

DEVELOPMENT AND SENSORY EVALUATION OF ENDODERMIS LAYER (*Acacia nilotica*) POWDER BASED PRODUCTS

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ABSTRACT

Acacia nilotica is a legume which helps in brace the gums that is extensive in sub tropical region of Australia, Asia and Africa. This tree has multiple medical benefits specially the bark which contains condensed tannin, flavonoids, gums and phlaba tannins. The crucial water soluble compound called ‘tannin’. Tannin solution is acidic and has an astringent taste. Tannins are known bactericides because they react with proteins irreversibly. Tannin- based pharmaceuticals to cure infections. The present study was aimed to investigate the possibility of bark powder to develop food products without detracting them from their organoleptic properties.

Key Words : Tannins, bark, organoleptic properties, astringent

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INTRODUCTION

Acacia nilotica (L.) Willd. ex Delile) is a medium sized, thorny, nearly evergreen tree that can reach a height of 20 -25 m but may remain a shrub in poor growing conditions. *A. nilotica* is a plant with a thick spherical crown, stems and branches usually sinister to black colored, grey-pinkish slash, fissured bark, exuding a reddish low quality gum. The plant has straight, light, thin, grey spines in axillary pairs, usually in 3 to 12 pairs, 5 to 7.5 cm long in young trees, mature trees commonly without thorns. *A. nilotica* is a pantropical and subtropical genus with species abundant throughout Asia, Australia, Africa and America. *A. nilotica* occurs naturally and is imperative in traditional rural and agro-pastoral systems (Shittu, 2010, Ali et al.,2011). *A. nilotica* is recognized by the following names: *Acacia*, *Acacia Arabica*, Babhul - Hindi and Napalese, Babla - Bengali, Babool - Unani, Babool Baum - German, Babhoola - Sanskrit, Babul, Babul Tree, Huanlong Kyain - Burmese, Kikar, Mughilan - Arabian Indogom - Japenese and Ummughion – Persian (Steve, 2004, Ali et al.,2011). *A. nilotica* is an imperative multipurpose plant that has been used broadly for the treatment of various diseases (Singh et al., 2009b, Ali et al.,2011).

Natural medicinal plants promote self healing, good health and durability in ayurvedic medicine practices and have acknowledged that *A. nilotica* can provide the nutrients and therapeutic ingredients to prevent, mitigate or treat many diseases or conditions). The stem bark has various uses like Anti bacterial, Anti-diabetic - Diabetes is a hyper glycemc condition due to improper carbohydrate and lipid metabolism or defect in insulin secretion/action. Over time, having high glucose in blood can cause various disorders like damaging of eyes, kidneys, and nerves. Diabetes is increasing at an alarming rate around the world; i.e., 25.8 million among the children and 8.3% in adults. According to world health organization diabetic cases will reach 336 million by 2030 (Sabu et al.,2002, Zubair, M. et al.2022) , antioxidant, anti-mutagenic, cytotoxic bark is used as astringent, acrid cooling, styptic, emollient, anthelmintic, aphrodisiac, diuretic, expectorant, emetic, nutritive, in hemorrhage, wound ulcers, leprosy, leucoderma, small pox, skin diseases, biliousness, burning sensation, toothache, leucoderma, dysentery and seminal weakness. The trunk bark is used for cold, bronchitis, diarrhoea, dysentery, biliousness, bleeding piles and leucoderma (Agrawal et al., 2010; Del, 2009; Kalaivani and Mathew, 2010b; Kaur et al., 2005; Singh et al., 2009; Singh et al., 2008a, Ali et al.,2011). The bark is used extensively for colds, bronchitis, biliousness, diarrhoea, dysentery, bleeding piles and leucoderma (Del, 2009, Ali et al.,2011). It is used by traditional healers of different regions of Chattisgarh in treatment of various cancer types of mouth, bone and skin. In West Africa, the bark and gum are used against cancers and/or tumors (of ear, eye, or testicles) and indurations of liver and spleen, the root for tuberculosis, the wood for smallpox and the leaves for ulcers (Kalaivani and Methew, 2010a, Ali et al.,2011). The compound present in the bark of *Acacia nilotica* that is Tannins which is mainly catechin gallates, gallic acid, ellagic acid etc. are the main phytochemicals that have been identified from different parts of *A. nilotica* (Jigam et al., 2010, Leela et al., 2010). Several research investigations are directed to study their degradation in order to ensure their safe use in food, pharmaceutical and other industrial applications. A number of microbes have been studied for their ability to break tannin-protein complexes and degrade tannins, especially hydrolysable (Rather L. J. et al., 2015).

