reagent was added to 0.5mL of the filtrate. The presence of turbidity indicates the presence of alkaloids.

Test for Terpenoids.

A 0.5mL of the extract was added with 0.25mL chloroform.1 mL of concentrated sulfuric acid was added to form a layer. A reddish brown precipitate coloration at the interface formed indicates the presence of terpenoids.

Test for Carotenoids.

A 0.5mL of the extract was added with 2.5mL of chloroform in a test tube. The mixture was mixed vigorously. The resulting mixture was filtered and 1.5mL of 85% sulfuric acid was added. A blue color at the interface indicates the presence of carotenoids.

Test for Quinones.

A 0.5mL of the extract was added with 1mL of ethanol. 1mL of potassium hydroxide was added to the mixture. Formation of blue color indicates the presence of quinones.

Test for Steroids.

A 0.5mL of the extract was dissolved in a 2.5mL of chloroform. Equal volume of concentrated sulfuric acid was then added through the side of the test tube. The upper layer that turned red and the sulfuric acid layer that shows yellow with green fluorescence indicates the presence of steroids.

Test for Coumarin.

A 0.5mL of the extract was mixed with few drops of NaOH. 0.5mL of ethanol was added to the mixture. Formation of yellow color indicates the presence of coumarins.

Test for Xantho-Proteins.

A 0.5mL of the extract was mixed with few drops of nitric acid. Few drops of 10% ammonia were added. Formation of red color indicates the presence of Xantho proteins.

Test for Vitamin C.

A 0.5 mL of the extract was added to 1mL of distilled water.0.05g of sodium bicarbonate and about 0.001g of ferrous sulfate was added and shaken. It was allowed to stay for few minutes. A deep violet color was produced. Then, 2.5mL of sulfuric acid was added, the color was disappears. This indicates the presence of Vitamin C.

Results and discussion

Morphological characterization of lubeg

Lubeg tree

Lubeg tree is a medium with a height of 5 to 7 meters, perennial with flaky, corky, grayish brown bark. It has green leaves, smooth and leathery. Type of leaf is simple unifoliate, opposite in arrangement and lanceolate shape. It is pinnately netted with an entire margin. Its apex is acute with small stipule, estipulate. The flower of Lubeg is bisexual, white in color, in clusters or inflorescence and with axillary spike. The fruit is white that turns to red and purple when ripe. It has a leathery or brittle rind, ovoid with one seed per fruit.

Phytochemical Analysis Of Lubeg Leaf And Fruit Extracts Using Three Solvents

The method used for the determination of different secondary metabolites present in plants using different solvents for extraction and examination were carried out for all extracts in standard methods. It included adding specific chemicals for every extract that resulted in change in color, formation of precipitate and froth.

Table 1. Phytochemical Analysis of Lubeg Leaf Extracts.

Plant Constituents	Aqueous	Ethanol	Methanol
Tannins	+	+++	+++
Saponins	+	++	+++
Flavonoids	-	++	++
Combined anthraquinones	-	-	-
Alkaloids	+	+	+
Terpenoids	-	-	-
Carotenoids	-	-	-
Quinones	-	-	-
Steroids	-	+++	+++
Coumarins	++	+++	+++
Xantho-protein	-	-	-

Results in the table above showed that in all solvent tannins, saponins and coumarins are present but both the methanolic and ethanolic extracts contained most (+++) of these plant constituents. Alkaloids are present in all the extracts but only in small amount. Steroids and flavonoids are both abundant in ethanolic and methanolic extracts while absent in aqueous extracts. Manicad, cited that Lubeg leaves showed the presence of flavonoids, tannins and saponins. Further, a study of Syzygium cumini (Myrtaceae) by Ramos and Bandiola showed that saponins, tannins, steroids and flavonoids are also present it its leaves. The leaves of Lubeg contain significant plant constituents that make a potential anti- oxidant and anti-inflammatory.

Table 2. Phytochemical Analysis of Lubeg Fruit Extracts.

Plant Constituents	Aqueous	Ethanol	Methanol
tannins	-	-	-
saponins	+	+	+
flavonoids	++	++	++
Combined anthraquinones	-	-	-
alkaloids	+	+	+
terpenoids	-	-	-
carotenoids	-	-	-
quinones	-	+++	+++
steroids	-	-	-
coumarins	+	++	-
Xantho-protein	-	-	-

Table 2 shows the result of the phytochemical analysis of Lubeg fruit extracts using the three solvents; water, ethanol and methanol. Quinones is noted to be very high (+++) in the ethanol and methanol extracts. Since the fruits contain pigments, this could be a derivative of quinones. Flavonoids are also present in all the three extracts, so with saponins and alkaloids but in a lesser amount.

Coumarins is present in Lubeg fruits in the aqueous and ethanol extracts. The fruits of Lubeg is eaten fresh, so once eaten, these metabolites which are good for the health can benefit human being especially flavonoids. Flavonoids is shown to have antioxidative activity, free radical scavenging capacity, coronary heart disease prevention and anticancer activity. It also exhibit potential for anti-human immunode ficiency virus functions. Yao *et al.*

Conclusions

Based on the findings, Lubeg fruit tree known to be indigenous in Lal-lo, Cagayan is characterized as medium, erect fruit tree with simple leaf, inflorescence flower and clustered fruits with purple in color when ripe and very sour in taste. Fruiting season is from July to September. It belongs to Family Myrtaceae. The phytochemical analysis shows that the leaves of Lubeg contain tannins, saponins and coumarins in all the extracts, flavonoids and steroids are present in the ethanolic and methanolic extracts while alkaloids are present in small amount. For the fruit of Lubeg, flavonoids, quinones, saponins and coumarins are present. More metabolites are present in the Lubeg leaves than in its fruits.

Recommendations

The following are recommended:

1. A research should be done to determine the quantitative analysis of the metabolites identified.
2. Product development should be conducted to come up with healthy and nutritious products from the leaves and fruits of Lubeg.
3. Qualitative phytochemical analysis should also be done to the seeds of Lubeg fruit for comparison to its leaves and flesh of fruits.

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