



FORMULATION OF TEA USING *RHUS CHINENSIS* (HEIMANG)

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Abstract: *Rhus chinensis* is lesser known highly acidic fruit, traditionally used for its digestive properties and treatment of diarrhoea, dysentery and gastrointestinal ailments. The parts of the plant that can be used include fruits, leaf and bark. Heimang tea is prepared from dried heimang seeds. It can be ground into powder and packed in tea bags. Heimang fruits are not only rich in vital vitamins and minerals, but being fibre rich can also support a healthy digestive system. While fruits in general are considered to be health protective foods. The major organic acids identified were malic acid, citric acid and ascorbic acid, which are documented for the first time. Knowing the importance and health benefits of *Rhus chinensis*, a study was conducted by formulating tea using *Rhus chinensis*, making the ordinary fruit/seeds into extra ordinary products and to introduce this locally available medicinal fruit to gain its popularity. For the present study using *Rhus chinensis*, ginger, cinnamon, tea leaves powder using different computation two variations was formulated using 9 hedonic rating scale, formulated tea powder was evaluated for sensory attributes, antioxidant analysis was assessed using DPPH Assay method. Hence the *Rhus chinensis* formulated tea powder can be used as functional food since; they provide health benefits and have curative properties which helps in the treatment and control of diseases and disorders.

Key words: *Rhus chinensis*, Antioxidant, Formulation.

I. INTRODUCTION

Manipur has a rich diversity of wild indigenous fruits identified in local communities through local names by reason of their uses for food and medicine and *Rhus chinensis* local name "Heimang" is one such fruit. It is an underutilized fruit due to its non-extensive use, but the fruit plays a major role in supplementing the diet of the local inhabitants. *Rhus chinensis*, commonly called Chinese sumac, Chinese gall or nutgall tree, is an open spreading large shrub or small tree that grows to 15-25'tall. *Rhus chinensis* has long been used by folk medicine practitioners in Asia. Fortunately, recent scientific research has revealed that *Rhus chinensis* compounds possess strong antiviral, antibacterial, anticancer, hepato protective, antidiarrheal and antioxidant activities (M.D. Heirangkhongjam et al, 2018). Moreover, compounds isolated from the stem of *Rhus chinensis* significantly suppressed HIV-1 activity in vitro. Compounds from this plant were also found to inhibit enamel demineralization of dental enamel with fluoride (John Willey et al, 2010). The parts of the plant that can be used include fruit, leaf, and bark (medicinalplants.co.in/heimang/).

Rhus chinensis, a species used in folk medicine by Chinese native people, the anti-HIV-1 activities of the petroleum ether, ethyl acetate, butanol and aqueous extract of *Rhus chinensis*, named as RC-1, RC-2, RC-3 and RC-4, respectively, was evaluated. Utilization of *R.chinensis* appears promising and describes its possible uses for human health with activities like anti-caries, antibacterial, antimicrobial, anti-diabetic, antiviral, anti-diarrhoeal, antioxidant and anti-cholesterol (Rui-Rui et al, 2006).

Heimang fruits are not only rich in vital vitamins and minerals, but being fibre rich can also support a healthy digestive system. While fruits in general are considered to be health protective foods. The major organic acids identified were malic acid, citric acid and ascorbic acid, which are documented for the first time. In comparison to whole fruit and seed pulp showed the maximum activities of antioxidants, total polyphenols and total flavonoids (Memthoi Devi Heirangkhongjam et al, 2018).

Heimang has powerful antioxidants that fight against bad cells that damage healthy cells. Antioxidants that fight against bad cells responsible for heart diseases, premature aging, stomach disorders, and many other adverse events. As a result of another scientific research, it has emerged that the heimang has an effective antifungal effect. Heimang is able to fight against *Aspergillus flavus*, especially a human pathogen. *Aspergillus flavus* can cause infection and shortness of breath.

R.chinensis Mill. Fruits were rich in phenolics, which include 13 types identified and quantified by UHPLC-ESI-HRMS/MS. Among the identified phenolics, myricetin-3-O-rhamnoside and quercetin-3-O-rhamnoside were the most dominant detected in all extracts. Extracts with 80% methanol, 80% ethanol and 80% acetone exhibited strong antioxidant and pancreatic lipase inhibitory activities in vitro, and these activities were positively correlated with phenolic contents. Myricetin-3-O-rhamnoside and quercetin-3-O-rhamnoside demonstrated good lipase inhibitory activities in a dose-dependent manner and synergistically inhibited lipase (Chengting Zhang et al, 2017).