PROCEDURE

The *Acacia nilotica* bark is very beneficial for gum health . Childen are fond of eating sweets so, these products development proven to be healthy for their gum health.

The bark of tree scratched and sun dried for 4-5 days to extract out the moisture content completely. The sun dried bark grind in a mixer to form fine powder which further used in the products. You can easily stored that in air tight container.

The products are prepared in 4 samples:

| | Candy/toffee | Candy/toffee (without milk) | Chaulai ladoo |
|------------|--------------|-----------------------------|---------------|
| Controlled | 100g | 100g | 100g |
| Sample 1 | 95:5 | 97.5:2.5 | 95:5 |
| Sample 2 | 90:10 | 95:5 | 90:10 |
| Sample 3 | 85:15 | 92.5:7.5 | 85:15 |

The beverage and mouthwash are prepared manually for gargle which works as mouth healer and freshner. Prevent from gum disorder.



SENSORY EVALUATION OF DEVELOPED PRODUCTS

Trained panel members evaluated the developed candy/toffee, chaulai Ladoo, mouthwash, medicinal beverage for colour, taste, texture and overall acceptability using 9-point hedonic scale.

Nine-point hedonic test

In this test, the consumers were asked to measure the degree of pleasurable and unpleasurable experience of food products on a nine-point hedonic test ranges from one to nine which were considered as dislike extremely to like extremely respectively. Scores are based on the hedonic scale of 1 to 9 where 1 = I dislike extremely (very bad) and 9 = I like extremely (Excellent) (Melgaard et.al, 1999). The samples were presented in plates along with water to the panellists. The score card of evaluation of sensory properties of candy/toffee, candy/toffee (without milk and milk powder), chaulai Ladoo, mouthwash, medicinal beverage is presented in Appendix.

STATISTICALLY ANALYSIS

The data was collected and further recorded in MS Excel (2010). The mean value and standard deviation (SD) of each class of each group, for every preparation was calculated. Standard error means (SEM) was calculated from mean and SD. Values. The data in the next chapter is presented as Mean \pm SEM.

CALCULATION OF NUTRITIVE VALUE OF THE PRODUCTS

Nutritional value or nutritive value as part of food quality is the measure of a well-balanced ratio of the essential nutrients carbohydrates, fat, protein, minerals and vitamins in items of food or diet in relation to the nutrients requirements of their consumer. Several nutritional rating systems and nutrition facts label have been invented to be able to rank food in terms of its nutritional value.

