DETERMINATION OF SOME KINDS OF IMPORTANT INGREDIENTS OF COMPONANTS AND BIOLOGICAL ACTIVITY OF GARCINIA COWA FRUIT

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SUMMARY

Tai Chua (Garcinia cowa Roxb.) in the plant family of Clusiaceae was a wealthy medical resource. For the industrial use in fruit processing, we need to understand the components extracted in Tai Chua and their bio-activity as well. We found that Tai Chua fruits had 90.28 - 93.43% humidity, 3.05 - 4.36% total acids, 3.03 - 4.34% total orgnanic acids, 0.7 - 0.74% total carbonhydrates, and 57.75 - 64.75 mg/100 g vitamin C. The extract in ethanol showed the high anti-bactrial effects. Three fruit stages were tested, including the young, ripen and over-ripen. The ripen fruits had high nutrients, vitamin C, and strong antibactrial activities. So it had a poten for the production of the foods originated from Tai Chua. The foods would be able to improve detoxicity, anti-imfamatory, antioxidants, slow aging and immunity.

Keywords: Acorn, antimicrobial activity, biochemical composition, organic acid, vitamin C.

I. INTRODUCTION

Garcinia cowa Roxb., Family Clusiaceae distributed in India, South Thailand, Vietnam, Myanmar. In the world, there have been many published studies on the pharmacological effects of secondary compounds extracted from the tree. Garcinia cowa fruit contain high levels of flavonoids, phloroglucinol and xanthone, have anticancer activity, antioxidant, anti-inflammatory, antimicrobial (Hamidi et al., 2017; Shen et al., 2006). In Vietnam, tilapia can be as high as 30 m, distributed more in northern provinces (Lao Cai, Ha Giang, Vinh Phu, Hoa Binh, Bac Thai, Lang Son), in tropical forests, 200 - 800 m above sea level, average temperature 22 - 26^0C, rainfall 1,500 - 2,000 mm. In terms of ecological characteristics, acacia is preferred for high humidity but water and weathered soil from sandstone, schist, granite or limestone. Acorn is usually grown for fruit picking, timber, greening, anti-erosion. Among the parts of the acorn, the fruit is rich in acidity with a sour taste, so it is often used as an additive in the food additive, besides, the fruit is also used as Traditional medicine to detoxify, reduce fever (Sriyatep et al., 2015; Wahyuni et al., 2017). Garcinia cowa, despite its many uses, is a valuable source of medicinal herbs that need to be planted and harvested in a directed manner. However, in our country the harvesting and processing of plant products is only by experience. It has not been standardized both quantitatively and qualitatively, so it is difficult to allow the production of high quality sourced, high quality yogurt products. Contribute to the creation of scientific basis for the processing of tangerine fruits into foods that are nutritious and detoxifying, increasing immunity and energy for the body, publishing scientific information. This study demonstrates some of the biochemical and biological effects of acorn fruit.

II. RESEARCH METHODOLOGY

2.1. Research materials

The fruits of the mature, unprotected trees, use three types of fruit: (i) fruit buns (large size, blue shells, firm fruit and blue-white); (ii) ripened fruits (large size, bright yellow shell and pulp, firm fruit); (iii) ripe berries (large size, yellow pods and flesh, soft flesh). Test organisms include E. coli, Bacillus subtilis (Gram), Aspergillus niger, Pythium (root rot), yeast Saccharomyces cerevisiae.

2.2. Research Methods

Determination of amount of water by drying method: Using heat to evaporate water in the sample. Weigh the sample before and after drying, and then calculate the percentage of water in the sample.

- Analysis of total acid content, total organic acid content, total sugar content, vitamin C content by common biochemical methods: total acidity determined by quantitative method with an alkaline solution standard; the organic acid content determined by the method of heating the sample to be combined with the quantity by a standard alkaline solution; Determine total sugar content by DNS method, use glucose to build up the standard graph; Determination of vitamin C content by titration with Iodine 0.001 N solution (Pham Van Cao, Bui Thi Nhu Thuan, 1991).

