

Formulation and Standardization of *Annona muricata* Leaves Incorporated Chammanthi and Sambar Powder

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ABSTRACT

Annona muricata is a medicinal plant it contain high level of alkaloid, Isoquinone, arporphine and protoberberine. Originating in the Caribbean and Central America, *A. muricata* is currently commonly cultivated in several regions with tropical and subtropical temperatures all over the world. In this study blended chammanthi and sambar powder, *Annona muricata* leaves were used. Vitamin C, an antioxidant with a reputation for strengthening the immune system, is abundant in soursop. Additionally, it encourages the breakdown of free radicals, which can shield our skin and cells from oxidative harm from the environment. Numerous antioxidants, including as phytosterols, tannins, and flavonoids, may be found in soursop (both the fruit and the leaves). Our entire health is influenced by antioxidants, which may also assist to prevent a number of diseases. The purpose of this research was to examine the nutritional composition, organoleptic characteristics, and storage quality that contained in *A. muricata* leaf powder. The freshly harvested leaves underwent 5-7 days of washing and sun drying. The ratio of *A. muricata* incorporated chammanthi powder and sambar powder were in the ratio 2:4:6 (AMCP1, AMCP2, AMCP3), (AMSP1, AMSP2, AMSP3) respectively. Twenty panels of semi-trained judges used a five-point rating system to assess the sensory input in terms of appearance, taste, texture, flavour, colour and overall acceptability. The outcomes showed that customers found the *A. muricata* included items to be very satisfactory. The high antioxidant content that lowers cancer risk and aids in immune strengthening.

Key words: *Annona muricata*, Antioxidant, Nutritional, Organoleptic, Immune

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INTRODUCTION

Around the world, medicinal plants are regarded as the cornerstone of health maintenance and care. *A. muricata* is one of the therapeutic plants. *A. muricata* is a member of the Annonaceae family. Although just a few species have spread outside of the tropics, the family contains of trees, shrubs, and woody climbers. The fibrous and fragrant bark, wood with fine tangential bands of parenchyma, alternating, and distichous leaves, a trimerous perianth, and ruminating endosperm are some of the characteristics that give Annonaceae their look. Due to the antifungal, bacteriostatic, and particularly cytotoxic properties of several chemical compounds in the leaves and bark, various Annonaceae

became significant in pharmaceuticals [1].

A. muricata favour low land locations with an altitude range of 0 to 1,200 meters and can tolerate poor soil conditions. Frost is too strong for it. Although its actual origin is uncertain, it is a native of the Americas' tropical areas and is extensively spread. On all climatic continents, especially in subtropical areas, it is an imported species. The plant is raised for its 20–30 cm long, prickly, green fruit, which is the second largest *Annona* after the jungle sop and may weigh up to 6.8 kg. Outside of its native range, a small amount of output may be found as far north as southern Florida, although much of this is garden planting for local consumption. Additionally, it is widely grown on the Mauritius Islands and in several regions of southeast Asia [2].

This plant can be used to cure a number of illnesses, including fever, respiratory conditions, malaria, liver, heart, and kidney infections, as well as other conditions. The pharmacological effects of *A. muricata* include antibacterial, antiprotozoan, antioxidant, insecticide, larvicide, selective cytotoxicity to tumour cells, anolytic, anti-stress, anti-ulcer, wound healing, anti-icteric, hepatoprotective, and hypoglycemic properties. It has

expanded in usage as a cancer therapy in recent years [3].

The bark, leaves, root, and seeds of *A. muricata* have all been used medicinally in various parts of the world. The decoction of bark, root, seed, or leaf is the preparation that is most frequently used in traditional medicines; however there are many different uses. Many tropical sub-Saharan nations, like Uganda, employ all parts to cure diseases including cancer, diabetes, parasite infections, and malaria [4]. The aqueous extract of *A. muricata* to control lepidopteran larvae, aphids, and thrips among others, highlighted the significance of this plant in pest management [5].

