



**ANTIOXIDANT ACTIVITY AND NUTRIENT COMPOSITION OF  
VADANARAYANAN (*DELONIX ELATA*) LEAF POWDER HEALTH MIX**

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**Abstract**

*Delonix elata* commonly known as vadanarayanan is an edible green plant in the family. *Delonix elata* leaves contains a phenolic compounds namely flavonones namely quercetin which is reported to have anti-inflammatory activity. A *Delonix elata* leaf powder incorporated recipes namely *Delonix elata* leaf powder incorporated health mix and soup powder were standardised and formulated in three variations. The *Delonix elata* leaf powder incorporated health mix had the highest acceptability in sensory attributes like appearance(8.5±0.5), colour(8.5±0.5), flavour(8.5±0.5), taste(8.5±0.5), texture(8.5±0.5) and overall acceptability(8.4±0.5). The nutrient composition of *Delonix elata* leaf powder incorporated health mix had an energy of 52.85 Kcal, protein content of 4.2g, carbohydrate, 6.65g, fat content of 1.05g and calcium content of 95.7mg. From the study it is concluded that *Delonix elata* leaf can be incorporated in to several recipes to increase the human health benefits.

**Key words:** *Delonix elata*, vadanarayanan, antioxidant activity.

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**1. Introduction**

The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition. Medicinal plants are anciently used for the treatment of human diseases since thousands of years<sup>11</sup>. In Tamilnadu, *Delonix elata* tree is available in most of the homes and on the road sides. It is also locally known in Tamilnadu as ‘Vadhamudakki’ and ‘Vadarakaachi’. *Delonix elata* Linn. is a medicinal plant belong to the family of Fabaceae<sup>2</sup>, its common name is white gulmohar, the tamil name is vaadhanaaraayanana<sup>18</sup>. Many researchers have already revealed the presence of phytochemicals namely alkaloids, flavonoids, steroids, phenols, glycosides and saponins in various plant extracts<sup>9,14</sup>. Extensive pharmacological studies on *Delonix elata* exhibited anti-inflammatory<sup>6,8,12</sup> and anti-arthritic activity.

Compounds like bioflavonoid are reported to produce anti-inflammatory action by decreasing capillary permeability<sup>1</sup>. Steroids are known to produce anti-inflammatory activity. The extracts contain flavonoids/steroid is which resulted in producing antiinflammatory activity<sup>11</sup>. *Delonix elata* leaves contains glycosides, flavonoids, phenols, saponins, tannins and steroids<sup>16</sup>. The presence of these bioactive compounds in crude extracts is known to confer antibacterial activity against disease-causing microorganisms<sup>3</sup>. Compounds like bioflavonoid are reported to produce anti-inflammatory action by decreasing capillary permeability<sup>15</sup>. The extracts tested might contains flavonoids, steriods and terpenoids which resulted in producing anti-inflammatory activity<sup>19</sup>. Though the leaf has beneficial effects in treating arthritis and many other health issues and also available everywhere, people are unaware of the health benefits of this leaf as well as the consumption of the leaf. People are moving towards costly remedies for the rheumatoid problems. Hence, to familiarize the utility of this locally available leaf which is present in the most of the houses and on road sides as the best cost effective solution for all the rheumatoid problems and also bronchial diseases, the investigator made an attempt to do research in this area.

## 2. Materials and Methods

The investigation was carried out in two phases. In the first phase of the study, different value added food products like health mix and instant soup powder was prepared and standardised by the incorporation of dried *Delonix elata* leaf powder. Three variations namely V1, V2 and V3 were prepared. The prepared products were evaluated to find out the most highly accepted level of incorporation. In the next phase of the study, the most accepted product was evaluated for its nutrient composition and antioxidant activity.

### 2.1 Selection And Procurement Of Vaadanarayanan (*Delonix Elata*) leaves

Fresh vaadanarayanan (*Delonix elata*) leaves were collected in the local market of Dindigul district. The *Delonix elata* leaves were checked to be free of rots, insects and worms and washed to clear out dirt. After 4 hours of drying, in a tray drier at 70<sup>0</sup> c the dried *Delonix elata* leaves were crushed to powder and the crushed powder was transferred into mixer grinder and ground for 5 minutes to make a fine powder. This powder was then used for the preparation of food products.



