



A Survey on Pineapple and its medicinal value

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Abstract – The present study aimed for evaluation of *Aquilaria agallocha* oil obtained by hydro-distillation from the woods for *in-vivo* and *in-vitro* anti-inflammatory activity. The oil was screened for *in-vivo* anti-inflammatory activity by carrageenan-induced paw edema in rat model and *In-vitro* anti-inflammatory activity by human red blood cell membrane stabilization method. The potency of the oil was compared with standard Diclofenac (10 mg/kg). The oil showed significant reduction of edema in carrageenan induced rat paw edema model maximum at 3 hr for AAO 50 mg/kg, AAO 100 mg/kg and diclofenec 10 mg/kg (% reduction in paw volume 58.59%, 62.11% and 68.94% respectively) and membrane stabilizing action on human red blood cell membrane at concentration of 100, 250 and 500 mcg/ml showed 39.66%, 62.94% and 78.50% which are comparable with standard diclofenec.

Keywords – *Aquilaria agallocha*, anti-inflammatory activity, carrageenan-induced paw edema, human red blood cell membrane.

INTRODUCTION

Pineapple (*Ananas comosus*), a tropical plant with edible multiple fruit consisting of coalesced berries, named for resemblance to the pine cone, is the most economically important plant in the *Bromeliaceae* family [1]. Pineapples may be cultivated from a crown cutting of the fruit, possibly flowering in 20-24 months and fruiting in the following six months.

Pineapple may be consumed fresh, canned, juiced, and are found in a wide array of food stuffs - dessert, fruit salad, jam, yogurt, ice cream, candy, and as a complement to meat dishes. In addition to consumption, in the Tripura the pineapple's leaves are used as the source of a textile fiber called piña, and is employed as a component of wall paper and furnishings, amongst other uses.

Kingdom	Plantae
(unranked)	Angiosperms
(unranked)	Monocots
(unranked)	Commelinids
Order	Poales
Family	Bromeliaceae
Subfamily	Bromelioideae
Genus	<i>Ananas</i>
Species	<i>comosus</i>

Botany [2]

The pineapple is an herbaceous perennial which grows to 1.0 to 1.5 meters (3.3 to 4.9 ft) tall, although sometimes it can be taller. In appearance, the plant itself has a short, stocky stem with tough, waxy leaves. When creating its fruit, it usually produces up to 200 flowers, although some large-

fruited cultivars can exceed this. Once it flowers, the individual fruits of the flowers join together to create what are commonly referred to as a pineapple. After the first fruit is produced, side shoots (called 'suckers' by commercial growers) are produced in the leaf axils of the main stem. Commercially, suckers that appear around the base are cultivated. It has 30 or more long, narrow, fleshy, trough-shaped leaves with sharp spines along the margins that are 30 to 100 centimeters (1.0 to 3.3 ft) long, surrounding a thick stem. In the first year of growth, the axis lengthens and thickens, bearing numerous leaves in close spirals. After 12 to 20 months, the stem grows into a spike-like inflorescence up to 15 cm (6 in) long with over 100 spirally arranged, trimerous flowers, each subtended by a bract. Flower colors vary, depending on variety, from lavender, through light purple to red.

The ovaries develop into berries which coalesce into a large, compact, multiple accessory fruit. The fruit of a pineapple is arranged in two interlocking helices, eight in one direction, thirteen in the other, each being a Fibonacci number.

Pineapple carries out CAM photosynthesis, fixing carbon dioxide at night and storing it as the acid malate and then releasing it during the day, aiding photosynthesis.

Seed storage

This species has Orthodox seeds - dry to 15-20% RH and store at -20°C, or as cool as possible.

Germination required [3, 4]

Based on other members of the family bromeliaceae, some researchers have described the seeds of this species as Physiologically Dormant.

This type of dormancy can be overcome by mimicking the seasonal patterns of the species native habitat. Use a moist pre-chill or pre-heat treatment (depending on local climatic conditions) or a dry after-ripening treatment, before germinating the seeds on agar, germination paper or sand at their optimum temperature. The seeds are hard and slow to germinate: try treating them with sulphuric acid before sowing.

