

Analysis of Secondary Metabolites and Antimicrobial Activity of Corn Hair (Stigma Mays) Tea

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Abstract

Corn Hair (Stigma mays) is considered as a waste product in the agricultural industry. But there are reports of its medicinal properties. This study investigate the chemical components present in Stigma mays ,its antimicrobial characteristics and therapeutic potential as herbal tea. The extracts were subjected to standard procedure to test the presence of metabolites. The result of the study positively showed abundant (+++) of alkaloids, flavonoids and triterpenes. The formation of muddy brown color, and dried corn silk hair. Saponins, tannins, glycosides however turned out to be moderate (++). Stigma mays hair extract possess a very strong antimicrobial activity against *Escherichia coli*, *Saccharomyces cerevisiae* and *Pseudomonas aeruginosa* with complete inhibitory activity. However, the aqueous extract showed negative inhibition activity against *Aspergillus niger*. The findings indicates that Stigma may contain various metabolites. This manifest potential application in health care and can be utilize as herbal tea.

Keywords: Herbal ,civilization, synthetic drugs ;traditional plants

I. INTRODUCTION

Herbal medicine is well known since many years ago. Before the discovery and availability of synthetic drugs, ailment incidence in rural area were completely dependent on plants that contains medicinal value. People who cannot bear the high cost of synthetic drug choose to use local plant found around their backyard, farmlands, road sides, and from the garden. The therapeutic effects of many traditional plants are due to the presence of phytochemicals. Different phytochemicals have specific physiological activities on the human body. Chemical components of plants could provide immunity against many diseases

One of these herbs is corn silk hair (Stigma mays) from Corn (*Zea mays* Linnaeus), also known as maize, a member of the family Poaceae or Gramineae. It is widely cultivated all over the world particularly tropical regions like the Philippines which is considered as one of the major crops for Filipino family next to rice. In the province of Isabela, 70% of farmers' plant corn of different

varieties. White corn is favor as staple or substitute to rice because of its taste and eating quality. White corn is also primarily used in cooking. The native corn includes 10,000 species, grouped in 600-700 different genera and this family includes wheat, oats, barley and rice. All parts of corn are utilized. Stigma mays hair is found inside the husk of corn. The silks are elongated. Colors green, yellow or light brown and later turn into red. The corn silk can be 30 cm long or longer with faint sweet taste. It is a waste products from corn tilling.

Stigma mays hair is rich in compounds. It contains sodium salt, carbohydrates, vitamins, proteins and minerals. Due to its potential benefits, there are reports regarding the pharmacological activities. This study focuses on the utilization of Corn Silk as herbal tea including its phytochemical and microbiological activities.

Objectives of the Study

This study primarily aimed to analyze the chemical and microbial activity of Corn Silk Hair (Stigma mays). Specifically, it sought to:

1. Determine the phytochemical compounds present in the Corn silk hair as possible component of herbal tea.
2. Assess the anti-microbial activity of Corn Silk Hair extract against *Escherichia Coli*, *Pseudomonas aeruginosa*, *Saccharomyces cerevisiae* and *Aspergillusniger*.

Scope and Limitation

Determination and analysis of the presence of the chemical components in an aqueous solution of Corn Silk Hair (*Stigma mays*), as well as to the anti- microbiological activity of the extract *Stigma Mays* against *Escherichia coli*, *Pseudomonasaeruginosa*, *Aspergillusniger* and *Saccharomyces cerevisiae*

II. RELATED LITERATURE



Figure 1. Whole Corn plant (Zea Mays)



Figure2. Dried and Fresh Corn Silk Hair (Stigma Mays)

Diseases/and or ailments are often cause by certain microorganism that include bacteria, protozoa and fungi. *Eschcherichia coli*, *Pseudomonas aeruginosa*, *Aspergillus Niger* are among the pathogens

commonly tested for their reaction, in term of growth inhibition with plant extract.

These plant extracts considered as natural sources of microbial agents, regarded as nutritionally safe and easily degradable. However, a recent study showed that there is no antibacterial activity in corn silk when it was investigated against species such as *Klebsiella pneumonia*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Streptococcus pyogenes*.