- Determination of antimicrobial activity of the test: Trim the sample of the acorn, soaking the sample in 85% ethanol solvent for 30 days. The extract is then filtered and the aqueous solution is obtained until it is viscous. Highly diluted with water in a high proportion of 9 parts water is high crude solution. Determination of activity against five types of microorganisms tested (Escherichia coli, Bacillus subtillis, Aspergillus niger, Pythium, Saccharomyces cerevisiae) by punching and measuring the diameter of microbial resistance ring formed around the hole after 72 h Inoculate microorganisms on the environment and appropriate temperatures for each type of microorganism. Data collected were processed by Microsoft Excel software to calculate mean, standard deviation. Comparison of data differences between experimental formulas by means of statistical analysis of mean quantities. The mean values were statistically significant different when $p < 0.05$ (Chu Van Man, 2009).

III. RESULTS AND DISCUSSION

3.1. Results of the determination of amount of water of *Garcinia cowa* fruit

The amount of water present in the tangerine fruit at three stages (ripening, ripening, ripe), as shown in table 1. The results show that the average moisture content of the fruit at the fruit stage 92.56% fresh fruit, 90.28% ripening fruit, 93.43% ripe fruit. The moisture content valuescorresponding to the different development periods of *Garcinia cowa* fruit were statistically analyzed, and the results showed that the difference between the values was statistically significant. Usually, of the same fruit, the moisture content reflects the dry matter content in the fruit: the high moisture content corresponds to the high water content and the dry matter content (nutrient content) is low, and vice versa. Applying this rule in comparison with the dry matter content of the three fruits, the ripening fruit has the highest dry matter content, and the ripe fruit has the lowest dry matter content.

Table 1. Amount water at different stages of fruit development

Type of fruit	Sample symbol	Weight of cup (g)	Sample weight (g)	Weight of cup and sample (g)		Moisture (% w/w)	Average moisture (% w/w)
				Before drying	After drying		
Immatrure	Bt1	30.3587	10.0065	40.3652	31.0969	92.6228	92.56^{b} ± 0.10
	Bt2	32.4365	10.0098	42.4463	33.1703	92.6692	
	Bt3	29.7139	10.0645	39.7784	30.4514	92.6723	
	Bt4	31.1056	10.0005	41.1061	31.8603	92.4534	
	Bt5	31.2195	9.9958	41.2153	31.9759	92.4328	
	Bt6	30.9160	10.0033	40.9193	31.6661	92.5015	
Matrure	Cth1	32.2430	9.9987	42.2417	33.2163	90.2657	90.28^{c} ± 0.17
	Cth2	29.8122	10.0261	39.8383	30.8085	90.0629	
	Cth3	30.3010	10.0258	40.3268	31.3026	90.0098	
	Cth4	30.5056	10.0343	40.5399	31.4638	90.4508	
	Cth5	30.3492	10.0383	40.3875	31.3124	90.4047	
	Cth6	29.9409	10.0160	39.9569	30.8924	90.5002	
Over matrure	Cm1	31.3740	10.0074	41.3814	32.0250	93.4948	93.43^{a} ± 0.17
	Cm2	30.5192	10.0065	40.5257	31.1848	93.3483	
	Cm3	30.9442	10.0002	40.9444	31.5692	93.7501	
	Cm4	31.3459	9.9991	41.3450	32.0188	93.2704	
	Cm5	29.3668	10.0256	39.3924	30.0271	93.4139	
	Cm6	31.0775	10.0053	41.0828	31.7457	93.3215	

Different letters in the same column show statistically significant differences with $p < 0.05$.