Due to the plant's high iron content, it might raise a person's red blood cell count. In this approach, it can aid in the management of conditions including hypertension and anaemia [6,7]. *A. muricata* bark and leaf extracts increased wound contraction as compared to untreated wounds. Four intricate stages make up wound healing: coagulation, inflammation, proliferation, and maturation. Some of these stages have been demonstrated to be accelerated by *A. muricata*. Collagen accumulated and fibroblasts multiplied throughout the maturation period. *A. muricata* elevates the collagen fibre deposition in the wound [8].

Researchers have been interested in the anti-inflammatory and anticancer capabilities of plant-based medicines because they provide alternative methods for treating a variety of contagious and crippling illnesses. A number of plant extracts have been proposed as potent immunomodulators with promising anti-inflammatory and anticancer properties, including *Annona muricata* L., *Catharanthus roseus* (L.) G. Don, *Camptotheca acuminata* Decne., *Centella asiatica* (L.) Urb., *Ipomoea batatas* (L.) Lam, *Phyllanthus amarus* Schumacher and Thonn [9-15].

In *A. muricata*, several antioxidant screens have been carried out. Natural antioxidants from plant species have drawn attention because of their ability to combat oxygen-derived free radicals, which are linked to the development of several diseases like cancer, cardiovascular disease, arthritis, and degenerative illnesses like Parkinson's and Alzheimers [16].

Objectives

To study the importance and therapeutic value of *Annona muricata* leaf.

To improve the nutrient content of the formulated product.

To evaluate the sensory qualities of the formulated product.

To determine the keeping quality.

METHODOLOGY

Selection of samples

The fresh samples of *Annona muricata* leaves were

selected for this experimental study.

Collection of samples

The fresh sample of *Annona muricata* leaves were collected from Thuckalay, Kanyakumari district. The remaining ingredients, which included coconut, lentils, sesame seeds, dry red chilies, coriander seeds, cumin seeds, fenugreek seed, pepper, mustard seed, curry leaves, oil and asafetida were purchased from a neighboring super market in Thuckalay, Kanyakumari district, Tamil Nadu (Figure 1).

Processing of the sample

To get rid of the dust and other foreign materials, the samples were carefully washed with running water two or three times. Then, it was dried using the old-fashioned method of sun drying, with special attention paid to the dried leaves, and it was ground into a fine powder using a conventional mixer. For further investigation, the material was sealed within an airtight container and kept at room temperature.

Product formulation, preparation of chammanthi and sambar powder

Dry-roast chana dal in a heated iron pan over a medium temperature until the dal turns golden brown. Remove and leave to cool on a platter. Then dry roast the urad dal till it emits a nutty aroma and changes colour (about 4-5 minutes). Place on a platter and leave to cool. The white sesame seeds are then added, and they are toasted until they begin to change colour and crackle. They are then removed to a dish to cool. Dry red chilies and curry leaves are added to a teaspoon of heated oil and sauteed until the red chilies balloon up and the curry leaves become crispy and dry. Once finished, extinguish the flame, place everything on a tray, and allow everything cool fully. Transfer the cooled-down roasted ingredients, salt, and hing to a blender. Depending on your preferences, pulse the components to a fine or coarse powder. After that, return it to the plate and thoroughly combine it with your hands. Place it in a container that is airtight. *A. muricata* leaves were added to the chammanthi powder at three different ratios 2:4:6 AMCP1, AMCP2, AMCP3.