PLATE.1 FRESH *DELONIX ELATA* LEAVES



*DELONIX ELATA* LEAVES POWDER

## 2.2. Standardization And Formulation Of *Delonix Elata* Leaf Incorporated Food

### Products

In easier terms, a standardization of recipe is a complete, specific set of written instructions for cook to produce consistent, high quality recipes every time. The *Delonix elata* leaf incorporated food products namely health mix and instant soup powder were standardised and prepared.

### 2.2.1. Standardisation And Formulation Of *Delonix Elata* Leaf Powder Incorporated

#### Health Mix:

- A standard health mix was prepared using the ingredients with different quantity like ragi(25g), roasted Bengal gram dhal(15g), sesame seeds(10g), almond(15g), cardamom(5g), jaggery(30g) without *Delonix elata* leaf powder.

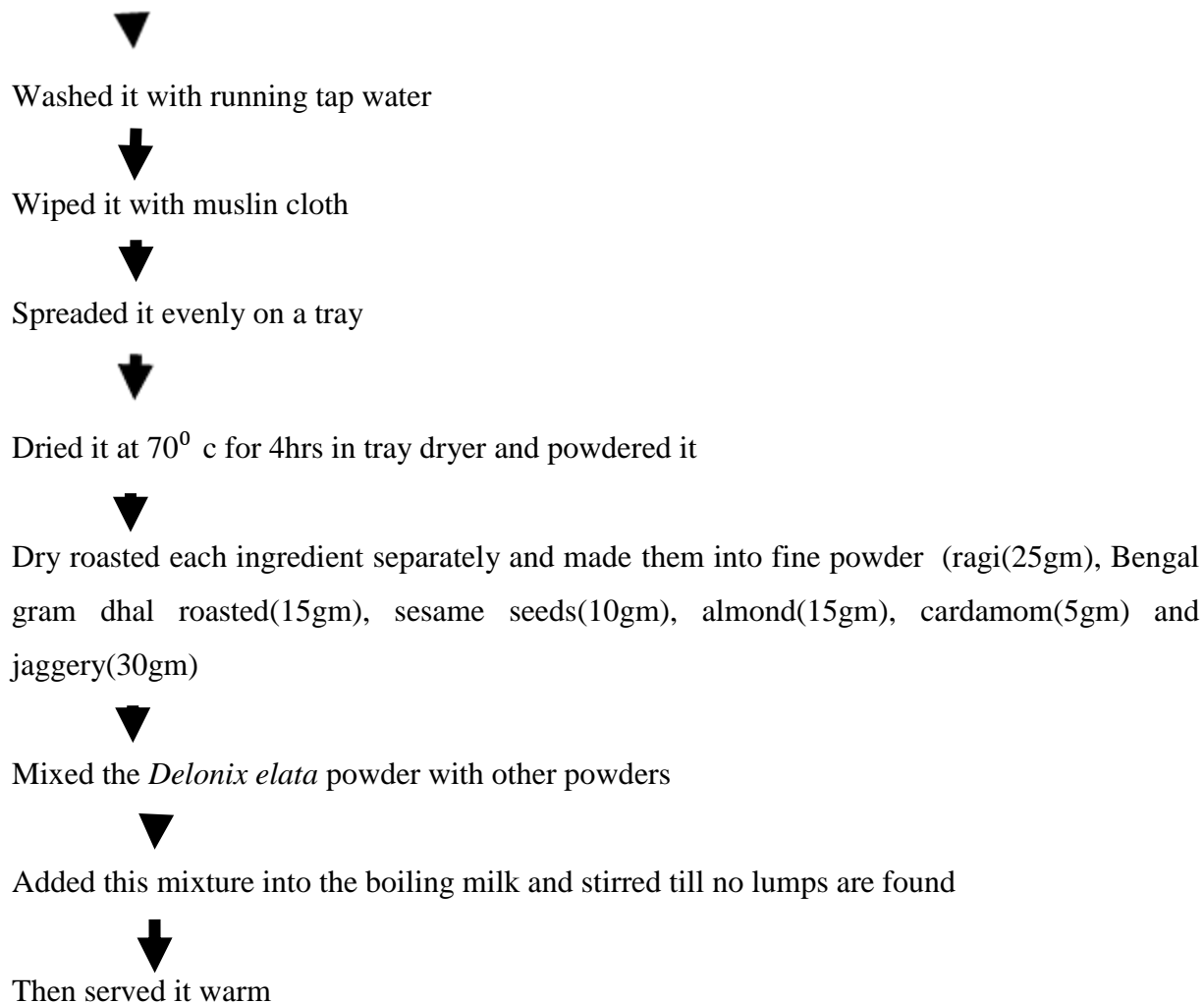
### 2.2.2. Standardisation And Formulation Of *Delonix Elata* Leaf Powder Incorporated

