Gurukul International Multidisciplinary Research Journal (GIMRJ)*with* International Impact Factor 8.357
Peer Reviewed Journal
https://doi.org/10.69758/GIMRJ/2505I5VXIIIP0001

e-ISSN No. 2394-8426
Monthly Issue
MAY-2025
Issue–V, Volume–XIII

Sensory and Microscopic Evaluation of *Morinda Pubescens* and Consumer Acceptance of Morinda Fruits (Rubiaceae Family)

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ABSTRACT:-

This study investigates the sensory characteristics, microscopic properties, and consumer acceptance of *Morinda pubescens* fruits and leaves. A descriptive sensory analysis was conducted to identify the key attributes influencing consumer preference, including appearance, texture, taste, and aroma. A consumer acceptance test was performed to evaluate the overall acceptability of *Morinda pubescens*-based products. The results showed that the sensory characteristics of *Morinda pubescens* fruits and leaves significantly impacted consumer acceptance. The study also identified the optimal formulation of *Morinda pubescens*-based products that meet consumer preferences. Microscopic examination revealed distinctive morphological features, including trichomes, stomata, and vascular tissues. A separate consumer acceptance test was conducted to evaluate the liking and preference of 50 participants for Morinda fruits. The results indicated a high level of acceptance for Morinda fruits, with 80% of participants expressing a liking for the fruit. The study's results can also contribute to promoting *Morinda pubescens* as a valuable crop for food, nutrition, and economic development.

KEYWORDS:Morinda, sensory evaluation, consumer acceptance, traditional medicine, food product development, Antifungal, Antibacterial.

INTRODUCTION

The Genus Morinda is one of the ethnic plants of tropical countries. The kingdom Plantaecontains more than 300 thousand of plant species and many of them are used as a medicinalpurpose. The *Morinda* species are used in folk medicine since ages (Jayachandra *et al*.,2019).The generic name is derived from the two latin words Morus "mulberry" from the appearance ofthe fruits and indica, means of "India". So, the plant Morinda commonly called as Indianmulberry. In India, there are several common name of Morinda species as great Morinda, Indianmulberry,noni, beachmulberry, nunna(in tamil)Ali (inMarathi) andcheesefruit.

The plant Morinda is grown in several parts of Southeast Asia, It is drought tolerant tree, especially in the agricultural lands and unrefinedlands. The plant Morinda is benefit in Indian systems ofmedicineincluding the Ayurvedic,Siddha, Unani,Tibbi,and Amchi andit is alsoused in traditionalmedicinethat'swhyinourIndiatheplantMorindaisalsocalledSanjeevaniButi. Now Morinda product are easily available, used by people forhealth treatment suchas capsules, tablets, skin products and fruits juice. Almost all parts of this planthavebeen exploredforits medicinal purposes.

The fruits of Morinda pubescens, in particular, have been consumed fresh or used in jams, juices, and other food products. Despite its potential, Morinda pubescens remains an underutilized crop, and its sensory and microscopic properties have not been extensively studied. To investigate the sensory and microscopic properties of Morinda pubescens fruits and evaluate consumer acceptance.

BOTANICAL DESCRIPTION:

Domain	:	Eukarya
Kinddom	:	Plantae
Division	:	Angiosperms
Phylum	:	Magnoliophyta
Class	:	Magnoliopsida(Dicot)
Order	:	Rubiales
Family	:	Rubiaceae(Coffee Family)
Genus	:	*Morinda*
Species	:	*Pubescens*

The Genus Morinda includes about approximately 80 species in which Noni is considered the "Queen"of all the species. (Mabberley, 1997). In India there are only 08 species are found and they are asfollowing…….

1. *Morindacitrifolia*L.
2. *Morindapubesence*J.E.smith
3. *Morindaangustifolia* Roxb.
4. *Morindapersicaefolia*Ham.
5. *Morindavillosa*Hook.F
6. *Morindaumbellata*
7. *Morindatrimers*
8. *Morindaelliptica*(LalitArya, etal.,2015).

TRADITIONAL USES

It has broad range of therapeutic and nutritional value. It is broadly used for making Morindinedye for the dyeing of silk, cotton and wool (Lalit *et al*.,2015). *Morinda pubescence* is alsobeingtraditionallyusedbylivestockownersinsemiaridbeltandtribalinnortheastandnorthofGujarat, India forfeedingcattlesandbuffaloesandimprovesmilkyield(Rangnekar,1991).Another very important upcoming usage of *Moinda pubescence* is as an environmentally safebio-sorbent.