Heat a pan and then add ½ cup coriander seeds and 2 tablespoons cumin seeds. On a low heat, roast the



Figure 1: *Annona muricata* leaves.

coriander and cumin, stirring often, until they become fragrant and change color. It takes roughly 1 to 2 minutes to roast these spices over a low heat. They should smell aromatic. Do not brown them too much. Remove them from the pan and add to a large plate or tray. Wipe the pan with a cotton napkin and add 16 to 18 dry red chilies. Before roasting red chilies, make sure to remove the seeds and the cap. The red chilies should be stirred during roasting until they change colour and have a strong smoky scent. On the same dish add toasted spices, spread out the roasted red chilies. Fenugreek seeds, 1.5 tablespoons, are added. Stir often while roasting. Avoid burning them by roasting until they are browned. To the same plate, remove. Include 1 tablespoon of black pepper, whole. Roast and stir often. Remove the black pepper from the pan and place it on the dish with the other spices as soon as it begins to smell. Add 2 tablespoons of split and husked Bengal gram, or chana dal, to the same pan at this time. The lentils should turn golden before being transferred to a dish with the other toasted spices since chana dal takes longer to cook than the spices. Add 1 tablespoon of split and husked black gram (urad dal) to the pan at this time. Continue stirring the lentils while they roast until they are brown and fragrant. Add them to the platter with the other spices. Include 1/3 cup curry leaves. The curry leaves should be roasted while being stirred until the leaves are crisp. Set apart. Add 1 1/2 teaspoons of black mustard seeds now. When all of the mustard seeds have popped, remove them and set them aside. At this point, turn off the heat and add a half-teaspoon of asafoetida to the pan. When the color changes and you can smell the asafoetida (hing) in the air, remove the pan from heat and keep it aside. Add the cooled spices to your spice grinder. Also add 1/2 tablespoon of turmeric. Depending on the size of your grinder jar and made affine powder. As soon as the masala powder cools at room temperature, then carefully spoon it in an air tight container. *A. muricata* leaves powder were incorporated with sambar powder at three different ratios 2:4:6 AMSP1, AMSP2, AMSP3.

Sensory evaluation

The prepared products were subjected to sensory analysis to find out the acceptability. The formulated products were organoleptically evaluated by using numerical score card. Sensory assessment were evaluated on the quality description (ie) appearance, texture, taste, colour, flavour and overall acceptability. The sensory evaluation was carried out for the product such as *A. muricata* incorporated chammanthi and sambar powder. The product were evaluated by a panel of 20 semi trained panel members from the Department of Nutrition and Dietetics, Muslim Arts College, Thiruvithancode, Kanyakumari District.

Nutrient analysis

Nutrients content was analysed was done in the powdered form of *A. muricata* leaves, such as protein, calcium, iron, and phosphorus. Each recipe's nutritional value and the amount of nutrients in each item were

determined.

Keeping quality of formulated products

The products were stored in different containers and kept at room temperature for two months. Once every 15 days, these containers were examined for the emergence of any off flavors and color changes in the masala mix.

Statistical analysis

The primary data thus obtained was statistically analyzed, specifically the mean, standard deviation, and standard mean error.

RESULTS AND DISCUSSION

Nutrients Analysis of *A. muricata* leaves powder

The nutrients present in *A. muricata* leaves powder such as protein, calcium, iron and phosphorus were analyzed and the result obtained was tabulated (Table 1).

The nutrients analysis of *A. muricata* leaves powder was carried out using standard procedure. The protein content of *A. muricata* leaves powder was 0.144 g. The calcium content of *A. muricata* leaves powder was 82 ppm/ mg. The iron content of *A. muricata* leaves powder was 0.417 µg/ ml. The phosphorus content of *A. muricata* leaves powder was 9.117 µg/ ml. Nutrients present in standard and *A. muricata* leaves powder incorporated chammanthi powder in the ratios 2:4:6 (Table 2).

From the above table it is revealed that 100 g of AMCP contain 7.04 of protein, 206 mg of calcium, 5.266 mg of iron and 215.55 mg of phosphorus. In 100g of AMCP1 contains 7.047 g of protein, 210.1 mg of calcium, 5.28 mg of iron and 216 mg of phosphorus. AMCP2 contains 7.05 g of protein, 214.2 mg of calcium, 5.30 mg of iron and 216.46 mg of phosphorus. AMCP3 contains 7.06 g of protein, 218.3 mg of calcium, 5.32 mg of iron and 216.92 mg of phosphorus respectively. Nutrients present in standard and *A. muricata* leaves powder incorporated sambar powder in the ratios 2:4:6 (Table 3).