If germination is low, you perform delicate surgery to enable the embryo to grow. Excise the tissue near the root tip.

Distribution [5]

The plant is indigenous to South America and is said to originate from the area between Southern Brazil and Paraguay; however, it is important to note that little is known about the origin of the domesticated pineapple (Pickersgill, 1976). The Spanish introduced it into the Philippines, Hawaii in the early 19th century. The fruit was cultivated successfully in European hothouses, and pineapple pits, beginning in 1720.

Production of pineapples by country — 2009 (thousand metric ton)^[21]

Philippines	2198
Thailand	1894
Costa Rica	1870
Indonesia	1558
Chile	1477
Brazil	1471
India	1341
Nigeria	898
Mexico	685
Vietnam	460
Colombia	428
Malaysia	400

Source:

Food and Agriculture Organization

Two varieties of Pineapples are available in Tripura during mid-May to mid-September. The varieties are Queen and Kew.

Queen Pineapple

Fruits are Spiny, golden yellow in color and emits pleasant aroma and flavor at the ripen stage. The fruits are harvested when eyes turns yellow during mid-May to mid-July when the fruit is available. Average weight of fruit varies from 600 Grams to 800 Grams. It possesses all the good organoleptic qualities. Juice is of bright yellow color. TSS varies from 10° to 14° brix depending upon the stage of maturity and season. P^H 4 to 4.5. Water content 80% to 90%. Sweetness and unique aroma differentiates it with Pineapple of other region of North East India.

Kew Pineapple

Spineless large size fruit weight varies from 1.5 Kg. to 3 Kg. Highly juicy with TSS content 8° to 12° brix. The color of Juice is light yellow with considerable aroma and flavor. Highly suitable for canning. Pineapples harvested at half ripe stage can be kept fresh for 1 to 3 weeks at 12° c to 13° c. Supply of garden fresh fruit may be made within 72 hours by surface transport & by 1 hour up to Calcutta by air.

Tripura Pineapple is a favorite for the lovers of fruit in its fresh forms as well as in preserves like jams, jellies and squashes. The highly favorable agro-climatic conditions for the cultivation of pineapple in Tripura allow its organic farming. The agriculture of Tripura, each year, gets a special boost from pineapple production between the middle of May and middle of September, both inclusive. This allows the crop to contribute a significant proportion in the economy of the state.

The produced varieties of pineapple in Tripura include Queen Pineapple and Kew pineapple. The spiny fruits of the Queen pineapple are golden yellow. The average fruit size does not exceed 600 to 800 grams but the fruits are highly aromatic. The juices of the spineless Kew variety of pineapple are perfect for canning. The fruits usually weigh around 1.5 Kg. to 3 Kg.

Pineapple processing industry in Tripura

The Fruit Processing industry in Tripura is still at a nascent stage. As regards pineapple processing, NERAMAC (a Government of India undertaking), has set up a modern Pineapple juice concentrate plant at Nalkata at North Tripura district, with a processing capacity of about 5760 TPA. The plant at Nalkata is operating at a low level due to non-operation of aseptic filter. However, the same is being rectified and natural juice concentrate will be available from the pineapple season of this millennium year. TSIC (a state Govt. undertaking), is also operating small canning factory, producing fresh canned pineapple juice and other pineapple products. The factory has processing capacity of 400 TPA. Cashew Processing has also been taken up by NERAMAC by setting up a small unit. As regards other fruit products, proper processing facilities are yet to be created. This offers a vast scope for setting up of Fruit Processing units in Tripura.

Nutritive values [6]

- Pineapple contains calcium, potassium, magnesium, fiber, and vitamin c
- It is low in fat and cholesterol.
- It is also a good source of vitamin, B1, vitamin B6, copper and dietary fiber.