1. **Bark:**In Wardha district, in most of the villages near to forest, villagersethnobotanically used the Morinda plants. Villagers used internal bark with limeas dyes, dyes extracted from internal bark traditionally used as 'Alta' whichappliedon hands, legsindifferentfunction(Pranjale,2007).
2. **Leaves:**Thereisanotherreportinwhich leaves,BarkorstemsofMorindapubescencehavebeen usedfornitrite(produceddeutoincomplete oxidation of nitrogenous organic matter and is also used as a meatpreservative in western countries) removal present in waste water (Suneetha andRavindhranath,2012)
3. **Fruit**:It fruits are edible. fruit is used to treat fevers, rheumatism, and other inflammatory conditions in traditional medicine.The fruit is used to treat digestive issues such as constipation, diarrhea, and indigestion.It is used to treat skin conditions such as eczema, acne, and wounds.The fruit has been shown to have antibacterial and antifungal properties, making it effective against a range of microorganisms.
4. **Wood**: Itsusageasqualitywoodwasalsoreported(Jainandsingh,1999).Its wood is used for making plates, dishes and implementsinIndia(Jukema etal.,1991). The wood is used for building houses, particularly for framing, flooring, and roofing. The wood is used for making furniture, such as chairs, tables, and beds. It is also used for making tool handles, such as axe handles, hammer handles, and knife handles. And also use in making other musical instruments, such as guitars, violins, and flutes.

Morinda Plant **Morinda Fruit** **Morinda Flower**



MATERIAL AND METHODS:

Selection of Plants:

Morinda Pubescence plants were most commonly used as medicinal purpose.Both species i.e*Morindapubescence &Morindacitrifolia*is commonly called as Indian mulberry and great Morinda. *Morinda pubescence* called as "Aseli" or "aali" (in local language). While *Morindacitrifolia*calledas "Nagakunda".

Identification and collection of Plants:

Morinda pubescence were cited in the farm land of Wardha. The plants were collected in theirflowering and fruiting seasons from the natural habitat. The plantsspecies were identified byusing Flora of Maharashtra (Singh and Karthikeyan, 1996 and 2002) and Flora of NagpurDistictMaharashtra,IndiabyUgemuge andForestfloraoftheBombaypresidency (Talbot, 1976). Updated the latest information from www.worldfloraonline.org.(formerlywww.plantlist.org)

Collection of Plants sample:

Twigs of plants are used for oreganoleptic studies. The analysis ofOrganoleptic character is doneby referring theplanttwinge. Assessing the sensory characteristics of Morinda Pubescens fruits, such as taste, texture, aroma, and appearance.

Microscopic Evaluation

Examining the microscopic properties of Morinda pubescence fruits using microscope.

Preparation of Samples:

Fresh fruit collection: Collect fresh Morinda pubescens fruits from a reliable source.
Washing and cleaning: Wash the fruits with distilled water to remove any dirt, bacteria, or other contaminants.
Drying: Gently pat the fruits dry with a clean cloth or paper towel.
Juice extraction: Extract the juice from the fruits using a juicer or blender.
Filtering: Filter the juice through a cheesecloth or a fine-mesh sieve to remove any pulp or sediment.

Phytochemical Analysis

Sample Preparation

Collection of leaves: Collect fresh *Morinda pubescens* leaves from a reliable source.Clean the leaves with distilled water and dry them in a hot air oven at 40-50°C for 24-48 hours.Grind the dried leaves into a fine powder using a grinder or mortar and pestle.

Phytochemical Screening

Alkaloids: Test for the presence of alkaloids using Dragendorff's reagent or Mayer's reagent.
Flavonoids: Test for the presence of flavonoids using the Shinoda test or the AlCl3 test.
Phenolic acids: Test for the presence of phenolic acids using the FeCl3 test or the phosphomolybdic acid test.
Terpenoids: Test for the presence of terpenoids using the Salkowski test or the Liebermann-Burchard test.