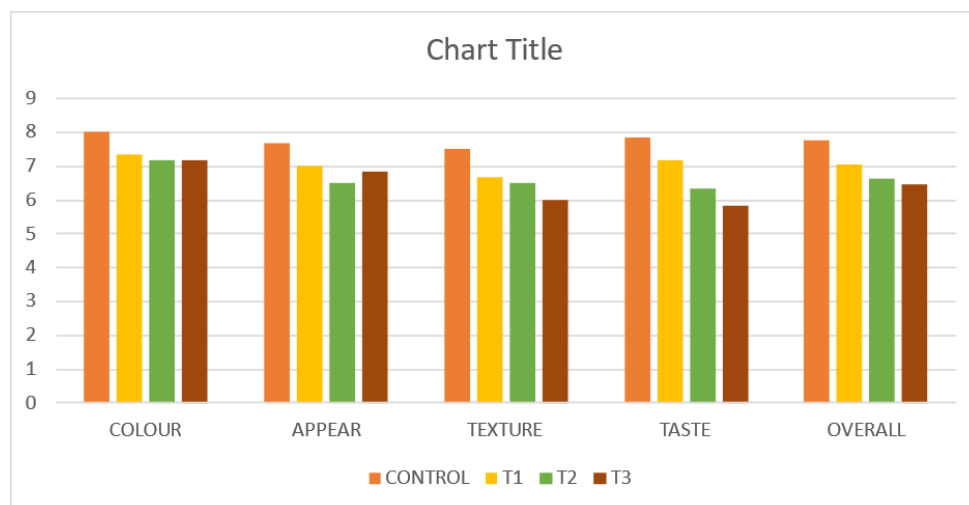
RESULT

The present study was aimed to investigate the possibility of bark powder to develop food products without detracting them from their organoleptic properties. Therefore, an attempt has been made to develop and formulate bark powder incorporated candy/toffee, chaulai Ladoo, mouthwash, medicinal beverage. These products were studied for sensory and nutritive properties. The results were subjected to statistical analysis and discussed with the help of tables, graphs and presented under the sections as below.

1. Mean sensory scores of *A. nilotica* bark powder incorporated candy/toffee

| Treatment | Colour | Appearance | Texture | Taste | Overall acceptability |
|-----------|----------|------------|----------|----------|-----------------------|
| Control | 8±0 | 7.6±0.8 | 7.5±0.8 | 7.8±0.4 | 7.7±0.3 |
| SAMPLE 1 | 7.3±0.5 | 7±0 | 6.6±0.8 | 7.1±0.4 | 7.0±0.3 |
| SAMPLE 2 | 7.1±0.9 | 6.5±0.54 | 6.5±0.83 | 6.3±0.81 | 6.6±0.18 |
| SAMPLE 3 | 7.1±1.32 | 6.8±1.1 | 6±0.89 | 5.8±0.98 | 6.4±0.19 |

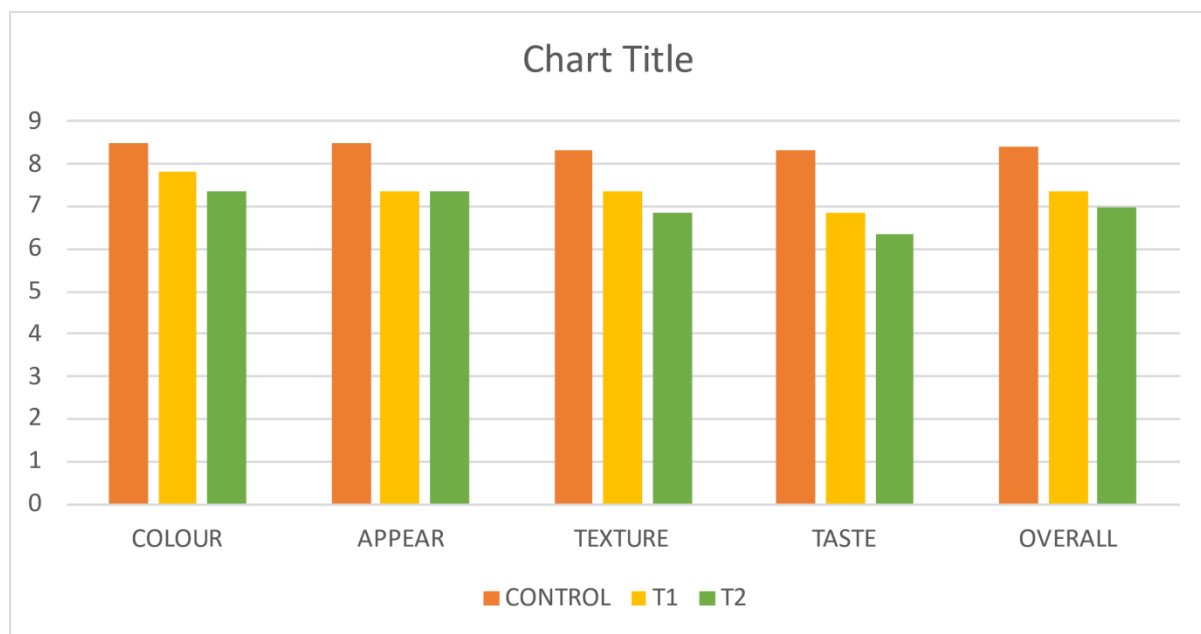
Bar graph showing the acceptability of candy/toffee incorporated with *A. nilotica* bark powder