III. MATERIALS AND METHODS

Materials

The corn specimen were gathered from Gamu, Isabela. The variety used was white corn or vegetable corn. It was harvested after 120 days. Only the collected corn silk hair were used in the study. *Stigma mays* hair was remove from the cobs and the inside tassel was collected. Fresh *Stigma mays* hair with a mass of 500 gm was set aside for aqueous extract and 500 gm hair was sun dried at 31-33 oC for 4 hrs for two days to remove its moisture content. Both fresh and dried sample was cut into small size .25 to .5 mm in which the dried sample was grind into powder form.

Preparation of Aqueous Solution

Corn hair extract was prepared following some of the standard procedures, 500gm dried *Stigma mays* hair powder and 500 fresh sample was boiled with distilled water for 25 min. The ratio used 1:10 (w/v). The solution was then filtered through the use of a laboratory filter paper.

Phytochemical and Microbial Analysis

The aqueous extract (*Stigma mays*) both sun dried and fresh was subjected to preliminary qualitative phytochemical analysis by following standard procedure. The screening was done at the Chemistry Laboratory of the College of Engineering and Architecture, Isabela State University City of Ilagan, Isabela. Confirmatory tests of the secondary metabolites and microbiological screening was conducted.

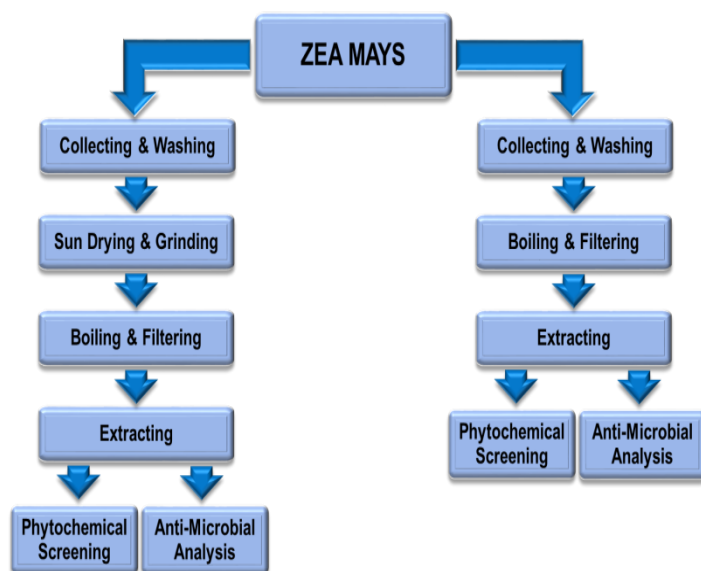


Figure 3. Extraction and Screening of Zea mays

IV. RESULTS AND DISCUSSION

Table 1: Phytochemical Test Analysis

PHYTOCHEMICALS	TEST PROCEDURE S	OBSERVATION
Tannins	Ferric Chloride Test	Greenish blue black solution
Alkaloids	Wagner test	Muddy brown color
Saponin	Froth Test	Foamy substance
Sterols	Salkowski's	No color reaction
Flavonoids	Alkaline Reagent Test	Yellow color that disappear upon the addition of dilute HCL

Phytochemical analysis procedures

Test for Tannins (Ferric Chloride Test)

A greenish blue black solution indicates the presence of tannins upon reaction of 1 ml extract with 1 ml FeCl₃.

Test for Alkaloids (Wagner Test)

Wagner reagent composed of a mixture of 2 gm I and 6 gm KI in 100 ml distilled water was prepared. Test for alkaloids reacts two (2) ml of Wagner reagent to 2 ml extract and formation of muddy brown color reveals the presence of alkaloids.

Test for Saponin (Froth Test)

A mixture of 0.2 ml extract with 5 ml distilled water in a test tube shaken for 15 minutes shows a foamy substance.

An equal amount of 1ml concentrated H₂SO₄ to 1 ml of Zea mays extract shows no change in color. No formation of a red precipitates indicates the absence of sterol compound.