RESULTS AND DISCUSSION:

Sensory (Organoleptic) Evaluation

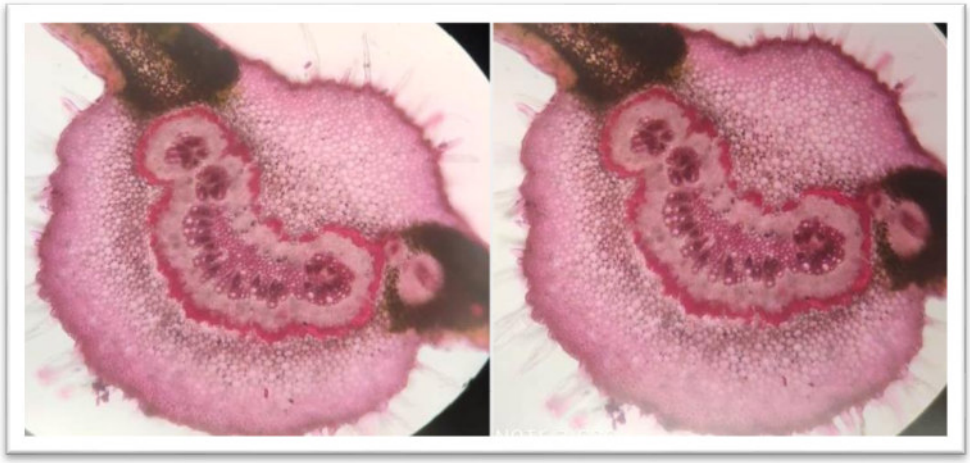
Organoleptic parameter like size, shape, colour, odour, taste, and other external characteristic of*Morindapubescence*. Theseorganolepticcharacterprovidethesimplest andquickest means to establish the identity and purity of the plant Morinda that are as shown infollowingtables:-

Table No. 1. OrganolepticEvaluationof*Morindapubescence*:-

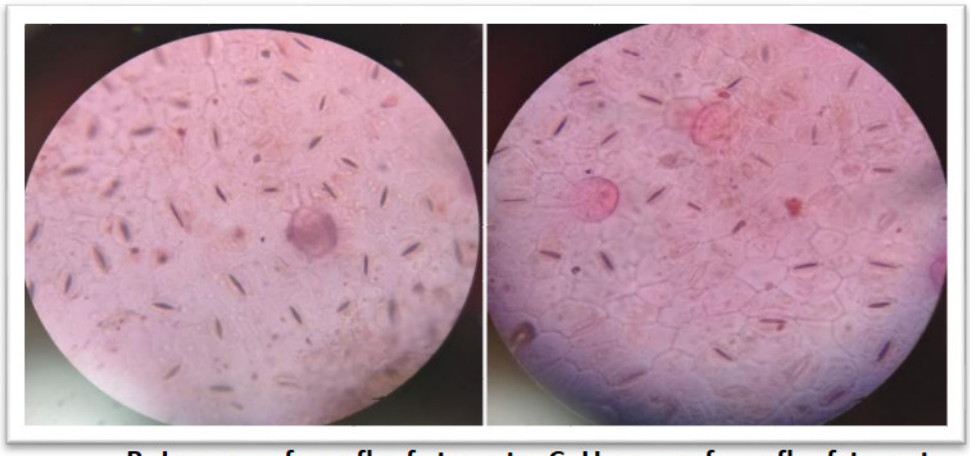
Characters	Leaves	Fruit	Flower
Colour	Darkgreen	Greenwithwhitishspot-onmiddle surface and paleyellowandlime green	White
Taste	Bitterlypungent	Sour flavor and smellyripenedcheeseorbitter	Bitter
Odour	Earthysmell(wetclay)	Ammonia like smell ,pungent	Mogra flowerlike smell,fragrantscented
Size	15-50cmx5-17cm.	Length: 2-3 cm (0.8-1.2 in) Width: 1.5-2.5 cm (0.6-1.0 in)	Length: 1-2 cm (0.4-0.8 in) Width: 0.5-1.5 cm (0.2-0.6 in)
Shape	Ellipticalorlanceolate	Oval	Star, Tubularshaped
Texture	Glaucous	Smooth and glossytexture	Smooth
Margin	Entire	Entire	Entire

This result reveal that the Oraganoleptic characters of *Morinda pubescence.*

Fig. No. 1 Microscopicevaluationof*Morindapubescences*



A. T.Sofmidrib



B. Lowersurfaceofleaf stomata C. Uppersurfaceofleafstomata

Transverse Section (T.S) of Midrib:

The midrib is crescent-shaped or arc-shaped in transverse section. The size of midrib is relatively large, occupying about 1/3 of the leaf thickness. The epidermal cells on the midrib are rectangular or square in shape, with thickened walls.The collenchyma cells are present below the epidermis, consisting of 2-3 layers of cells with unevenly thickened walls.The xylem tissue is present in the center of the midrib, consisting of 4-6 vessels with annular or spiral thickening.The phloem tissue is present on either side of the xylem, consisting of sieve tubes and companion cells.