Heimang tea was first developed in Manipur Dweller teas, a start-up tea business from Manipur, founded by Elizabeth Yamben. Since heimang is a traditional medicine, which provides health benefits so, formulating drinks/tea using heimang seeds and other value added ingredients like cinnamon, ginger, tea leaves and also sugar and salt for taste will enhance the quality of the product eventually will provide additional health benefits.

Heimang (*Rhus chinensis*) is a traditionally known for its digestive, antioxidant and antiviral properties. Commonly called as chinese sumac or nutgall tree, Hei-mang is a good source of tannin, which is a naturally occurring polyphenol (excellent antioxidant), adding astringency as well as complexity to the tea blend (www.llando.com, 2014-2019).

II. METHODOLOGY

2.1 Composition of the formulated variations

The ingredients like ginger, cinnamon and tea powder were taken from the Coimbatore local market whereas *Rhus chinensis* is procured from Manipur which is used as a traditional medicine that provides health benefits on consumption. The ingredients was procured from Coimbatore market and partly from Manipur and they are available at minimum cost.

Table 2.1: Composition of the selected ingredients

Ingredients	Standard (g)	Variation 1 (g)	Variation 2 (g)
Rhuschinensis	5	5	5
Tea powder	5	-	-
Ginger	-	2.5	-
Cinnamon	-	-	2.5
Salt	-	2.5	2.5
Sugar	5	5	5
Total	15	15	15

The ingredients was standardized into 15g for all the variations, for standard 5g of *Rhuschinensis* powder, 5g of tea powder and 5g of ground powder was taken, in variation-1 5g of *Rhuschinensis* powder, 2.5g of ginger powder, 2.5g of salt and 5g of sugar and for variation-2 5g of *Rhuschinensis* powder, 2.5 g of cinnamon powder, 2.5g of salt and 5g of sugar. The dried ingredients like ginger, cinnamon, tea leaves, *Rhuschinensis* and sugar were ground into powder was ready in teabags.

2.2 formulation of tea

Formulation of heimang tea possesses two variations and one standard

- Standard: In standard the ingredients i.e. tea powder, sugar, *R.chinensis* powder were used and packed in a biodegradable tea bag .
- Variation 1: In variation one in place of tea powder, ginger powder and salt were used while other ingredients remain the same.
- Variation 2: In variation 2 cinnamon powder, *R.chinensis*, sugar powder and salt were used. Cinnamon were used to enhance the quality of the tea.

2.3 Packaging

The ground ingredients were packed in a tea bag viz. standard, variation 1 and variation 2 separately which needs to dip in a hot water and can drink either in hot or cold form.

2.4 Sensory evaluation

The sensory characteristics like appearance, colour, flavour, taste, odour and overall acceptability of the tea was evaluated by a panel of 10 members who were normal healthy adults using nine point hedonic scale representing like extremely to dislike extremely which were given 9-1 points. According to the scores obtained from the score card were tabulated and mean scores were calculated. 9 is the highest point which indicates like extremely and 1 points indicate dislike extremely.

2.4 Antioxidant analysis

The formulated variations and standard was analysed for antioxidant using DPPH Assay method

$$\% \text{ RSA} = \frac{\text{Abs control} - \text{Abs sample}}{\text{Abs control}} \times 100$$

Where, RSA is the Radical Scavenging Activity

Abs control is the absorbance of DPPH radical + ethanol

Abs sample is the absorbance of DPPH radical + sample extract

DPPH radical scavenging activity:

Diphenylpicrylhydrazyl (DPPH), a violet stable free radical in solution and having an absorbance at 517nm, this colour rapidly disappear when the DPPH is reduced to diphenylpicryl-hydrazine by a compound with anti-radical property, also resulting in a decoloration. The intensity of the staining is inversely proportional to the capacity of the antioxidants present in the medium to give protons. The DPPH scavenging activity was determining according to the assay.