#### Soup Powder:

- The standardisation and formulation of *Delonix elata* leaf powder. A standard soup powder was prepared using the ingredients with different quantity like maize(20g), wheat(20g), peas(20g), pepper(5g), cumin seeds(5g), coriander seeds(10g), cloves(5g), turmeric(5g), ginger(10gm) without *Delonix elata* leaf powder.

### 2.2.3 Preparation Of *Delonix Elata* Leaf Incorporated Health Mix

*Delonix elata* leaves



**PLATE.2** *DELONIX ELATA* LEAF POWDER INCORPORATED HEALTH MIX

#### 2.2.4. Preparation Of *Delonix Elata* Leaf Powder Incorporated Soup Powder

*Delonix elata* leaves

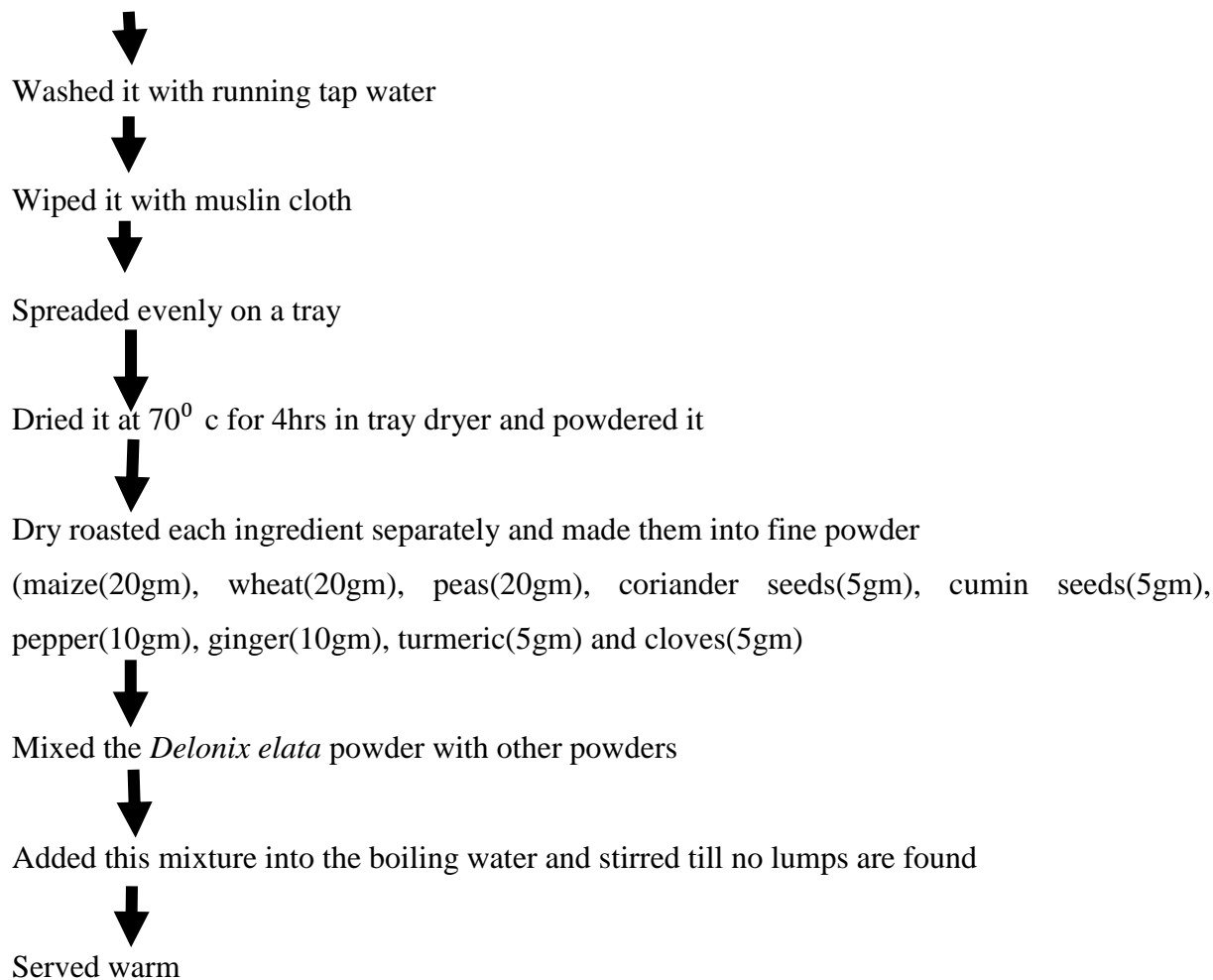


PLATE-3 *DELONIX ELATA* LEAF POWDER INCORPORATED SOUP POWDER

### 2.3. Sensory Evaluation And Acceptability Of *Delonix Elata* Leaf Powder Incorporated Food Product:

According to the Institute of Food Technologists (IFT), sensory evaluation is a scientific method used to evoke, measure, analyse and interpret those responses to products as perceived through the senses of sight, hearing, touch, smell and taste<sup>5,20</sup>. In this study, the formulated *Delonix elata* leaf powder incorporated health mix was evaluated for its highest acceptability against a standard by a testing panel comprising of 25 members.

The nine point hedonic rating scale was used to evaluate the sensory attribute like colour, appearance, flavour, taste, texture and overall acceptability for the selected *delonix elata* leaf powder incorporated recipe.

