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Formulation and evaluation of nutraceutical powder

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Abstract

The overall aim of this present study was to formulate and evaluate Nutraceutical powder. The crude rugs used in this preparation are Amla, Pomegranate, Guava, Ashwagandha, Tulsi and Beetroot (colouring agent) for effective formulation. These crude rugs contain active constituents like Ellargic acid, Myrtilin, Quercetin, Somniferin, and Oleanolic acid respectively. The formulated Nutraceutical powder was evaluated for Sensory evaluation, Bulk density, Tapped density, Hausner's ratio, and Carr's index, Angle of repose, Moisture content, and Ash value. Nutraceutical powders are food derived from plants and/or their derivatives such as roots, oils, seeds, leaves, flowers, etc. that support wellness and fight against acute and chronic ailments induced by unhealthy dietary fibres. Nutraceutical can be purchased in various formulations such as capsules, pills, Liquid, and gels. Some of the formulations are currently available in the market. This research has also shown the comparison of herbal Nutraceutical formulation with marketed formulations.

Keywords: Cardio protective agents, cattley guava, chebulinic acid, evaluation parameters, isothymonin, *Phyllanthus emblica*

Introduction

The term Nutraceutical was coined from Nutrition and Pharmaceuticals by Stephen De. Felice [1]. The concept of Nutraceutical arises 1st in UK, Germany, and France where the diet was rated higher by consumer, than exercise or hereditary factors to achieve good health [2]. Nutraceutical become known as natural products that make the line between food and drug fade [3]. The Nutraceutical of both plant and animal origin hold exciting opportunities for food industries to create novel food products in the future. Nutraceutical studies are now focusing on the examination of foods for their and disease preventing potential [4]. Instead of negative attributes such as microorganism count, adulterants, Fatty acids, and inorganic pollutant concentration [5].

Emblia officinalis or Amla is a fruit of deciduous tree which belong to the family Euphorbiaceae [6]. The active constituent present in Amla are Gallic acid, Ellargic acid, and Rutin, etc. It possesses analgesic, anti-inflammatory, antioxidant, and several other pharmacological properties [7]. Amla shows heart protective antioxidant, free radical, scavenging properties [8]. It is well known Indian medicinal herb which provides numerous health benefit. Amla consider a powerful rejuvenator and valuable in delaying senescence and degenerative process. Pomegranate is well established fruit of shrub that is particularly cultivated in West Asia and the region around Mediterranean, as well as other parts of world, including America where the climate is suitable for its growth [9]. It belongs to the Family Punicaceae. Pomegranate is well known source of valuable nutritional substance. It contains hydrolysable Tannins, condensed tannins, Flavonols, Anthocyanins and Phenolic organic acid compounds that have been studied and related with numerous health benefits against diseases. The edible part of fruit is at least 50% of fruit (40% of arils and 10% of seeds), and rest is the nonedible peel. Peels are the source of phenolic, minerals, and complex polysaccharides. Another constituent that plays major role in Pomegranate as Functional food is Anthocyanin. The Scientific name of Guava i.e. *Psidium guajava* L. Belongs to Family Myrtaceae. There are about 150 species of guava available in worldwide, out of which common guava, cattley guava, peer guava, and apple guava are the most important species. It has rich nutritional properties like contains dietary fibres, Vitamin A and C, Folic acid, Minerals such as K, Cu, Mn, etc. [10]. This fruit comes in various sizes, shapes, and flavours depending upon variety. Ashwagandha (*Withania somnifera*) belongs to Family Solanaceae has a history of its use in

the traditional Indian medicine date back nearly 3000 years. Its roots have been used as an Aphrodisiac, Narcotic, Tonic, Diuretic, Anthelmintic, and stimulant. There has been a growing interest in type potential health benefit of Ashwagandha particularly in the areas of Stress management, Cognitive function, and physical performances. Tulsi (*Ocimum sanctum*) belongs to the Family of Lamiaceae are excellent source of potential drugs in the recent years there has been an increasing awareness about the importance of medicinal plants. Herbal plant extract are very useful and major source of medicine and plays a vital role in controlling various types of Pathogens.