From the above table it is revealed that 100 g of AMSP contain 15.108 of protein, 302.42 mg of calcium, 6.495 mg of iron and 276.21 mg of phosphorus. In 100g of AMSP1 contains 15.115 g of protein, 306.52 mg of calcium, 6.286 mg of iron and 216 mg of phosphorus. AMSP2 contains 15.122 g of protein, 310.62 mg of calcium, 6.536 mg of iron and 277.57 mg of phosphorus. AMSP3 contains 15.129 g of protein, 314.72 mg of calcium, 6.557 mg of iron and 277.57 mg of phosphorus respectively.

Sensory evaluation

The sensory evaluation of the formulated products is given in the following Table 4 and Figure 1.

Table 1: Nutrient analysis of *A. muricata* leaves powder.

S. No	Nutrients	Amount
1	Protein	0.144 g
2	Calcium	82ppm/mg
3	Iron	0.417µg ml
4	Phosphorus	9.117 µg ml

From the above Table 4 and Figure 1 the mean sensory analysis of standard and *A. muricata* blended chammanthi powder in the ratios 2:4:6 such as appearance, texture, taste, flavor, color and overall acceptability for AMCP are 5, 5, 4.8, 5, 5, and 4.7; AMCP1 are 4.65, 4.8, 4.35, 4.5 and 4.3; AMCP2 are 5, 4.7, 4.7, 4.8, 5 and 5; AMCP3 are 3.7, 3.3, 3.8, 3.2, 3.1 and 3.45 respectively.

The sensory analysis of standard and *A. muricata* leaves powder incorporated with sambar powder in the ratios 2:4:6. From the Table 5 and Figure 2 the mean sensory

parameters for standard and *A. muricata* blended sambar powder in the ratios 2:4:6 such as appearance, texture, taste, flavor, color and overall acceptability for AMSP are 5, 5, 5, 5, 5, and 4.35; AMSP1 are 4.7, 5, 4.7, 5 and 5; AMSP2 are 3.45, 3.5, 3.5, 3.8, 3.7 and 3.8; AMSP3 are 2.94, 3.4, 3.25, 3.25, 2.9 and 3.5 respectively.

Shelf life of formulated product

Keeping quality of the samples was done for the *A. muricata* blended chammanthi and sambar powder. To

Table 2: Nutrients present in standard and *A. muricata* leaves powder incorporated with chammanthi powder in the ratios 2:4:6.

S. No	Nutrients	Amount (g)	Protein (g)	Calcium (mg)	Iron (mg)	Phosphorus (mg)
1	AMCP	100g	7.04	206	5.266	215.55
2	AMCP1	100g	7.047	210.1	5.28	216
3	AMCP2	100g	7.05	214.2	5.3	216.46
4	AMCP3	100g	7.06	218.3	5.32	216.92

Table 3: Nutrients present in standard and *A. muricata* leaves powder incorporated with sambar powder in the ratios 2:4:6.

S.No	Nutrients	Amount (g)	Protein (g)	Calcium (mg)	Iron (mg)	Phosphorus (mg)
1	AMSP	100 g	15.108	302.42	6.495	276.21
2	AMSP1	100 g	15.115	306.52	6.286	216
3	AMSP2	100 g	15.122	310.62	6.536	277.2
4	AMSP3	100 g	15.129	314.72	6.557	277.57

Table 4: The sensory analysis of standard and *A. muricata* leaves powder incorporated with chammanthi powder in the ratios 2:4:6.