2. Mean sensory scores of *A. nilotica* bark powder incorporated candy/toffee (without milk and milk powder)

| Treatment | Colour | Appearance | Texture | Taste | Overall acceptability |
|--------------------------|----------|------------|----------|----------|-----------------------|
| Control | 8.5±0.5 | 8.5±0.5 | 8.3±0.5 | 8.3±0.5 | 8.4±0.01 |
| Type1(ANC ₁) | 7.8±0.4 | 7.3±0.5 | 7.3±0.5 | 6.8±0.9 | 7.3±0.25 |
| Type2(ANC ₂) | 7.3±0.8 | 7.3±0.51 | 6.8±0.40 | 6.3±0.81 | 6.95±0.20 |
| Type3(ANC ₃) | 7.5±0.54 | 7.5±0.5 | 6.6±0.51 | 6±1.09 | 6.91±0.27 |

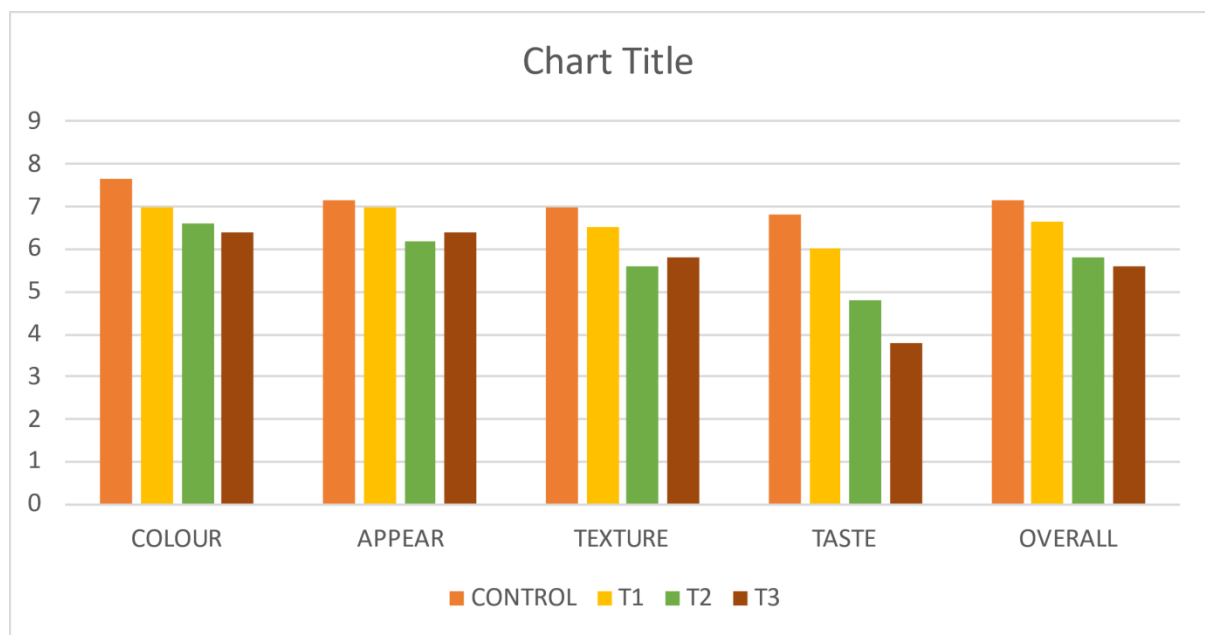
Bar graph showing the acceptability of candy/ toffee (without milk and milk powder) incorporated with *A. nilotica* bark powder



