Phytochemical test and antmicrobial activity of *Chaenomeles japonica* (Thunberg) lindlelyex. spach, Hist-Nat.Veg

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ABTRACT

The medicinal plant *Chaenomeles japonica* (Thunberg) lindlelyex.spach, Hist-Nat.Veg is belonging to the family Rosaceae, which known as Japanese quince in English and Chin-Saw-ga in Myanmar. These plants were collected from Panglong University Campus. In this study, morphological characters, preliminary phytochemical tests, physico-chemical properties, nutritional values and antimicrobial activity of *Chaenomeles japonica* (Thunberg) lindlelyex. Spach Hist-Nat.Veg were comprised. The investigation of preliminary phytochemical test revealed that alkaloid, glycoside, reducing sugar, saponin, cyanogenic glycoside, steroid, terpenoid, phenolic compound, α-amino acid, carbohydrate, tannin, flavonoid, acid, base and neutral are present. In the Physico-chemical properties, moisture content, total ash, acid insoluble ash, water soluble ash, ethanol, methanol, pet-ether, ethyl acetate, chloroform, acetone and water soluble extracts were determined. In nutrition facts of the fruits were showed that ash, crude protein, crude fat and carbohydrate. In the result of antimicrobial tests, various extractof the fruits were tested against different microorganisms by using agar diffusion method. These were found that acetone and ethanol extract of fruits show more sensitive than *Bacillus pumilus, Candida albicans* and *Escherichia coli.*

INTRODUCTION

Chaenomeles japonica (Thungberg) Lindlely.ex spach belongs to the family Rosaceae. Rosaceae is a large family of perhaps 115 genera and 3200 species, distributed over most of the earth and abundant in Eastern Asia, North America and Europe. The family is of considerable economic importance in temperate regions.(Lawrence, 1964).*Rosaceae* is a family of 124 genera and about 3375 species. Widely distributed in all parts of the world, mostly in North temperate regions. In Ceylon, it is represented by 12 genera with 30 species. Four species are endemic and two species doubtfully endemic. (Dassanayake, 1981). *Chaenomeles* is a genus of three species of deciduous spiny shrubs, usually 1-3m tall, in the family Rosaceae. They are native to Japan, Korea, China, Bhutan and Myanmar. (Burmese:Chinsaw-ga) Zhang et al, 2010). Genus name comes from the Greek words chaino meaning to gape and melon meaning an apple in the incorrect belief that the fruits split open.(Wu *et.al*org.,2003). There are five wild *Chaenomeles* species in China, which are *Chaenomeles speciosa, Chaenomeles thibetica, Chaenomeles cathayensis, Chaenomeles sinensis* and *Chaenomeles japonica.*(Flora of China, 1974).Although all quince apecies have flowers, gardeners in the west often refer to these species as "flowering quince", since *Chaenomeles* are grown ornamentally for their flowers, not for their fruits. These plants have also been called "Japanese quince", and the name "japonica" (referring to *C.japonica*) was widely used for these plants in the 19th and 20th centuries. The names "japonica" or "Japanese quince" were often loosely applied to *Chaenomeles* in general, regardless of their species. The most commonly cultivated *Chaenomeles* referred to as "japonica" are actually the hybrid *C.* x *superba* and *C. speciosa;C. japonica* itself is not as commonly grown. (Zhang *et.al*, 2010).*Chaenomeles japonica* (Thunb) Lindlely.exspach, known as Maule's quince or Japanese quince, is a species of flowering quince. (Bailey, 1976).*Chaenomeles japonica* is native to japan, and has small fruit, apple shoped, 3.4 cm diameter. The flowers are usually red, but can be white or pink. The leaves are 3.5cm long. *Chaenomeles* and other quinces have been grown for centuries for food, medicines, and so that people may enjoy their beauty.(Dharmananda,2005). Fruits of the genus *Chaenomeles* have mulitiple uses. They are used in food industry (for liquors and candies) and in Chinese medicine. (Young, Fen, lei, Xiao, Sun, 2009; The flesh of quince fruit is pale yellow and hard. Due to an abundant amount of essential oils ripe quince fruit exudes specific and pleasant aroma.