SI.No	Sensory parameters	AMCP		AMCP1		AMCP2		AMCP3	
		Mean ± S.D	S.M.E	Mean ± S.D	S.M.E	Mean ± S.D	S.M.E	Mean ± S.D	S.M.E
1	Appearance	5 ± 0	0	4.65 ± 0.22	0.04	5 ± 0	0	3.7 ± 0.18	0.04
2	Texture	5 ± 0	0	4.8 ± 0.16	0.03	4.7 ± 0.16	0.03	3.3 ± 0.02	0.05
3	Taste	4.8 ± 0.16	0.03	4.35 ± 0.21	0.01	4.7 ± 0.22	0.05	3.8 ± 0.22	0.05
4	Flavor	5 ± 0	0	4.35 ± 0.22	0.05	4.8 ± 0.16	0.03	3.2 ± 0.41	0.09
5	Color	5 ± 0	0	4.5 ± 0.25	0.05	5 ± 0	0	3.1 ± 0.11	0.02
6	Overall acceptability	4.7 ± 0.12	0.02	4.3 ± 0.25	0.05	5 ± 0	0	3.45 ± 0.24	0.05

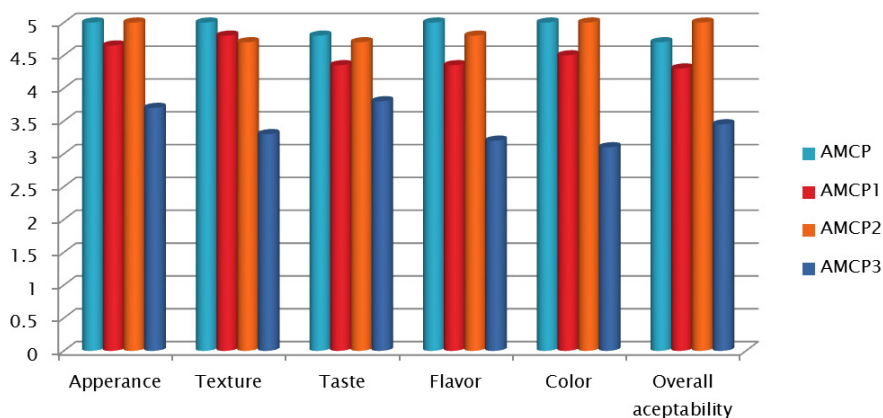


Figure 1: The sensory analysis of standard and *A. muricata* leaves powder incorporated with chammanthi powder in the ratios 2:4:6.

Table 5: The sensory analysis of standard and *A. muricata* leaves powder incorporated sambar powder in the ratios 2:4:6.

SI.No	Sensory parameters	AMSP		AMSP1		AMSP2		AMSP3	
		Mean ± S.D	S.M.E	Mean ± S.D	S.M.E	Mean ± S.D	S.M.E	Mean ± S.D	S.M.E
1	Appearance	5 ± 0	0	4.7 ± 0.12	0.02	3.45 ± 0.24	0.05	2.95 ± 0.32	0.01
2	Texture	5 ± 0	0	5 ± 0	0	3.5 ± 0.25	0.05	3.4 ± 0.24	0.05
3	Taste	5 ± 0	0	4.8 ± 0.16	0.03	3.5 ± 0.25	0.05	3.25 ± 0.19	0.04
4	Flavor	5 ± 0	0	4.7 ± 0.14	0.01	3.8 ± 0.18	0.04	3.25 ± 0.19	0.04
5	Color	5 ± 0	0	5 ± 0	0	3.7 ± 0.22	0.05	2.9 ± 0.25	0.05
6	Overall acceptability	4.35 ± 0.22	0.04	5 ± 0	0	3.8 ± 0.18	0.04	3.5 ± 0.41	0.09