3. Mean sensory scores of *A. nilotica* bark powder incorporated chaulai Ladoo

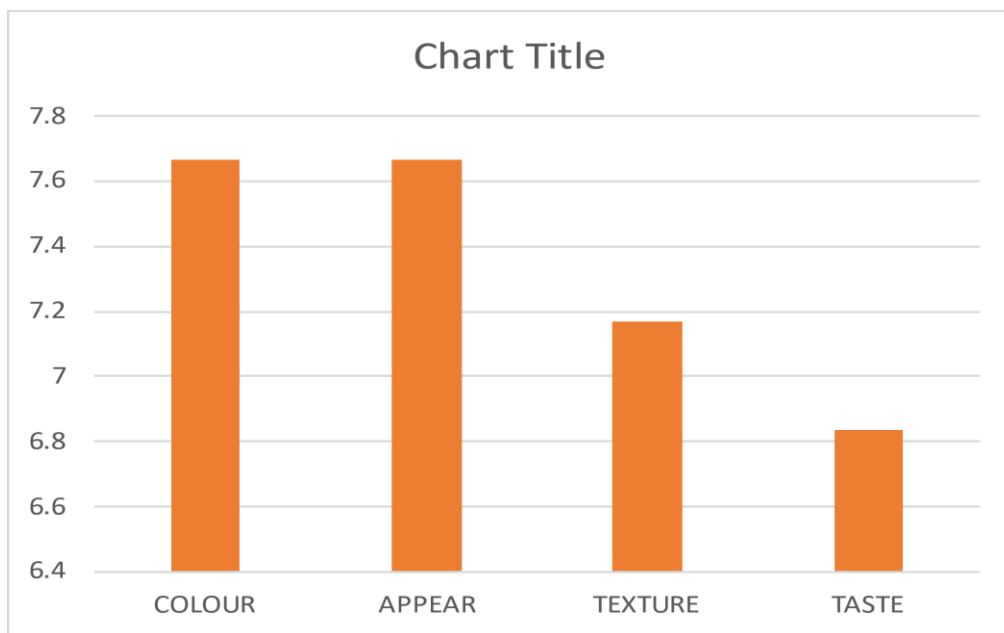
| Treatment | Colour | Appearance | Texture | Taste | Overall acceptability |
|--------------------------|----------|------------|----------|----------|-----------------------|
| Control | 7.6±0.5 | 7.1±0.4 | 7±0 | 6.8±0.4 | 7.1±0.22 |
| Type1(ANL ₁) | 7±0 | 7±0 | 6.5±0.5 | 6±0.6 | 6.6±0.34 |
| Type2(ANL ₂) | 6.6±0.5 | 6.2±0.44 | 5.6±0.54 | 4.8±1.09 | 5.8±0.29 |
| Type3(ANL ₃) | 6.4±0.54 | 6.4±0.54 | 5.8±0.44 | 3.8±1.64 | 5.6±0.56 |

Bar graph showing the acceptability of chaulai Ladoo incorporated with *A. nilotica* bark powder