Test for Flavonoids

One (1) ml extract was treated with 1-2 drops of sodium hydroxide. The mixture forms a yellow color solution upon shaken. This indicates the presence of flavonoids in the extract.

Table 2. Confirmatory Phytochemical Analysis of Corn Silk Hair (Stigma mays)

Sample	Test Parameter Unit	Result	Method Used
Extract brownish liquid in bottle marked as <i>Corn Silk Extract (Fresh Fully Grown)</i> , 500 mL	Sterols	-	Lieberman n-Burchard Test
	Triterpenes	+++	Lieberman n-Burchard Test
	Flavonoids	+++	Magnesium Turning Test
	Alkaloids	+++	Mayer's Test
	Saponins	++	Froth Test
	Glycosides	++	Fehling's Test
	Tannins	++	Ferric Chloride Test
Extract brownish liquid in bottle marked as <i>Corn Silk Extract (Sun Dried) Fully Grown</i> , 500 mL	Sterols	-	Lieberman n-Burchard Test
	Triterpenes	+++	Lieberman n-Burchard Test
	Flavonoids	+++	Magnesium Turning Test
	Alkaloids	+++	Mayer's Test
	Saponins	++	Froth Test
	Glycosides	+	Fehling's Test
	Tannins	++	Ferric Chloride Test

Legend

- (+) Traces
- (++) Moderate
- (+++)
- (-) Absence of constituents

Based on the results of the phytochemical screening of the dried and fresh corn silk extract, the samples have an almost identical results. The absence of sterols were observed from both of the samples, which was determined using Liebermann-Burchard test.

Phytochemical analysis observed from both dried and fresh samples shows the presence of the following metabolites such as Triterpenes,

Flavanoids, Alkaloids, Saponins, Glycosides and Tannins. The presence of alkaloids a naturally occurring organic nitrogen-containing base as an abundant compound (+++) is an indicator that this plant sample can be a very good source of medicine, Certain alkaloids is an excellent analgesic, it can also be used for the relief of pain and irregular heartbeat. With more than 3,000 identified type of alkaloids and some are known used in medicine today, the type of alkaloid should be isolated for future studies. Moreover flavonoids and triterpenes an abundant substance (+++) present in stigma may have an antioxidant activity. Tea flavonoids lowers the blood levels of cholesterol and triglycerides. Glycosides, tannins,saponins (++) in a moderate concentrations are also very important compounds.

Table 3. Antimicrobial activity of Corn Silk (Stigma mays) extract against Escherichia coli

Sample / Control	<i>Escherichia coli</i> (ATCC 25922)					
	Replicate 1	Replicate 2	Replicate 3	Total Mean Zone of Inhibition (mm)	Reactivity	Inhibitory Activity
Corn Silk Extract Fresh Sample 1 (10 mm)	10.00	10.00	10.00	10.00	2	+++
Corn Silk Extract Sun Dried Sample 2 (10 mm)	10.00	10.00	10.00	10.00	2	+++
Positive Control: Amikacin 30ug(6 mm)	16.11	16.03	16.42	16.19	4	+++
Negative Control: Sample-free disc (10 mm)	0.00	0.00	0.00	0.00	0	-

Using the Disc Difussion Method, both samples of aqueous extract of Stigma mays showed a complete (+++) inhibitory activity against Escherichia coli. This type of bacteria normally lives in the intestines. There are types of E.coli , some strain especially bad

strain can cause abdominal cramps, vomiting, and bloody diarrhea. It can also lead to kidney failure in children.

Table 4. Antimicrobial activity of Corn Silk (*Stigma mays*) extract against *Pseudomonas aeruginosa*

Sample / Control	<i>Pseudomonas aeruginosa</i> (ATCC 27853)					
	Replicate 1	Replicate 2	Replicate 3	Total Mean Zone of Inhibition (mm)	Reactivity	Inhibitory Activity
Corn Silk Extract Fresh Sample 1 (10 mm)	10.00	10.00	10.00	10.00	2	+++
Corn Silk Extract Fresh Sample 2 (10 mm)	10.00	10.00	10.00	10.00	2	+++
Positive Control: Amikacin 30ug (6 mm)	26.96	25.65	27.33	26.65	4	+++
Negative Control: Sample-free disc (10 mm)	0.00	0.00	0.00	0.00	0	-

Antimicrobial Activity

Pseudomonas aeruginosa exhibit complete inhibitory activity (+++) with a mild reactivity and a total mean zone of 10 mm to *Stigma mays*.