### 3. Analysis Of Nutrient Content And Antioxidant Activity Of The Selected Recipe :

#### 3.1. Analysis Of Nutrient Content Of The Selected Recipe:

The most accepted variation among the selected recipe variation was subjected to chemical analysis for nutrients in the laboratory. The nutrients like carbohydrate, protein, fat, calcium, iron, fibre, moisture and ash were calculated.

#### 3.2. Analysis Of Antioxidant Activity Of The Selected Recipe:

2,2-di-phenyl-1-picrylhydrazyl (DPPH radical scavenging capacity assay) and ferric reducing (FRAP) assay methods were used for the analysis of antioxidant activity<sup>4</sup>.

### 4. Analysis And Interpretation Of Data:

The collected data was consolidated, tabulated and statistically analysed. Mean and Standard deviation were used for the statistical analysis of data.

### 5. Results And Discussion

**Table. 1. Mean Score Of Acceptability Of *Delonix Elata* Leaf Powder Incorporated Health Mix**

ATTRIBUTES	MEAN±STANDARD DEVIATION			
	STANDARD	VARIATION 1	VARIATION 2	VARIATION 3
APPEARANCE	8.1±0.5	7.8±0.5	8.5±0.5	7.7±0.7
COLOUR	8.1±0.6	7.6±0.6	8.5±0.5	7.2±0.7
FLAVOUR	7.5 ±0.5	7.9±0.7	8.5±0.5	7±0.7
TASTE	7.7±0.7	7.8 ±0.7	8.5±0.5	7.1±0.7
TEXTURE	7.7±0.6	7.7±0.5	8.5±0.5	7 ±0.9
OVERALL ACCEPTABILITY	7.7±0.5	7.5 ±0.5	8.4±0.5	7.3±0.6

**V1- Variation 1(%), V2- Variation (2%), V3- Variation (3%)**

The overall acceptability of *Delonix elata* leaf powder incorporated health mix powder revealed that the variation 2 has got the highest mean score 8.4. The least accepted sample were V1 and V3 with a mean score of 7.5 and 7.3 respectively. The mean score of the variation 2 is the highest than all the variations.