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Carbohydrates, amino acids, proteins and organic acids are important components of the chemical composition of the quince. *Chaenomeles japonica* fruit have been shown to have antimicrobial and antioxidant properties (Essawi, Srour, 2000; rumpunen, Kviklys, 2001). Quince fruit, as a natural source of antioxidants, may be used in foods or naturaceuticals for the disease prevention (Yaung *et.al,* 2009)

Materials and methods

Botanical studies

The specimens were collected from PangLong University Campus, Shan State. The plant was systematically carried to the Department of Botany, PangLong University, to get correct family, genus and species with the help of reference such as Hooker (1885), Kartikar & Basu (1935), Burkill (1935), Backer (1965), Lawrence (1969), Dassanayake (1995),Kress (2003).

Chemical studies

The samples were washed, cut into small pieces and then dried in room temperature. After that, the samples were ground into powder and stored in an air tight container. Preliminary phytochemical examination on the powder was performed to find out the chemical components of plant part. The powder sample was tested for alkaloid, glycosides, reducing sugars, saponin glycoside, cyanogenic glycoside, steroid, terpenoid, phenolic compound, α-amino acid, carbohydrate, tannin, flavonoid and acid, base and neutral.Phytochemical test was used according to the method by Central Council Research in Unani Medicine(1989) and Trease & Evans(1978). In the physico-chemical properties, moisture contents, total ash, acid insoluble ash, water soluble ash, ethanol, methanol, pet-ether, ethyl acetate, chloroform, acetone and water soluble extracts were determined. Nutritional values of samples were studied at the Food Industries Development Supporting Laboratory (FIDSL). The moisture, the crude fiber, ash, crude protein, crude fat and carbohydrate from powdered sample were examined according to Willan (1980) and Myanmar Traditional Medicine Formulary (1969).In the antimicrobial tests, various extract of the fruits were tested against different microorganisms by using agar well diffusion method.

RESULT

Scientific Name - *Chaenomeles japonica* (Thunberg) Lindlely Ex. spach
Myanmar Name - Chin-saw- ka
Family Name - Rosaceae
English Name - Japanese quince
Part Used - Fruits

Morphological character of *Chaenomeles japonica* (Thunberg) lindlely ex.spach

Perennial shrubs, about 3m height, with slender throns Stems with spreading branches, branchelets purple when young, brown when old. Leaves simple, deciduous, alternate, stipulate, reniform, about 0.1cm long, herbaceous; petiolate, 1.0-1.7 cm long; lamina obovate to spatulate 4-7 cm long, 2-3 cm wide, cuneate or broadly cuneate at the base, margins crenate, abtuse at the apex, glabrous, coarsely, dark green colour. Inflorescences axillary, racemose with 3-5 cm fascicled flowers.Flowers bracteate, with an epipetalous or bracteolate, orbicular, about 0.7 cm in diameter; pedicellate, short or nearly absent, glabrous; bisexual, regular, pentamerous, epigynous, brightly red, 1.8-3.1 cm long, 1.5-4.0cm in diameter, campanulate. Calyx 5-lobed , calyx tube adnate to the ovary, ovate-really sub orbicular, 0.6-0.9 cm in long, acute at the tips, pinkish green in inner and green an margin and outer, glabrous, caducous. Petals-5, born on the calyx tube, 1.1-1.6 cm long, brightly red, orbicular with narrow base. Stamens 15-20, epicalyx, 1.1-1.6 cm long, as longs as petals, inserted, filaments long, pink to red; anthers dithecous, introrse, dorsifixed, dehiscing longitudinally. Pentacarpellary, ovary oblong, about 0.7 cm long, adnate to the calyx tube, 20 ovules in each locule, pentalocular; styles-5, connate at the base, as long as stamens, white; stigma diffusely

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branched, dark. Fruits fleshy, green-yellow pome, sub globose, maturing early, 3-5 cm in diameter, fruiting pedicel short or nearly absent. Seeds reddish brown, oblong with acute tip.The results were shown in figure (1)

Uses : anti–inflammatory, anticancer, antimalaria, antidirrhoea, antitumor, antibacterial, antivirus, antidysentery, wound healing, skin disense, heart diseases lung diseases and foods as jam, juice, wine and salad.

Fig. (1)Morphological characters of *Chaenomeles japonica* (Thunberg) lindlely ex. spach

A. Habit B. Leaves C.Inflorescence with leaves D. Flowers E. L.S of Flower F. Fruit G. L.S of fruit H. Seed I. Products

hemical Study

Preliminary phytochemical tests of the fruits of *Chaenomeles japonica* (Thunberg) lindlelyex.spach

Preliminary phytochemical tests of the fruits of *Chaenomeles japonica* (Thunberg) Lindlelyex.spach were indicated the presence of alkaloid, glycoside, reducing sugar, saponin glycoside, cyanogenic glycoside, steroid,phenolic compound, α-amino acid, carbohydrate, tannin, flavonoid, acid, base and neutral. The results were shown in Table (1).