Pseudomonas aeruginosa is a common genus of bacteria, which can create infections in the body. This type of bacteria is present in pneumonia, coughing and congestion. Strain of this bacteria also causes infection in the ear like pain, itching, skin rashes, and redness in eyes.

Table 5. Antimicrobial activity of Corn Silk (*Stigma mays*) extract against *Saccharomyces cerevisiae*

Sample / Control	<i>Saccharomyces cerevisiae</i> (ATCC 9763)					
	Replicate 1	Replicate 2	Replicate 3	Total Mean Zone of Inhibition (mm)	Reactivity	Inhibitory Activity
Corn Silk Extract Fresh Sample 1 (10 mm)	0.00	0.00	0.00	0.00	0	-
Corn Silk Extract Sun Dried Sample 2 (10 mm)	10.00	10.00	10.00	10.00	2	+++
Positive Control:	26.20	27.05	26.71	26.65	4	+++

Nystatin(10 mm)						
Negative Control: Sample-free disc (10 mm)	0.00	0.00	0.00	0.00	0	-

Corn Silk extract (Sun Dried) sample showed a complete inhibitory against *Saccharomyces cerevisiae* with mild reactivity (2) and total mean inhibition zone of 10 mm. However Corn Silk fresh

sample boiled in water showed a negative inhibitory activity against this bacteria. *Saccharomyces cerevisiae* is a common colonizer of the human respiratory, gastrointestinal and urinary tracts.

Table 6. Antimicrobial activity of Corn Silk (*Stigma maydis*) extract against *Aspergillus niger*

Sample / Control	<i>Aspergillus niger</i> (ITDI Ref No.3008)					
	Replicate 1	Replicate 2	Replicate 3	Total Mean Zone of Inhibition (mm)	Reactivity	Inhibitory Activity
Corn Silk Extract Fresh Sample 1 (10 mm)	0.00	0.00	0.00	0.00	0	-
Corn Silk Extract Sun Dried Sample 2 (10 mm)	0.00	0.00	0.00	0.00	0	-
Positive Control: <i>Clotrimazole</i> (10 mm)	16.95	17.74	17.97	17.55	3	+++
Negative Control: Sample-free disc (10 mm)	0.00	0.00	0.00	0.00	0	-

Table 6 *Aspergillus niger* of the corn silk aqueous extract fresh and dried with an equal amount of 10 mm, where each had 3 replicates. It shows a negative inhibitory and zero reactivity. *Aspergillus niger* is a fungus.. This reveals that stigma may does not have an antifungal activity against *Aspergillus niger*.

V. SUMMARY AND CONCLUSION

Corn hair extract (*Stigma maydis*) contain abundant metabolites of triterpenes, flavonoids, alkaloids and a moderate traces of glycosides , saponins and tannins for both sample of fresh and sun dried *Stigma maydis* hair. However sterols possess negative constituents in the sample, Corn Silk hair extract possesses a strong antimicrobial activity against *Escherichia Coli* and

Pseudomonas aeruginosa. Corn silk extract fresh sample reveals negative inhibitory activity against *Saccharomyces cerevisiae* but complete inhibitory on corn silk extract sun dried. Data also shows that the 0 mm zone of inhibition both for the two sample extract of stigma may. It indicates that it has a negative inhibitory activity against *Aspergillus Niger*. With this, the study shows that chemical and bioactive substance found in Stigma may hair confirm to the folkloric use of this plant in treating diseases and microbial infection.

VI. RECOMMENDATION

Hence, highly recommended to isolate and purify the maximum therapeutic potentials of stigma may hair as an herbal tea and as a raw material in food and pharmaceutical industries. The use of other bacterial strains to test the antimicrobial activity must be conducted.

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