Ingredient

1) AMLA

1. **Biological source:** *Phyllanthus embolic L.*
2. **Family:** Phyllanthaceae
3. **Synonyms:** Emblica
4. **Chemical Constituents:** 1, 6-di-o-galloyl-beta-D-glucose, kaempferol, Ellagic Gallic acid, corilagin, chebulinic acid.



Fig 1: Amla

Emblica officinalis (EO) holds a sacred place in Ayurveda. The various names for the tree are Alma, Indian glass berry, or *Phyllanthus embolica*. The fruit *Phyllanthus emblica L.* is one of the most popular botanicals used for medicinal and nutraceutical.

Role of Amla as Nutraceutical

Antioxidant activity

Diverse *in vivo*, *in vitro* and human studies support the antioxidant activity of *P. emblica L.* components. In the case of the *in vitro* studies the content of the polyphenol in this fruit has also been associated with high antioxidant activity^[11].

Cardioprotective Activity

Low-density lipoprotein cholesterol is a primary need in the development of atherosclerosis.

Anticancer Activity

Plants from the polyphenols have been found to improve protection against cancer. Specifically, polyphenols inhibit stress and produce pro-inflammatory chemicals to prevent DNA damage and increase apoptosis through various mechanisms^[12].

Digestive Tract Protection: According to the study, the liver of animals treated with Amla extract had significant

improvements in adiponectin activity which improves steatosis.

Neurological Protection

The attenuation of neurological alterations, particularly the biochemical changes observed in carriers of Alzheimer's disease.

Pomegranate

- **Biological source:** *Punica granatum*
- **Family:** Punicaceae
- **Synonyms:** Genus *Punica*
- **Chemical Constituents:** Myrtilli, Ellagic Acid, Cyanidin-3, 5-O-diglucoside, Punicalins, Urolithin Metabolites, Gallagic Acid, Punicic Acid.



Fig 2: Pomegranate

Pomegranate and its juice and extract are currently being widely promoted, with or without scientific support, to consumer as one of the new super foods, capable of addressing a variety of health ailments.

Role of Pomegranate as a Nutraceutical

Antioxidant Activity

Reactive oxygen's species (ROS), formed in normal cellular metabolic processes or generated from exposure to ionizing or xenobiotic radiation, are held non causal factors in a large amount of chronic diseases. Anthocyanins, Phenols, and Vitamins as A, C, E confer the high antioxidant power to Pomegranate as reported by several authors in both *in vitro* and *in vivo* models^[13].

Cardiovascular disease

Dietary consumption of flavonoid-rich nutrients, as well as pure flavonoids, was shown to attenuate the progression of atherosclerosis in animals. atherosclerotic patients with carotid artery stenosis (a narrowing of the arteries in the neck that supply blood to the brain) that consumed pomegranate juice (50 ml day⁻¹) in addition to the irregular medication for one year (n= 10) had on average 30% decrease in intima media thickness (IMT) compared with a 9% increase in IMT in control patients (n = 9)^[14].

Anticancer Activity

Inhibition of cancer takes place by Pomegranate juice which includes various types of cancers like breast, skin, and colon, cervical.

Guava

- 1. Biological Source:** Dried extract of *Psidium guajava* leaves.
- 2. Synonym:** *Psidium guajava*, Peru, Amrood.
- 3. Family:** Myrtaceae.
- 4. Chemical Constituents:** Quercetin, Ascorbic acid, terpenes, Caryophyllene, Limonene, hyperin.
- 5. Geographical Source:** Mexico, Central America, West Indies, Brazil.



Fig 3: Guava

Guava is an important fruit crop cultivated widely. It is considered one of the richest sources of vitamin C. Guava can affect the Myocardium inotropes. Guava skin extract can control the level of diabetes after 21 days of treatment [14].