Composition of Pineapple per 100 g

Component	Fresh ripe	In syrup
Water	86.5 g	78.99
Energy	49 Kcal	78 Kcal
Fat	0.43 g	0.11 g
Protein	0.39 g	0.35 g
Carbohydrate	12.39 g	20.20 g
Fiber	1.2 g	0.8 g
Potassium	113 mg	104 mg
Phosphorus	7 mg	7 mg
Iron	0.37 mg	0.38 mg
Sodium	1 mg	1 mg
Magnesium	14 mg	16 mg
Calcium	7 mg	14 mg
Zinc	0, 08 mg	0.12 mg
Selenium	0.6 mcg	0.4 mcg
Vitamin C	15.4 mg	7.4 mg
Vitamin A	23 UI	14 UI
Vitamin B1	0.092 mg	0.090 mg
Vitamin B2	0.036 mg	0.025 mg
Vitamin E	0.10 mg	0.10 mg
Niacin	0,42 mg	0, 28 mg
Folic acid	11 mcg	5 mcg

Medical Properties of Pineapple [2, 7, 8]

Pineapple juice imparts a sweet taste and serves as an option for drinking plain or mixed with other juices. Its medical properties make it a good choice for a variety of health conditions and injuries, although compounds in this juice can interact with some antibiotics. Always consult your health care provider before taking pineapple juice for a medical problem.

Pineapple contains a proteolytic enzyme bromelain, which digests food by breaking down protein. Only modest quantities of bromelain are in the edible parts of the fruit, all commercially available bromelain is derived from the stem. Bromelain supplements are particularly popular among athletes for treating all sorts of physical aches and injuries. There are questions about how well bromelain is absorbed, and to many herbal authorities the value may be overstated. Nature gave us many similar proteolytic enzymes, (like Ginger), that are more highly concentrated in the edible parts of the plants. Pineapple is healthy

fruit, a good source of manganese, as well as containing significant amounts of Vitamin C.

Traditional Use [2, 7, 8]

Pineapple has been used as a medicinal plant in several native cultures. The root and fruit are either eaten or applied topically as an anti-inflammatory and digestive. It is traditionally used as an anti-parasitic agent in the Tripura.

Bromelain has been known chemically since 1876. In 1957, bromelain was introduced as a therapeutic compound when Heinicke found it in high concentrations in pineapple stems.

The root and fruit are either eaten or applied topically as an anti-inflammatory and as a proteolytic agent. It is traditionally used as an anthelmintic agent in the Tripura. A root decoction is used to treat diarrhoea.

In some cultures, the pineapple has become associated with the notion of welcome, an association bespoken by the use of pineapple motifs as carved decorations in woodworking. Many people bring a pineapple as a gift when meeting someone for the first time.

This fruit contains sugar, vitamin C, and bromelain, a proteolytic enzyme that breaks down protein. It is also low in sodium and rich in potassium; however, Pineapple was not recognized as having any other medicinal benefits for many years. This fruit also has anti-inflammatory and digestive properties. The bromelain in Pineapple helps fight infections by dissolving layers of slough and bacteria-rich surfaces. This fruit can also be used to aid in digestion. It can clear bronchial passages in those suffering with pneumonia and bronchitis. The anti-inflammatory properties in this fruit help reduce the symptoms of arthritis, and help reduce pain after surgery and sport injuries. Pineapple is currently being studied for its effectiveness in preventing heart disease.

To receive the most nutritional value from Pineapple, it is best to eat it raw or canned, if it is canned in its own juices, but this fruit does come in other formulations as well and is an ingredient in many products.

1.1. Bromelain

The U.S. National Library of Medicine lists bromelain as a proteolytic digestive enzyme. When taken with meals, bromelain aids in the digestion of proteins, working to break proteins down into amino acids. On an empty stomach, bromelain has anti-inflammatory properties. Certain conditions, such as sinusitis, burns, pancreatic insufficiency and skin rashes seem to benefit from the ingestion of bromelain, according to the National Library of Medicine. Both the fruit and stem of a pineapple contain bromelain.