3.2. Analysis of some biochemical components

In biochemical norms related to the quality of food (vegetables, fruits), the total acid content of which contains mainly organic acids and vitamins plays an important role. The results showed that the acidity and total organic acids, total sugar, and vitamin C content of *Garcinia cowa* fruit at different stages of development (Table 2): Total acidity and total organic acids: Total acids include all organic and inorganic acids present in the fruit. Normally, in the plant body, acids usually exist in the form of organic acids. According to Ritthiwigrom et al. (2013), acetic acid in the acorn consists mainly of organic acids such as malic acid, tartaric acid, acetic acid. Analysis of total acidity and total organic acids in sour cherries also showed that, with total acidity as a percentage, when the fruit reached maturity, fruit and fruit ripening was high (3.05% to 4.36%), which accounts for the majority of organic acids (3.03% to 4.34%). In particular, the total acidity and total organic acids at the ripening stage reached the highest and the ripening stage was the lowest. Comparing the organic acidity of the fruit with other nutrient-rich fruits, the organic acidity of the high-yielding of *Garcinia cowa* fruit is comparable to that of apricots, plums, oranges. The total sugar content in the fruit is low, only 0.7% (fruit cake) to 0.74% (ripe fruit). Thus, the sugar/acid ratio in the taurine is low, about 1/6, and that makes the fruit sour. Vitamin C is also known as ascorbic acid - an organic acid, and in total organic acids with vitamin C. However, given the particularly important role of vitamin C in human and animal health (increasing immune system, anti-aging, antioxidant), vitamin C content is determined

separately. The results showed that vitamin C content in the taurine fruit corresponding to different stages of development is different. The vitamin C content in ripe fruits is higher than that of 64.75 mg/100 g, the fruit is 62.41 mg/100 g, and the fruit is ripe with 57.75 mg/100 g. In general, the vitamin C content of the fruit is high, equivalent to high vitamin C fruits such as grapefruit, orange, lemon, strawberry. The results of the study are also consistent with the publication by Sarma et al. (2014) of the vitamin C content of tilapia.

Table 2. Some biochemical norms of the fruit in the development stages

Fruit type	Full fruit acid (% w/w)	Organic Acid (% w/w)	Gross Road (% w/w)	Vitamin C (mg/100 g)
Nine	$3.99^{b} \pm 0.17$	$3.97^{b} \pm 0.08$	$0.70^{b} \pm 0.03$	$62.41^{ab} \pm 1.82$
Nine harvested	$4.36^{a} \pm 0.19$	$4.34^{a} \pm 0.06$	$0.73^{a} \pm 0.03$	$64.75^{a} \pm 1.34$
Nine muzzle	$3.05^{c} \pm 0.14$	$3.03^{c} \pm 0.06$	$0.74^{a} \pm 0.02$	$57.75^{b} \pm 1.37$

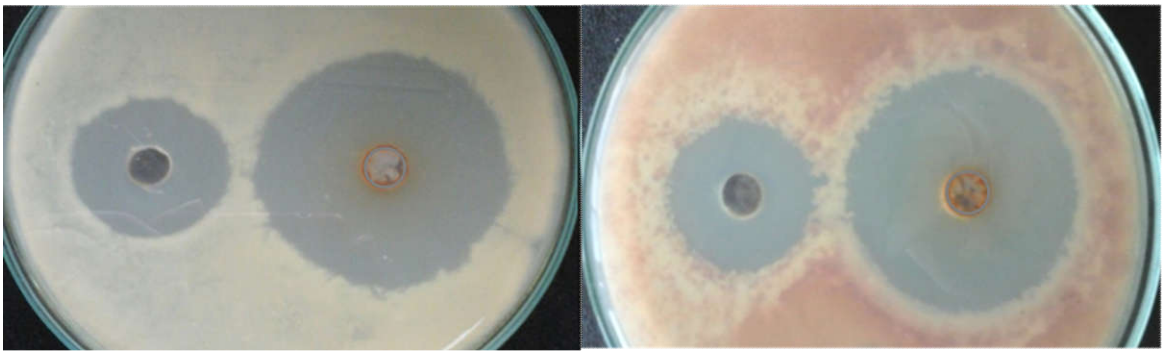
Different letters in the same column show statistically significant differences with $p < 0.05$.