Dry Rhuschinensis



Dry Ginger



Cinnamon



Ground ingredients



Rhus chinensis tea bags



Rhus chinensis tea (heimang)

III. RESULTS AND DISCUSSION

3.1 Organoleptic evaluation of the developed tea

Formulation of tea using *Rhus chinensis* was done to introduce the traditional medicinal fruit available in the North East part of India. In order to enhance the quality of the tea, value added ingredients like ginger, cinnamon and tea powder was incorporated. The proportion used for each ingredients was measured with measuring spoon and the weight of the three product was more than 6gms.

The selection of the raw ingredients of the developed tea with a consideration of its acceptability, enhance the quality of the product and its health benefits. Sensory evaluation of Heimang tea was done by 10 panellist which was selected randomly and the scores of various sensory characteristic evaluation of the product is given below:

Table 3.1 Organoleptic Evaluation of the formulated *Rhuschinensis* tea (Heimang tea)

Sensory characteristic	Mean score		
	Standard	Variation 1	Variation 2
Colour	8.3	7.3	8.1
Taste	8	7.4	8.2
Appearance	8.3	7.0	8.1
Flavour	8	7.4	8.2
Odour	7.6	7.8	8.1
Over acceptability	8.04	7.38	8.14

The sensory evaluation of colour, taste, appearance and flavour for standard and variation-2 were equally accepted as like very much except the odour of the standard which was like moderately. The acceptability of variation-1 was like moderately for colour, taste, appearance, flavour and odour. The organoleptic evaluation of the developed tea, among the three sample variation-2 was mostly accepted by the panellist. The mean score for the acceptability of the developed tea for standard, variation-1 and variation-2 is 8.04, 7.38 and 8.14. Therefore, among the three tea variations, variation-2 was highly accepted by the panellists.

Bar graph representation of the overall acceptability of the three sample

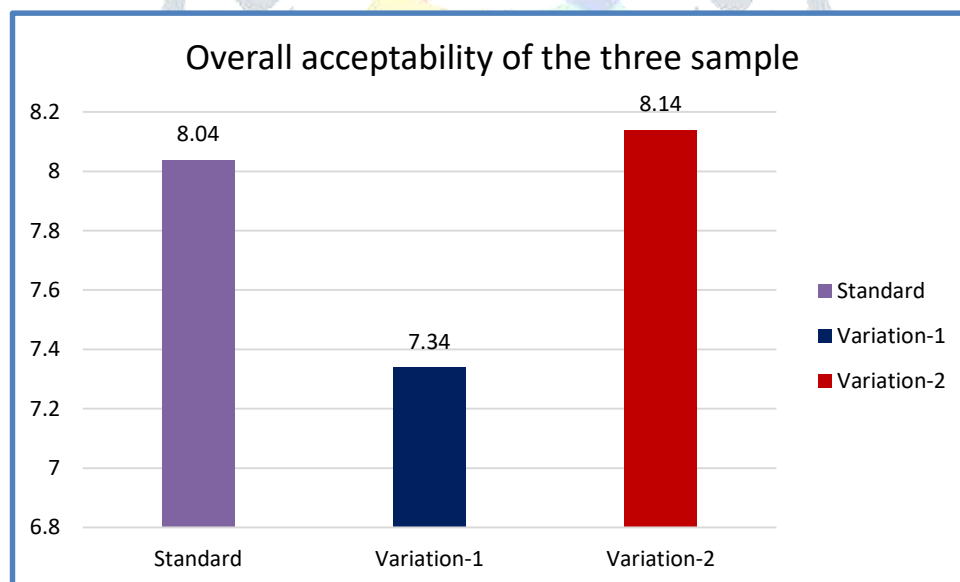


Figure: 1 Graphical representation of the overall acceptability of the three sample

3.2 Total Antioxidant Activity of the formulated Rhus chinensis tea

Formulated variation was analysed for the total antioxidant activity using DPPH method

Table 3.2 Antioxidant activity of Rhus chinensis tea (heimang tea)

Name of the sample	Concentration(μg)				
	10 μg	25 μg	50 μg	100 μg	150 μg
Standard	0.37%	3.00%	11.10%	24.80%	52.10%
Variation-1	0.40%	3.60%	14.20%	27.90%	61.00%
Variation-2	0.53%	4.10%	14.90%	28.90%	64.70%

The antioxidant analysis of the developed tea using DPPH assay was given on the above table. The antioxidant activity of standard, variation-1 and variation-2 at 10 μg is 0.37%, 0.40% and 0.53%, at 25 μg is 3.00%, 3.60% and 4.10%, whereas at 50 μg concentration the antioxidant activity of standard, variation-1 and variation-2 is 11.10%, 14.20% and 14.90%. The antioxidant activity of the three sample at 100 μg is 24.90%, 27.90% and 28.90% and at 150 μg concentration the antioxidant activity of standard, variation-1 and variation-2 is 52.10%, 61.00% and 64.70%. The antioxidant activity of variation-2 has the highest value compare to standard and variation-1.