**Table.2. Mean Score Of Acceptability Of *Delonix Elata* Leaf Powder Incorporated Soup Powder**

ATTRIBUTES	MEAN±STANDARD DEVIATION			
	STANDARD	VARIATION 1	VARIATION 2	VARIATION 3
APPEARANCE	7.9±0.8	8±0.7	8±1.0	7.7±0.8
COLOUR	7.8±0.7	7.3±0.6	7.8±0.8	7±0.3
FLAVOUR	7.9±0.8	7.8±0.7	8.3±0.8	6.5±0.5
TASTE	7.7±0.7	7.5±0.6	8.1±0.8	7.5±0.7
TEXTURE	8.2±0.7	7.5±0.7	7.9±0.9	6.8±0.7
OVERALL ACCEPTABILITY	7.3±0.8	7.5 ±0.5	8.1±0.7	7.4±0.6

**V1- Variation 1(%), V2- Variation (2%), V3- Variation (3%)**

The overall acceptability of *Delonix elata* leaf powder incorporated soup powder revealed that the variation 2 has got the highest mean score 8.1. The least accepted sample were V1 and V3 with a mean score of 7.5 and 7.4 respectively. The mean score of the variation 2 is the highest than the all variations.

**Table.3. Antioxidant Activity Of *Delonix Elata* Leaf Powder**

CONCENTRATION (µg/ml)	ASCORBIC ACID	ANTIOXIDANT ACTIVITY (µg/g)
20	220±3.1	190.35±0.5
40	225.65±2.9	221.05±1.5
60	258.55±3.5	236.10±1.5
80	346.85±2.5	245.30±0.5
100	344.55±1.6	282.20±1.5

**SOURCE:** Antioxidant activity of ferric (FRAP) assay and DPPH assay,<sup>17</sup>.

The above shows the antioxidant activity of concentration of 20µg/ml contains 190.35±0.5µg/g and concentration of 100µg/ml contains 282.20±1.5µg/g.

**Table.4. Antioxidant Activity Of *Delonix Elata* Leaf Powder Incorporated Health Mix**

CONCENTRATION (µg/ml)	ASCORBIC ACID	ANTIOXIDANT ACTIVITY (µg/g)
20	220.35±3.1	191.20±2.5
40	225.65±2.9	209.15±1.5
60	258.55±3.5	223.30±1.5
80	346.85±2.5	230.70±1.5
100	344.55±1.6	276.30±2.5

**SOURCE:** Antioxidant activity of ferric (FRAP) assay and DPPH assay<sup>17</sup>. The above shows the antioxidant activity of concentration of 20µg/ml contains 191.20±2.5µg/g and concentration of 100µg/ml contains 276.30±2.5µg/g.

**Table.5. Nutrient Composition Of *Delonix Elata* Leaf Powder Incorporated Health Mix Powder**

NUTRIENTS	RESULTS (g/100g)
Carbohydrate (g/100g)	6.65g
Protein (g/100g)	4.2g
Fat (g/100g)	1.05g
Fibre (g/100g)	15.6g
Moisture (g/100g)	75g
Calcium (g/100g)	95.7mg
Iron (g/100g)	6.9mg
Ash (g/100g)	2.54g

The above table shows the nutrient composition of *Delonix elata* leaf powder incorporated calcium rich powder highly acceptability. It had an carbohydrate(6.65g), protein(4.2g), fat(1.05g), fibre(15.6g), calcium(95.7), iron(6.9mg), moisture(73g) and ash(2.54g).

### Conclusion

- The study proved that the *Delonix elata* leaf powder incorporated recipe was palatable and can be used for preventing the rheumatoid arthritis. *Delonix elata* leaves is an



underutilised food in India. Moreover *Delonix elata* leaves can be utilized for its anti-inflammatory capacity for preventing rheumatoid arthritis and inflammation. *Delonix elata* leaf powder incorporated recipes will help in preventing rheumatoid arthritis, inflammation as they have anti inflammatory activity and presence of phenolic compound contain flavonones namely quercetin help against rheumatoid arthritis, inflammation and many other conditions. From this study, it is concluded that, *Delonix elata* leaf powder can be incorporated in several recipes are nutritious and will help in combating many diseases.