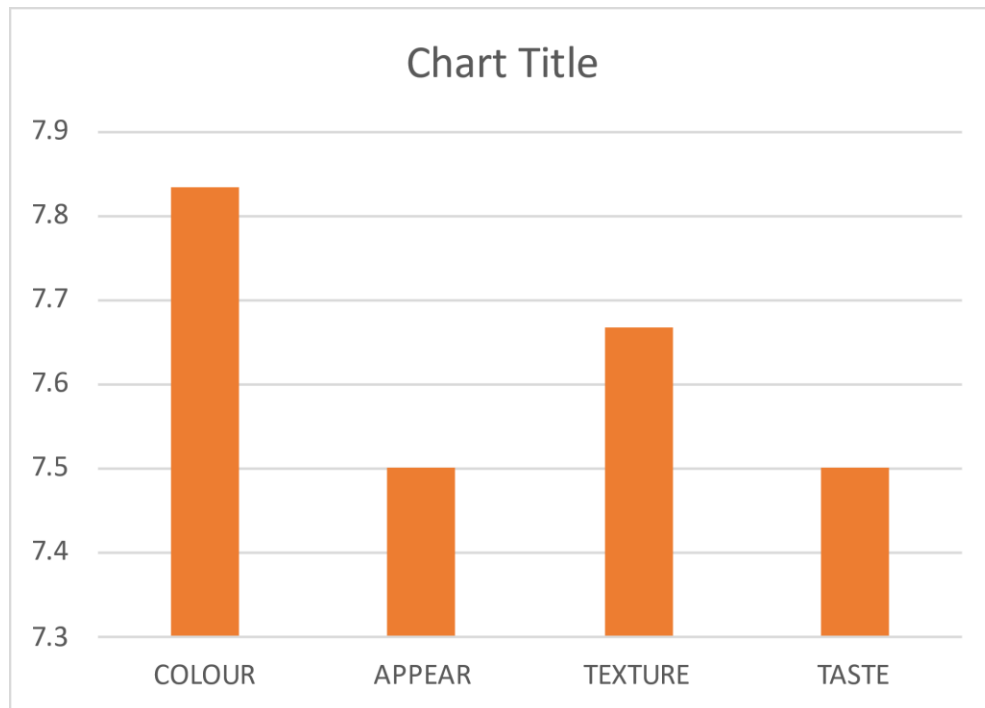
Mean sensory scores of *A. nilotica* bark incorporated mouthwash

| Treatment | Colour | Appearance | Texture | Taste | Overall acceptability |
|-----------|---------|------------|---------|---------|-----------------------|
| sample | 7.6±0.5 | 7.6±0.5 | 7.1±0.4 | 6.8±0.7 | 6.8±0.14 |

Bar graph showing the acceptability of mouthwash incorporated with *A. nilotica* bark powder**Mean sensory scores of *A. nilotica* bark incorporated beverage**

| Treatment | Colour | Appearance | Texture | Taste | Overall acceptability |
|-----------|---------|------------|---------|---------|-----------------------|
| sample | 7.8±0.4 | 7.5±0.5 | 7.6±0.5 | 7.5±0.5 | 7.5±0.06 |

Bar graph showing the acceptability of medicinal beverage incorporated with *A. nilotica* bark powder



CONCLUSION

The bark contains high amount of fibre and valuable compound tannin and gallic acid can be use in the food products.

Candy/toffee is commonly consumed, which is reasonable price and has a health benefits. There are 39 calories in caramel candy/toffee coming from 5% protein, 77% carbs, 18% fat and 0% alcohol. The caramel contains antioxidants, which are compounds that protect the body from damage caused by harmful free radicals. Antioxidant can help to boost the immune system and reduce the risk of chronic diseases such as cancer and heart diseases. On the other hand chaulai Ladoo is also a very famous snack and also consumed during fast by the people all over the country. It is widely use as it has good self-life and can be stored in air tight containers for months if kept in appropriate conditions.

The sensory scores of the developed products be revealed that other than the control samples the most desirable products were those having 2.5% and 5% *Acacia nilotica* bark powder incorporation. Enrichment with powder in food products enhanced their nutritional attributes by adding fibre, potassium, calcium and zinc. By adopting slight changes during processing, the antioxidant and nutritive activity of the final products can be increased and a valuable reserve will be optimally utilised. It is concluded that present study is the initial step towards the utilisation of agro-waste in snacks like candy/toffee, medicinal beverage and chaulai Ladoo

preparation. bark of *Acacia nilotica* contains tannins, phytochemicals with a wide range of medicinal properties, including anticancer, antioxidant, anti-inflammatory, antibacterial, antifungal, antiplasmodial and antibacterial activities (Ali A., Akhtar N., et al. 2012).

Acacia nilotica is a multipurpose tree species, which is widely distributed and used in agroforestry and urban forestry for various services. This tree is part of an economic dynamic and in the strategies of resilience in the face of different threats from the population and provides a considerable opportunity for climate adaptation. Therefore, we recommend that *Acacia nilotica* should be included in planting programmes for socio-economic and ecological benefits, which can be a climate change response (Amadou, I., et al. 2020) and have multipurpose health benefits which need to be discovered further.

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