Total Antioxidant activity of the formulated sample

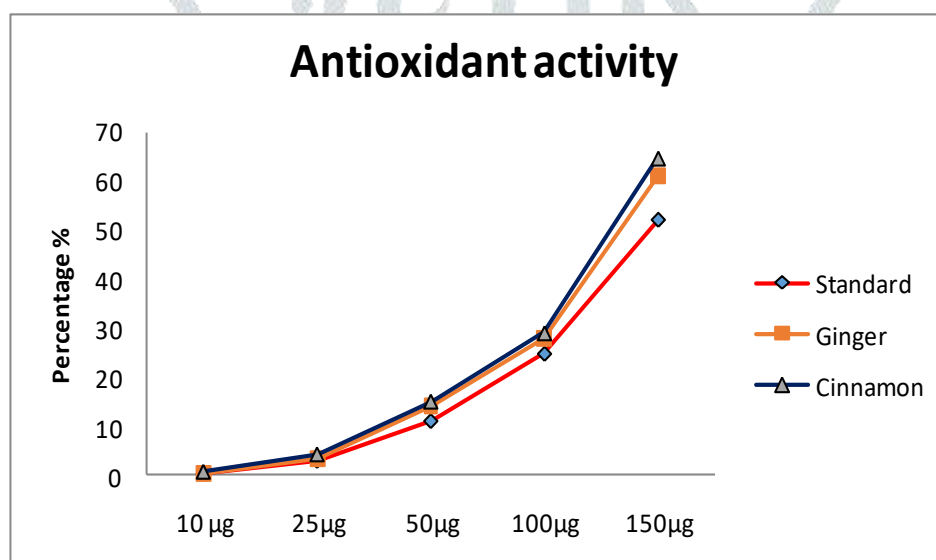


Figure 2: Antioxidant activity of standard, ginger and cinnamon

The graph represent the antioxidant activity of the three given sample, where standard sample has the least antioxidant activity and sample-2 i.e. ginger has the second least scavenging capacity whereas cinnamon sample-3 has the highest antioxidant activity.

Table 3.3: Paired- Sampled T Test of Rhus chinensis tea by DPPH radical scavenging activity

Concentration (µg)	Variations	t	df	Sig. tailed (2-tailed)	mean differences	95% Confidence Interval of the Difference	
						Lower	Upper
10	Ginger	5.28	2.00	0.03*	2.30	4.18	0.42
	Cinnamon	1.01	2.00	0.42	96.34	505.22	312.54
25	Ginger	7.37	2	0.02*	2.83	4.49	1.18
	Cinnamon	17.61	2.00	0.00*	11.00	13.69	8.31
50	Ginger	38.11	2.00	0.00*	6.60	7.35	5.85
	Cinnamon	68.74	2.00	0.00*	10.50	11.16	9.84
100	Ginger	75.10	2.00	0.00*	18.90	19.98	17.82
	Cinnamon	19.79	2.00	0.00*	10.90	13.27	8.53
150	Ginger	35.70	2.00	0.00*	20.30	22.75	17.85
	Cinnamon	61.64	2.00	0.00*	26.23	28.06	24.40

***Significant association**

Variation-1 and variation-2 are significantly associated with standard at different concentration except variation-2 is not significantly associated with standard at 10µg. variation-1 and variation-2 are significantly associated with standard at different concentration since the value are lesser than 0.05 except variation-2 at 10µg concentration i.e.0.42 they are not significantly associated with the standard.

III. CONCLUSION

Rhus chinensis tea (heimang tea) was prepared at a minimum cost using locally available heimang and value added ingredients like ginger, cinnamon and tea powder contributes a desirable amount of antioxidant so it can be considered as functional foods promoting health benefits. They are also highly acceptable by the panellist. The formulated tea was not only accepted but also they have got a high value of antioxidant which will provide health benefits to the consumers.

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