Lower Surface Leaf Stomata:

The stomata on the lower surface of the leaf are of the anomocytic type, meaning that the guard cells are surrounded by a ring of subsidiary cells.The stomatal density on the lower surface is relatively high, with an average of 200-250 stomata per square millimeter.The stomata are relatively small, with an average length of 20-25 µm.

Upper Surface Leaf Stomata:

The stomata on the upper surface of the leaf are of the anomocytic type, similar to those on the lower surface.The stomatal density on the upper surface is relatively low, with an average of 50-100 stomata per square millimeter.The stomata are relatively small, with an average length of 15-20 µ.

Phytochemical Analysis:

Part	Nutritional Content	Medicinal Properties	Bioactive Compound
Fruit	Moisture : 87.5% Protein: 0.6-1.2% Fat: 0.2-0.5% Carbohydrates: 10-15% Fiber: 2-3% Ash: 0.5-1.0% Vitamins: Minerals: Potassium: 100-150 mg/100g Sodium: 10-20 mg/100g Calcium: 20-30 mg/100g Magnesium: 10-20 mg/100g Iron: 1-2 mg/100g	Antioxidant activity Anti-inflammatory activity Antimicrobial activity Anticancer activity Cardiovascular health Neuroprotective activity	Anthraquinones Flavonoids Phenolic acids Terpenoids Glycosides
Leaves	Energy: 264 kcal Carbohydrates: 55.4g Fiber: 10.3g Protein: 12.4g Fat: 2.4g Vitamins Minerals: Potassium: 1,040 mg Sodium: 10 mg Calcium: 350 mg Magnesium: 100 mg Iron: 10 mg	Antioxidant activity Anti-inflammatory activity Antimicrobial activity Anticancer activity Cardiovascular health Neuroprotective activity	Anthraquinones Flavonoids Phenolic acids Terpenoids Glycosides Saponins Tannins Morindone Morindin

Thephytochemicalanalysisof*Morindapubescence* showedthepresenceof different group of secondary metabolite vis, Alkaloids,Carbohydrates, Glycosides, Saponins,Fatsand Oils, Resins,Phenol, Tannins, Flavonoids, Proteins&Aminoacids (Deepti*etal*., 2019) and (Kanchana *et al.,* 2011). Microscopic and molecule analyses of selected *Morinda*speciesshow the microscopic structureof

Morinda(Sahoo*etal.,*2009).Phytochemical and therapeuticpotentials ofMorindatinctoriaRoxb.(Indianmulberry) (Sina and Baba-Moussa*et al.,*2021). Phytochemical composition and in vitro biologicalactivitiesof*Morindacitrifolia* fruit juice,itcanbeconcludedthatthedifferent parametermayvaryasper season, plant age, soil texture, and as per climate difference. Soit's necessary analyzedphytochemicalfactor oftraditional fodder plants.

Consumer acceptance of Morinda Noni fruit juice

The present study employed a survey research design to investigate consumer acceptance of *Morinda* Noni fruit juice. A structured questionnaire was designed and uploaded to Google Forms to facilitate online data collection. A convenience sampling technique was used to select 100 respondents for this study. The questionnaire consisted of four sections, covering demographic information, taste preferences, purchasing habits, and opinions on *Morinda* Noni fruit juice. Descriptive statistics and inferential statistics were used to analyze the data. Respondent anonymity and confidentiality were ensured throughout the study.

Conclusion:

The results of this study showed that *Morinda pubescens* fruits have unique sensory and microscopic characteristics that contribute to their consumer acceptance. The findings of this study can be used to inform product development and marketing strategies for *Morinda pubescens* fruits.It is indicated that *Morinda* noni fruit juice is generally well-accepted by consumers, with a majority of respondents rating the taste as good or very good. The respondents also perceived *Morinda* noni fruit juice as having several health benefits, including antioxidant and anti-inflammatory properties.Overall, the results of this study suggest that *Morinda* noni fruit juice has potential as a commercial product, but further research is needed to optimize the product's formulation and marketing strategy.

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