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### References

1. Di Carlo G et al. Flavonoids: old and new aspects of a class of natural therapeutic drugs. *Life Sci.* 1999;65(4):337-53-3523. doi: 10.1016/s0024-3205(99)00120-4, PMID 10421421.
2. Ghada A, El-Hegazi M. In vitro studies on *Delonix elata* pL. an endangered medicinal plant. *World Appl Sci J.* 2011;14(5):679-86.
3. Gutteridge JM. Lipid peroxidation and antioxidants as biomarkers of tissue damage. *Clin Chem.* 1995;41(12 Pt 2):1819-28. doi: 10.1093/clinchem/41.12.1819, PMID 7497639.
4. Huang D, Ou B, Prior RL. The chemistry behind antioxidant capacity assays. *J Agric Food Chem.* 2005;53(6):1841-56. doi: 10.1021/jf030723c, PMID 15769103.
5. IFT (Institute of food Technologists). Sensory evaluation methods. Chicago: Society for the Food Technologists; 2007.
6. Krishan Rao RV, Ganapathy P, Mallikarjuna Rao GR B. Anti-inflammatory activity of the leaves and barks of *Delonix elata*. *Anc Sci Life.* 1997;17(2):01-3.
7. Lu Y, Yeap Foo L. Antioxidant activities of polyphenols from sage (*Salvia officinalis*). *Food Chem.* 2001;75(2):197-202. doi: 10.1016/S0308-8146(01)00198-4.
8. Manimekalai K, Shetty H, Salwe K. Evaluation of the effect of the ethanolic extract of *Delonix elata* on acute inflammation in rats. *J Nat Pharm.* 2011;2(3):149-53. doi: 10.4103/2229-5119.86265.
9. Mojab F, Kamalinejad M, Ghaderi N, Vahidipour HR. Phytochemical screening of some species of Iranian plants. *Iran J Pharm Res.* 2003;2:77-82.
10. Momin RK, Kadam VB. Determination of ash values of some medicinal plants of genus

- Sesbania of Marathwada region in Maharashtra. *J Phytol.* 2011;3(12):52-4.
11. Mujumdar AM, et al. Antiinflammatory activity of *Curcuma amada* Roxb. in albino rats. *Indian J Pharmacol.* 2000;32:375-7.
  12. Muruganathan G, Mohan S. Anti- arthritic and immune modifying potential of *Delonix elata* Bark extracts. *Res J Pharm Biol Chem Sci.* 2013;4(2):1642-8.
  13. Muruganathan G, Mohan S. Anti-inflammatory and Anti-arthritic activities of *Delonix elata* bark Extracts. *Int J Res Ayur Pharm.* 2011;2(6):1819-21.
  14. Parekh J, Chanda S. Phytochemicals screening of some plants from Western region of India. *Plant Arch.* 2008;8(2):657-62.
  15. Parmer NS, Ghosh MN. Anti-inflammatory activity of gossypin a biflavonoid isolated from *Hibiscus vitifolicus* Linn. *Indian J Pharmacol.* 1978;10:277-93.
  16. Verma R, Pavithra P, Janani V, Charumathi K, Indumathy R, Potala S. Antibacterial activity of plants used in Indian herbal medicine. *Int J Green Pharm.* 2010;4(1):22-8. doi: 10.4103/0973-8258.62161.
  17. Prior RL, Wu X, Schaich K. Standardized methods for the determination of antioxidant capacity and phenolic in foods and dietary supplements. *J Agric Food Chem.* 2005;53(10):4290-302. doi: 10.1021/jf0502698, PMID 15884874.
  18. Samvatsar S, Diwanji VB. Plants used by the tribals of western M.P. *J Econ Taxon Bot.* 1999;23:305-14.
  19. Sethuraman MG, Sulochana N, Arivudai NR. Anti-inflammatory activity of *Wrightia tinctoria* flowers. *Indian Drugs.* 1984;22(3):158-9.
  20. Stone H, Sidel J. *Sensory evaluation practices.* 2<sup>nd</sup> ed. San Diego: Acad Press Inc; 1993.