Table (1). Preliminary phytochemical tests of the fruits of *Chaenomeles japonica* (Thunberg) lindlelyex.spach

No.	Chemical Constituents	Extract	Reagent used	Observation	Results
1.	Alkaloid	1% HCL	1. Mayer's regent 2. Dragendorff's reagent 3. Wagner's reagent	White ppts Orange ppts Yellow ppts	Present Present Present
2.	Glycoside	H_2O	10% lead acetate	White ppts	Present
3.	Reducing sugar	H_2O	1. Benedict solution 2. Fehling solution	Reddish ppts	Present
4.	Saponin glycoside	H_2O	Distilled Water	Frothing	Present
5.	Steroid	PE	Acetic anhydriole + Conc H_2SO_4 acid	Green	Present
6.	Terpenoid	EtoH $CHCL_3$	Conc H_2SO_4 acid	Reddish Brown	Present
7.	Phenolic compound	H_2O	$FeCL_3$ solution	Brown	Present
8.	Flavonoid	MeOH	Mg turing + ConcHCL acid	Pink	Present
9.	Carbohydrate	H_2O	10% α nepthol + Conc H_2SO_4	Pink ring	Present +
10.	Cyanogeneic glycoside	H_2O	Conc H_2SO_4+ sodium picrate paper	No change in colour	Absent -
11.	α-amino acid	H_2O	Ninhydrin	Pink	Present
12.	Tannin	H_2O	1% gelatin solution	White ppts	Present
13.	Acid/ Base/ Neutral compound	H_2O	Bromocresol green	Yellow	Acidic
(+) = Present, (-) = Absent, (ppt)= Precipitate					

4.5 Physico-chemical properties of the fruits of *Chaenomeles japonica* (Thunberg) lindlelyex.spach

In physico-chemical properties, moisture content, total ash, acid insoluble ash and water soluble ash and solubility in different soluble of the fruits were included, and the results were shown in Table (2).

Table (2)Physico-chemical properties of the fruits of *Chaenomeles japonica* (Thunberg) lindlelyex.spach

No.	Physico-Chemical properties	Percentage(%)
		Fruit
1	Moisture content	8.01
2	Total ash	1.04
3	Acid insoluble ash	2.31
4	Water soluble ash	42.31
5	Pet-ether soluble extractive	0.65

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Table. (3) Nutritional values of fruits of *Chaenomeles japonica* (Thunberg) lindlely ex.spach

1	Crude Protein	0.80
2	Crude Fibre	0.05
3	Crude Fat	0.32
4	Carbohydrate	14.31
5	Energy Value	63

Examination of nutrient content in the powdered fruits of *Chaenomeles japonica* (Thunberg) lindlelyex.spach

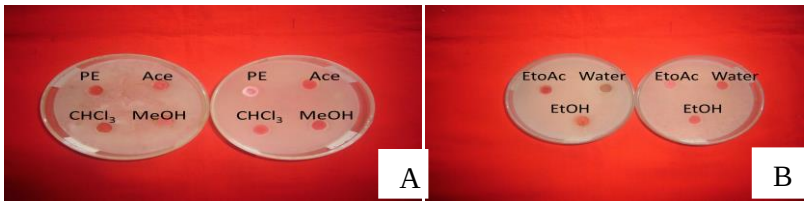
The determination of nutrient content such as crude protein, crude fiber, crude fat and carbohydrate from powdered fruits of *Chaenomeles japonica* (Thunberg) lindlely

6	$CHCl_3$ soluble extractive	1.70
7	Acetone soluble extractive	1.38
8	EtoAC soluble extractive	2.13
9	MeOH soluble extractive	4.81
10	EtoH soluble extractive	5.11
11	Water soluble extractive	10.48

Table.(4) Antimicrobial activities of diffusion solvent of the fruits of*Chaenomeles japonica* (Thunberg) lindlelyex.spach