Role of Guava as Nutraceutical

Antioxidant Activity

Sometimes environmental changes and hormones become reasons for free radicals' production. These free radicals are responsible for Oxidation reactions [15]. Pink guava also has high antioxidant activity [16].

Antimicrobial activity

Guava leaf extract doses can reduce the amount of cough due to its anti-cough activity. Aqueous, chloroform, and methanol extract of leaves can reduce the growth of different bacteria. Guava leaf extract can inhibit the growth of *S. aureus*. Plant leaves and Bark methanol extract can inhibit *Bacillus* and *Salmonella* bacteria [17].

Anti-diarrheal activity

Guava leaves contain morphine-like compounds and control muscular tone. Guava has high cytotoxicity [18]. It is used to treat diarrhea caused by *E. coli* or *S. aureus* toxins [19]. Locomotor coordination can be improved by ethyl acetate extract of Guava fruit [20].

Anti-inflammatory activity

Phenol is an important compound that is present in guava and dependable for anti-allergy and anti-inflammatory activity [21].

Anti-parasitic activity

Guava is reported to have anti-parasitic medications used to treat infection caused by ectoparasites, protozoa, parasitic fungi, and helminths among other things. Guava Leaf essential oil performed effectively as a host for *Toxoplasma Gondii* in an *in vitro* anti-parasitic experiment [22].

Ashwagandha

- 1. Synonyms:** *Withania somnifera*, Indian winter cherry, Indian Ginseng.

- 2. Biological source:** It consists of dried roots and stem bases of *Withania somnifera*, etc.
- 3. Family:** Solanaceae
- 4. Chemical Constituents:** Withanine, tropine, Somniferin, Anahygrine, Choline, etc.
- 5. Geographical source:** Congo, South Africa, Pakistan India (MP, UP, Punjab, Gujarat).



Fig 4: Ashwagandha

Ashwagandha also known as Indian Ginseng is an Indian winter cherry. The material used for medicinal purposes is the root. Ashwagandha is derived from two words 'Ashwa' meaning horse. One gains power similar to the horse after consuming this root. The second word is 'Gandha', which means fragrance and refers to the characteristic smell of the fresh root of the plant [23].

Role of Ashwagandha as a Nutraceutical

Neuroprotective and Anti-Neurodegenerative effect

Ashwagandha use in Alzheimer's disease

Dementia is a syndrome with a multifactorial Etiology characterized by the range of symptoms caused by brain disease, typically with a chronic and progressive course. Neurodegenerative disease destroys the CNS, resulting in irreversible damage. In Alzheimer's disease, an abnormal deposition of β - amyloid protein in the brain is observed.

Ashwagandha use in Parkinson's disease

Ashwagandha improves biochemical parameters, in Parkinson's disease, its effects depend on the dose administered [24].

Anti-inflammatory/Immunomodulatory Effect

Ashwagandha is studied for the treatment of many diseases associated with inflammation in the body, like Cardiovascular, diseases. Autoimmune diseases like diabetes, cancers, and neurodegenerative diseases can also be treated with Ashwagandha.

Antibacterial Properties

Increased infection caused by drug-resistant strains has become a major problem. It is known that reckless and often unwarranted use of antibiotics has resulted in the development of drug-resistant strains, and in some situations, these drugs have become completely ineffective.

Anticancer Effect

Ashwagandha is effective against cancer such as breast cancer, colon, lung, prostate, and blood cancer [25].

Anti-diabetic Activity

Ashwagandha shows effective anti-diabetic properties. Animal studies have shown its ability to lower blood glucose levels [26]. In a study conducted on White albino rats with hypercholesterolemia, a reduction in cholesterol levels and also in the antioxidant effect of *Withania somnifera* were observed [27].