1.2. Vitamin C

A powerful antioxidant, vitamin C supports the formation of collagen in bones, blood vessels, cartilage and muscle, as well as the absorption of iron. Vitamin C also retards the development of urinary tract infections during pregnancy and reduces the risk of certain cancers, including colon, esophagus and stomach. According to the Dietary Guidelines for Americans produced by the U.S. Department of Health and Human Services in 2005, 1/2 cup of raw pineapple contains 28mg of vitamin C and only 37 calories.

1.3. Vitamin B1

The vitamin B1, or thiamine, found in pineapples allows the cells of the body to convert carbohydrates into energy. Heart, muscle and nervous system function depend on vitamin B. It is also crucial for red blood cell formulation.

1.4. Manganese and Copper

Several essential minerals exist in pineapples, including manganese, a trace mineral instrumental to the formation of bone, as well as the creation and activation of certain enzymes. Pineapples also include copper, another trace mineral. It assists in the absorption of iron and regulates blood pressure and heart rate.

1.5. Fiber

Pineapples, like many fruits, contain significant fiber. Lowered blood cholesterol, which in turn lowers heart disease risk, seems to occur when dietary fiber levels increase, according to the American Cancer Society. Other conditions such as diabetes and constipation benefit in similar ways from increased fiber intake. According to the Harvard School of Public Health, several studies indicate that increased fiber intake diminishes the metabolic syndrome, a cluster of health hazards including high blood pressure, high insulin levels, excess abdominal weight and high triglyceride levels.

Benefits Colitis Patients

Drinking pineapple juice may impart some medical benefits for people who suffer from colitis. This is a condition marked by inflammation of your large intestine. It can trigger abdominal pain and bloating, diarrhea, gas and dehydration. A study published in the December 2010 issue of "Inflammatory Bowel Diseases" indicates that consumption of fresh or frozen pineapple juice may decrease colon swelling due to an enzyme known as bromelain in the fruit. Researchers note that bromelain extract worked more effectively than this juice, but pineapple juice still provided benefits. This study was on mice, so there is a need for human studies to confirm these findings.

Reduces Cholesterol

Include pineapple juice in your diet, and you may naturally reduce the amount of cholesterol in your bloodstream. Research available in the December 2005 edition of "Medical Science Monitor" studied the effect of pineapple and other fruit juices on plasma lipids. Researchers discovered that rats that consumed pineapple juice over a three-hour period experienced a decrease in lipoprotein particles, compounds that carry fat through the blood, and increased metabolism, activities that lower cholesterol levels. As this was an animal study, human studies are required.

1.6. Speeds Healing of Tissue Injuries

The next time you have an injury to your tendons, ligaments or other soft tissues, consider drinking pineapple juice. Evidence presented in the April 2011 "Journal of Medicinal Food" reveals that the bromelain in this juice slightly increased the quantity of tendon cells after a crush injury to the Achilles heel in rat models; it also decreased the levels of malondialdehyde, a compound that may cause mutations in tissues. In doing so, pineapple juice contributed to healing in the early stages of an injury, but human studies need to be undertaken.

1.7. Contributes to Male Fertility

Pineapple juice's high manganese content means it is a good choice for boosting fertility through sperm quality. A 1-cup serving of this juice provides 1.3 mg of manganese; the daily-recommended intake for men is 2.3 mg each day. The July-August 2009 issue of "Oxidative Medicine and Cellular Longevity" features a study from Indian researchers, which correlates manganese consumption in pineapple juice and other foods with increased sperm movement. It also protected sperm during freezing for storage, which can raise your chances of conception.

For joint and muscle pain

Eating pineapple rich in bromelain can have a powerful anti-inflammatory effect. This makes the fruit useful both to prevent and treat sports injuries in those who exercise regularly. It can speed the healing of bruises. It may also help ease arthritis pain and is a good remedy for generalized joint aches, tendonitis and bursitis.