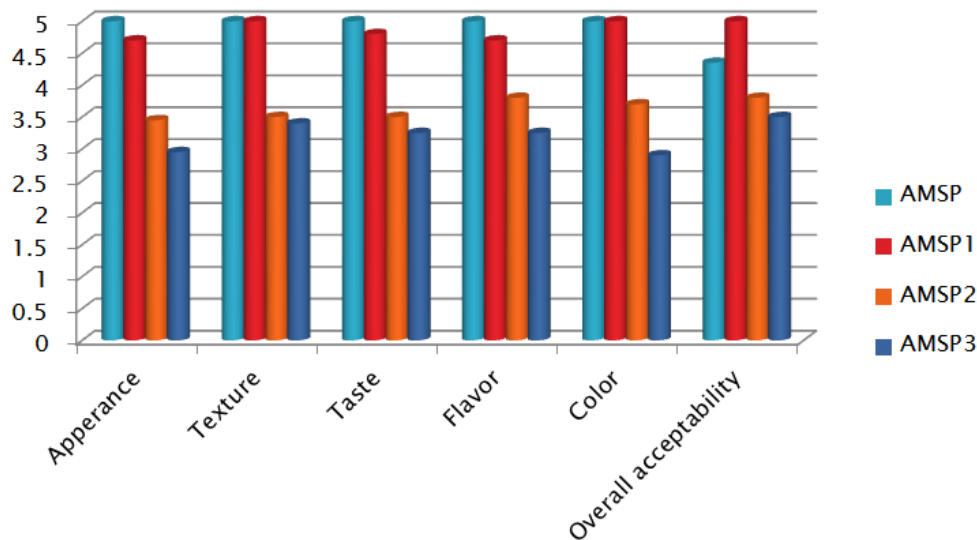


Figure 2: The sensory analysis of standard and *A. muricata* leaves powder incorporated with sambar powder in the ratios 2:4:6.

Table 6: Shelf life of standard and *A. muricata* leaves powder incorporated mix.

S. No	Days	AMCP1	AMCP2	AMCP3	AMSP1	AMSP2	AMSP3
1	15	No Change	No Change	No Change	No Change	No Change	No Change
2	30	No Change	No Change	No Change	No Change	No Change	No Change
3	45	No Change	No Change	No Change	No Change	No Change	No Change
4	60	No Change	No Change	No Change	No Change	No Change	No Change

find out the storage behavior they were kept for about two months at room temperature. These containers were checked as examined once in 15 days for the growth of any microorganism, color changes, development of any off flavor and formation of any buds and insects. From the Table 6 it is found that *A. muricata* leaves powder incorporated chammanthi and sambar powder doesn't show any changes at room temperature for about 60 days.

DISCUSSION

According to the current study, chammanthi and sambar powder that has been combined with *A. muricata* has a longer shelf life and a significant nutritional impact. In mice models, *A. muricata* leaves outperformed curcumin, a well-known natural chemo preventive, in terms of anti-tumor efficacy. This extract has demonstrated a protective impact on biochemical processes and morphological alterations in colorectal cancer induction. *A. muricata* leaf and stem extract found in commercial powder capsules also shown anti-tumorigenic and anti-metastatic effects on pancreatic cancers in animal models [17].

The leaves of *A. muricata* have also been intensively examined for various pharmacological and biological qualities aside from the anti-inflammatory and anticancer effects. The leaves of *A. muricata* exhibited notable antiulcer action against lesions, according to research by Bento, et al. [18]. Additionally, the ethyl acetate leaf extract of *A. muricata* has been found to have outstanding wound healing effects [18]. Superoxide dismutase and catalase, as well as non-enzymatic

antioxidants including vitamin C and vitamin E, were discovered to be present in the *A. muricata* leaves in a different study [20]. The DPPH test showed that the aqueous and ethanol extracts of *A. muricata* leaves have substantial antioxidant activity [21]. Additionally, it was discovered that the leaves of *A. muricata* possessed anti-plasmodial, anti-arthritic, anti-protozoal, antibacterial, antimicrobial, anticonvulsant, antidiabetic, antihypertensive, antiparasitic, insecticidal, gastro protective, molluscicidal, hepatoprotective, and bilirubin-lowering properties [8,22]. The DPPH test showed that the aqueous and ethanol extracts of *A. muricata* leaves have substantial antioxidant activity [21].

CONCLUSION

The results of this investigation indicate that the designed product has a number of health advantages. The item is nutrient-rich in many different ways. It aids in the treatment of several disorders. It receives the greatest value in sensory analysis and can be consumed by those with cancer, diabetes, etc. The formulated product was generally well received.

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