Tulsi

1. **Synonym:** *Ocimum sanctum* L, Gauri.
2. **Biological source:** It consists of dried leaves of the plant *Ocimum sanctum* Linn.
3. **Family:** Lamiaceae.
4. **Chemical Constituent:** Oleanolic acid, ursolic acid, Linolenic acid, rosmarinic acid, Chlorophyll, Eugenol, etc.
5. **Geographical source:** Annual herb found throughout India.

**Fig 5:** Tulsi

Ocimum sanctum L. commonly known as holy basil is an herbaceous perennial and considered one of the most important sources of medicine and drugs with many secondary metabolites and essential oils. Extract of Tulsi is recommended for the treatment of malaria, diarrhoea, bronchial asthma, bronchitis, skin diseases, arthritis, chronic fever, eye disease, etc.

Role of Tulsi as Nutraceutical**Antimicrobial property**

Tulsi leaves contain hexane, acetone, and ethanol extract which have antimicrobial property against certain Gram-positive and Gram-negative bacterial pathogens and some fungi.

Respiratory disorder

Tulsi is an important constituent of cough syrup and expectorants. Chewing Tulsi leaf relieves colds and flu [28]. To treat sore throat boiled water with basil leaves is used for the treatment.

Heart disorder

As Basil reduces the level of cholesterol it has a beneficial effect on cardiac disease and weakness resulting from them [29].

Kidney stone

Basil has strengthened the effect on the kidneys. In case of renal stone, the juice of basil leaves and honey, regularly for 6 months will expel them via the urinary tract [30].

Table 1: Formulation Table

Sr. no.	Ingredients	Quantity in gm	Active constituents	Amount of active constituents	Uses
1.	Amla powder	15 gm	Vitamin C	50 mg	Antioxidant, anti-diabetic, keeps skin healthy
2.	Pomegranate	10 gm	Vit K, Ca, folate, Mg	9.94-Ca,9.74-Mg,7mcg-Vitk	Antioxidants, Anti-athero sclerotic
3.	Basil	5 gm	Methyl cinnamate, linalool		Anti-cancer, Antidiabetic
4.	Ashwagandha	5 gm	Sito in glycoside, Withania A	450 mg of Withania A	Boost memory
5.	Guava	4 gm	Vitamin C	40mg	Antioxidant, heart health
6.	Sucrose	3.5 gm	-	-	Sweetening agent
7.	Cinnamon powder	2.5 gm	-	-	Preservative
8.	Beetroot powder	5 gm	-	-	Coloring agent

Procedure for making dry extract**Fig 7:** Soxhlet Extraction Apparatus**Fig 8:** Amla Powder

- Amla powder can be used in dry form. Amla powder is already available in the market which can be used directly but may have artificial preservatives. So, by preparing in the lab, we can get more and better products.
- First of all, take approximately 10 to 15 Amla fruits.
- Wash them and cut them over the seeds.
- Now cut them into small pieces and grate or grind them coarsely without losing their water.
- Now spread this over a clean butter paper.
- We can sun dry them or we can dry them into hot air oven.
- After complete drying they will leave moisture and become completely dry.
- Now grind them into fine powder.
- Pass from the appropriate sieve.
- Now assemble the Soxhlet apparatus by cleaning allots parts.
- Take vehicle as a water.
- About 30gm of powder is taken and wrapped in filter paper.
- Now add this powdered drug entrapped in filter paper into the thimble of the Soxhlet apparatus.
- Place Dover a heating metal.
- Now heat it and continue the cycles until men strum get completely clear.
- Collect the extract from the round bottom flask.
- Placed in evaporating dish and evaporate it until dry powdered drug is found.



Fig 9: Pomegranate powder

Pomegranate powder can be isolated from its peel or its seeds. But we can use both of them. Peel contains active constituents but its seeds also have a good number of active agents which are used for good heart health.