For corns, calluses and dry skin

Corn and calluses on the feet and rough skin on the elbows and heels can be removed with the fruit acids in pineapple. Apply mashed fruit to the affected area and leave it on for an hour. Rinse and gently scrub the area to remove the dead skin. Several treatments may be needed.

Pineapple Strengthens Bones

One of the benefits of pineapple is that it helps to build **healthy bones**. Pineapples are rich in manganese, a trace mineral that is needed for your body to build bone and **connective tissues**. Just one cup of pineapple provides 73% of the daily recommended amount of manganese. The benefits of pineapple can affect the growth of bones in young people and the strengthening of bones in older people.

Pineapple is Good for Colds and Coughs

While many people often take extra vitamin C or drink extra orange juice when they have a cold, few consider eating pineapple. The benefits of pineapple when you have a cold or cough are the same as the benefits of orange juice, but there is an additional benefit of pineapple. Bromelain, which is found in pineapples, has been found to help suppress coughs and loosen mucus.

Put briefly, here are some of the principal benefits of eating pineapples:- High in vitamin C; Good source of potassium; Loaded with manganese; Anti-inflammatory; Aid in digestion; Reduces blood clotting; May help angina by removing plaque from arterial walls.

Pineapple is good for your gums

Furthermore, due to its high vitamin C content, pineapples are good for your oral health as well. Vitamin C can reduce your risk of gingivitis and periodontal disease. Besides increasing the ability of connective tissue to repair itself, vitamin C also increases the body's ability to fight invading bacteria and other toxins that contribute to gum disease. Periodontal disease, which destroys gum tissue and underlying jaw bones, has been linked to heart disease, stroke and type- 2 diabetes.

Therapeutic effect

The enzyme bromelain in the pineapple starts the digestive process, thereby relieving gastrointestinal upset, improving circulation, stopping cramps and inhibiting inflammation. It may help rid the body of inflammatory compounds that contribute to arthritis. Pineapples also have diuretic properties and reduce perspiration, a process that helps flush toxins from the body.

Methods of Administration [9]

For digestive problems

Besides helping to break down the proteins in food, the enzyme bromelain found in pineapple, aids in destroying the harmful bacteria in the stomach and intestine. Because it can increase a poor appetite resulting from insufficient gastric juices, fresh pineapple juice is often prescribed as a

tonic and body building drink for convalescents and for cancer patients undergoing treatment.

For wrinkles

The alpha-hydroxy acids that are added to many skin creams are found naturally in pineapple. These compounds help reduce the appearance of fine wrinkles when applied to the skin, so pineapple is a useful ingredient in facial masks.

For fever

Drinking pineapple juice can help hydrate the body and restore the immune system.

Take care

Like all acids, the fruit acids in pineapple can have an aggressive, corrosive effect on certain substances. In the body, the gums and tooth enamel are at particular risk and eating too much pineapple may contribute to gingivitis and cavities. After eating pineapple products rinse your mouth with water and brush your teeth as soon as possible.

Dosage

To take advantage of pineapple's myriad healing powers, drink 3 ½ ounces of fresh pineapple juice three times daily before meals or eat a slice of fresh pineapple at each meal.

Fresh pineapple juice can calm digestive upset in children. Mix pineapple juice with an herbal tea that eases stomach trouble, such as chamomile; give it to toddlers and older children in small amounts.

Pineapple Side Effects [10]

If you are taking a prescription blood thinner, be careful with bromelain, which works similarly. Generally, you should take bromelain for only eight to ten days, but it may be tolerated for longer periods. Avoid overdosing and possible stomach upset by noting the product strength.

CONCLUSION

The two different types of pineapple have huge nutritive and medicinal value. Production plant of Tripura has the capacity of about 5760 TPA. Pineapple grows in different parts of the world. Tripura tribal and non-tribal people use the plant's leaves as well as fruits in different traditional system of medicine. Though it has huge nutritive value but it has also few side effects. Further study will be carried to find out different pharmacological activities.

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