Organisms						
Extracts	***Bacillus pumilus***	***Bacillus subtilis***	***Candida albicans***	***Escherichia coli***	***Pseudomonas aeruginosa***	***Staphylococcus aureus***
Pet-ehter	12mm(+)	11mm(+)	12mm(+)	12mm(+)	11mm(+)	12mm(+)
$CHCl_3$	12mm(+)	11mm(+)	11mm(+)	12mm(+)	11mm(+)	12mm(+)
MeOH	12mm(+)	11mm(+)	12mm(+)	12mm(+)	12mm(+)	12mm(+)
Acetone	14mm(+)	13mm(+)	12mm(+)	14mm(+)	13mm(+)	13mm(+)
EtoAC	13mm(+)	13mm(+)	13mm(+)	13mm(+)	13mm(+)	13mm(+)
EtoH	14mm(+)	12mm(+)	14mm(+)	15mm(+)	13mm(+)	12mm(+)
H2O	11mm(+)	_	12mm(+)	11mm(+)	12mm(+)	12mm(+)

Agar Well-10mm "Organisms"
10mm~14mm(+)(1)*Bacillus pumilus* (N.C.I.B-8982)(4) *Escherichia coli* (N.C.I.B 8134)
15mm~19mm(++) (2)*Bacillus subtilis*(N.C.T.C-8236) (5) *Pseudomonas aeruginosa* (6749)
20mm above(+++) (3)*Candida albicans*(6) *Staphylococcusaureus*(N.C.P.C. 6371)



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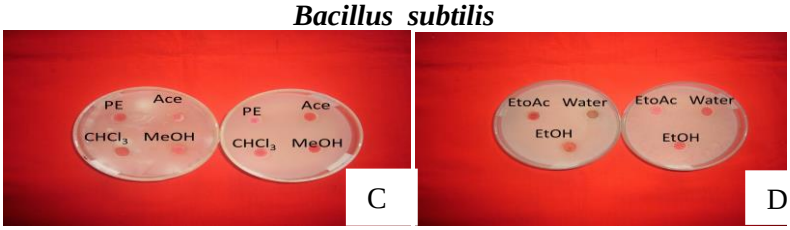
Bacillus subtilis



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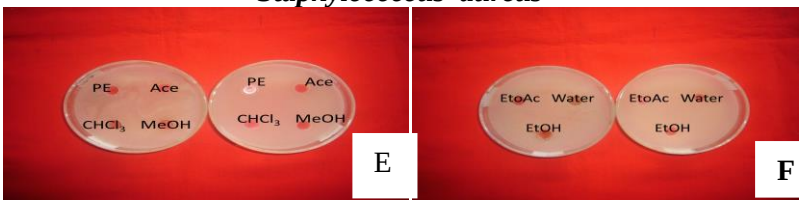
Staphylococcus aureus



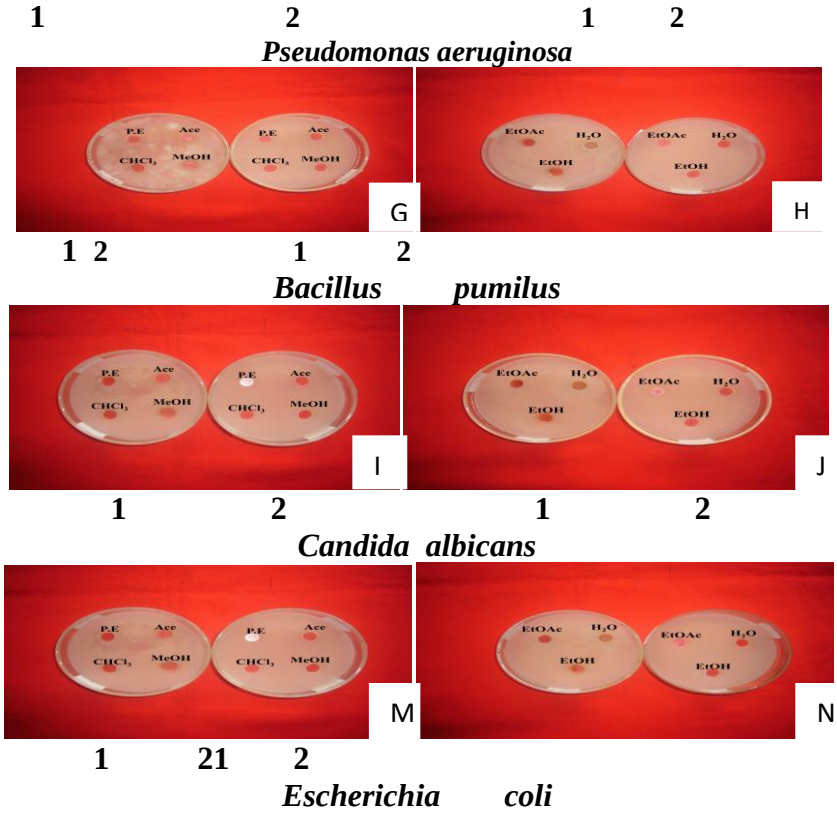


Fig.(2) Antimicrobial activities of diffusion solvent extracts of the fruits of *Chaenomeles japonica* (Thunberg) lindlely ex. spach