- The fresh pomegranate fruits are taken then they are peeled and spread over butter paper.
- We can dry the under sunlight but due to its natural color dry it in hot air oven.
- After drying all of they are grinded into a fine powder and then pass them through in a sieve.
- This powder is extracted again in the Soxhlet apparatus.
- This will give the extract which evaporated on a heating bath to get dried extract.
- Now this extract is converted to fine powder and passed through the sieve.
- It is ready to use.



Fig 10: Basil powder

- Basil powder can be isolated from the basil leaves and seeds. Basil leaves and seeds are rich in active constituents.
- Weigh about 10 to 15gm of basil leaves and its seeds.
- Dry the min hot air over.
- Now collect dry basil and convert into fine powder.
- Now extract it with Soxhlet apparatus.
- Now collect the extract and dry it.
- Convert the material into fine powder and pass it through sieve



Fig 11: Ashwagandha powder

- Ashwagandha powder can be used in powder form.
- It is already available in the market so it can be used directly.
- This powder is then extracted using the Soxhlet extractor apparatus.
- Now isolated extract is then evaporated in evaporating dish to get dry extract.
- Now this extract is converted to fine powder and passed through the sieve.
- This extract is used.



Fig 12: Guava powder

Guava powder is one of the critical products to isolate. Fresh guava fruit is taken then it is cleaned. Cut into small pieces or converted to paste. This paste or pieces are sun-dried or hot air oven-dried. This dry product is then grinded into the grinder to get a fine powder. This fine powder is then passed through the sieve. Soxhlet extraction can't be done for the guava. This powder is then used with other powder.

Preparation of powder formulation

1. Weigh all the dry ingredients as mentioned in the formulation table accordingly.
2. Mix it into the mortar and pestle gently.

- Now add a coloring agent, sweetening agent, and preservative to it.
- Now mix all the ingredients to get the final powder.
- Weigh it and pass it through the sieve.
- Nutraceutical powder is ready

Evaluation of Nutraceutical powder

Sensory evaluation

- Colour:** Slightly yellowish cream-colored powder.
- Odour:** Characteristic.
- Taste:** Palatable/fruity.
- Texture:** Amorphous.

Results

Table 2: Evaluation Parameters

Sr. No.	Evaluation Parameters	Result
1.	Bulk Density	1.13gm/ml
2.	Tapped Density	1.25gm/ml
3.	Hauser's Ratio	1.10
4.	Car's Index	9.6
5.	Angle Of Repose	26.67
6.	Moisture Content	0.3%
7.	Total Ash Value	13%
8.	Acid Insoluble Ash Value	2%
9.	Water Soluble Ash Value	4%

Table 3: Comparison with Marketed Formulations

Marketed Products	Disadvantages	Advantages of powder Product over marketed products
Nutraceutical Tablets	Not for any age group. Not carry anywhere safely. Steroids are present.	Children's, young ones easily take by addition with water. Carry as juice at everywhere. All herbal ingredients are present.
Nutraceutical Capsule	Sometimes have leakage.	No leakage of powder.
Powder Formulation	Powder formulations like proteins they are for hair, skin, and help to sustain energy	Nutraceutical powder formulation shows antioxidant activity, antineoplastic activity for the Diseases.

Conclusion

Nutraceuticals are products generally found all over the world today. This formulation gives the freshness to the person. All ingredients used in the formulation are herbal so the side effects of the powder are very low. They are easily available in our day-to-day life. The various compounds used in the nutraceutical powder are mostly herbal compounds having no type of side effect in many cases nutraceutical products offer an advantage over a synthetic drug under development by the Pharma industry. Nutraceutical products such as powder, tablets, and capsules cannot replace pharmaceuticals but can have strong high value tool for the prevention of diseases. The compounds in the powder are as dietary supplements also. The above research provides knowledge about the source, scope, safety, and evaluation of the Nutraceutical powder. Powder products works more effectively as compared to other nutraceutical products. This nutraceutical powder is for diet and nutrient supplements to the body which are required to maintain a healthy lifestyle.

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