3.3. Results of antimicrobial activity determination

Screening of antagonistic activity against microorganisms including bacteria (Bacillus subtilis, E. coli), mold (Aspergillus niger, Pythium), yeast (Saccharomyces cerevisiae) for the three phases of development, there was a strong activity against all five test organisms, with the inverse diameter of the extracted juice when not diluted with each microorganism, as shown in table 3. The antimicrobial activity of the extracted sour cherubic extract was apparent not only with the untreated fruit extract, but also with 10 times dilution (Figure 1). The results were consistent with the findings of Jabit et al. (2009), which confirmed that the fruit was rich in secondary compounds and resistant to microorganisms.

Table 3. Vitamin C content of *Garcinia cowa* fruit according to periods of development

Type of fruit	Diameter of resistance ring (mm)				
	B. subtilis	***E. coli***	***A. niger***	***Pythium***	***S. cerevisiae***
Nine	3.4 ± 0.05	3.0 ± 0.02	4.0 ± 0.01	2.6 ± 0.02	2.4 ± 0.01
Nine harvested	3.4 ± 0.07	3.1 ± 0.03	4.2 ± 0.06	2.6 ± 0.02	2.3 ± 0.01
Nine muzzle	3.2 ± 0.02	3.0 ± 0.05	4.2 ± 0.04	2.5 ± 0.04	2.3 ± 0.03



(A) (B)

Fig. 1. Bacillus subtilis (A) and Pythium (B) antimicrobial activity of fruit ripening fruit extracted at the non-diluted fruit (right) and diluted 10 times (left)

IV. CONCLUSION

Garcinia cowa (Tai chua) fruit has an organic acid content, high vitamin C content and strong anti-microbial activity. Harvesting of fruit in matrure for nutrient quality and highest vitamin C content. It is suitable as a source of natural ingredients to extract biologically active substances used in medicine and pharmacy, and processed into foods rich in nutritional value, increasing the ability to detoxify and resist inflammation, antioxidant, anti-aging and increased immunity for humans and animals.

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XÁC ĐỊNH THÀNH PHẦN VÀ HOẠT TÍNH SINH HỌC CỦA MỘT SỐ NHÓM HỢP CHẤT CHÍNH TRONG QUẢ TAI CHUA

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TÓM TẮT

Cho đến nay chưa có nhiều nghiên cứu cơ bản về phân tích, đánh giá các giá trị về thành phần hoạt tính sinh học của quả cây Tai chua (*Garcinia cowa* fruit). Vì vậy, việc phân tích các thành phần hóa sinh và các hoạt động sinh học trong quả của *G. cowa* là tiền đề khoa học cho nghiên cứu tiếp theo cho sản xuất và chế biến sử dụng các sản phẩm từ *G. cowa*. Kết quả nghiên cứu cho thấy: hàm lượng nước 90,28 - 93,43%, tổng hàm lượng axit 3,05 - 4,36%, tổng hàm lượng axit hữu cơ 3,03 - 4,34%, tổng hàm lượng đường 0,70 - 0,74%, nồng độ vitamin C 57,75 - 64,75 mg/100 g. Chiết xuất ethanol của củ quả *G. cowa* có hoạt tính kháng khuẩn đáng kể. Quả cây Tai chua (*Garcinia cowa* fruit) là một loại trái cây có tuổi thọ cao và có tính kháng khuẩn cao, thích hợp sử dụng làm nguyên liệu chế biến các thực phẩm chất lượng cao, tăng khả năng giải độc, chống viêm, chống oxy hóa và gia tăng miễn dịch.

Từ khoá: Axit hữu cơ, hoạt tính kháng khuẩn, quả Tai chua (*Garcinia cowa fruit)*, thành phần sinh hóa, vitamin C.

Received : 02/3/2018
Revised : 23/3/2018
Accepted : 02/4/2018