Discussion and Conclusions

The medicinal plant *Chaenomeles japonica* (Thunberg) lindlely ex. spachbelong to the family Rosaceae were collected from Panglong University Campus. In the presence investigation, the morphological studied on both vegetative and reproductive parts of the plants were carried out.

In this study, the medicinal plant of *Chaenomeles japonica* (Thunberg) lindlely ex. spach (Chin-saw-ka) is perennial shrubs, stems with spreading branch, branchlets purple when young, brown when old. Leaves simple, deciduous, alternate, stipulate, reniform, petiolate lamina obovate to spatulate, glabrous coarsely dark green.Inflorescences axillary, racemose. Flowers bracteates with an epipetalous or bracteolate orbicular, pentamerous, epigynous, brightly red.Calyx-5 lobed, calyx lobe adnate to the calyx, pinkish green in inner.Petals-5 born on the calyx tube brightly red. Stamens 15-20, epipetalous, filament long, pink to red; anther dithecous, pentacarpellary, ovary oblong, pentalocular, style-5, stigma diffusely branched. Fruits fleshy greens-yellow pome, seeds reddish brown, oblong with acute tip. These characters are in agreement with those described by Hooker (1885), Kartikar & Basu (1935), Burkill (1935), Backer (1965), Lawrence (1969), Dassanayake (1995).

In this investigation, the preliminary phytochemical tests, physico-chemical properties, elemental analysis, nutritional values and antimicrobial activities were carried out using the powdered samples of the fruits of *Chaenomeles japonica* (Thunberg) lindlely ex. spach.The fruits of *Chaenomeles japonica* (Thunberg) lindlely ex. spachcontained alkaloid, glycoside, reducing sugar, saponin, steroid, terpenoid, phenolic compound, flavonoid, carbohydrate, α-amino acid tannin and acidic compound. Cyanogenic glycoside was absent.The physico-chemical properties the most significantly soluble matter content of fruits of *Chaenomeles japonica* (Thunberg) lindlely ex. spachwere most soluble in water, ethanol and methanol, least soluble in chloroforms, acetone and pet-ether. In quantitative analysis, moisture content, total

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ash, acid insoluble ash, water soluble ash and solubility matter in different solvents were investigated. The determination of nutrient values of the fruits of revealed that crude fat was present as major constituents and more than others such as crude fibres, carbohydrate and crude protein.Antimicrobial activities were tested on six pathogenic microorganisms by using agar well diffusion method. The results of the present study with chloroform, methanol, acetone, ethyl acetate and ethanol extracts of *Chaenomeles japonica* (Thunberg) lindlely ex. spach showed the significant activities against six microorganisms.The different extracts of the fruit showed effective microbial activity against. *Escherichia coli, Bacillus pumilus and Candida albicans*. The acetone and ethanol extracts showed that they were sensitive against *Bacillus pumilus, Candida albicans* and *Escherichia coli.* Therefore, the present research focus the usefulness of the medicinal plant *Chaenomeles japonica* (Thunberg) lindlely ex. spachon antimicrobial activity.As the suggestion for further studies, the bioactivities should be made for Cholesterol agent, *Chaenomeles japonica* (Thunberg) lindlely ex. spach. Moreover *Chaenomeles japonica* (Thunberg) lindlely ex. spachhave many medicinal values so that further bioactivity studies should be done Chin-Saw-Ka. In Myanmar traditional prectitioners, Chin-Saw-ka has many medical values so that further bioactivity studies should be done.

In the research, the fruits of *Chaenomeles japonica* (Thunberg) lindlely ex. spach are edible for flavorable food and valuable in economic market. So, the economic plant of *Chaenomeles japonica* (Thunberg) lindlely ex. spachcan be utilized for food and Myanmar traditional medicine systematically.

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