



PRODUCT DEVELOPMENT, CONSUMER PREFERENCE AND MARKET POTENTIAL OF LOTUS SQUASH MIX

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ABSTRACT:

This study explores the development of natural beverage products has increased significantly due to rising health awareness among consumers. Lotus squash mix is considered an innovative drink prepared using lotus petals and other natural ingredients. Lotus is widely recognized for its nutritional and medicinal properties. The preparation of squash from lotus petals provides a refreshing and flavourful beverage option. The product can be used as a concentrate and diluted with water before consumption. Natural beverages like lotus squash mix are gaining popularity in both urban and rural markets. This product combines taste, nutrition, and traditional herbal value. Therefore, lotus squash mix can become a promising beverage in the market.

1.1 INTRODUCTION:

Lotus is an aquatic plant that has cultural, medicinal, and nutritional importance in many Asian countries. In India, the lotus flower holds a special place in tradition and agriculture. Different parts of the lotus plant, including seeds, stems, roots, and petals, are used in food and herbal preparations. Lotus petals contain antioxidants and bioactive compounds that contribute to overall health. These properties make lotus a valuable ingredient for food and beverage products. The use of lotus petals in beverage preparation is a unique approach to developing herbal drinks. Lotus squash mix is a beverage concentrate prepared using lotus petals and other natural ingredients. The product can be diluted with water to produce a refreshing drink. Such products help promote the use of natural plant-based ingredients. This makes lotus squash mix an innovative beverage product.

1.2 OBJECTIVES:

The primary objective of this study is to develop a natural beverage product using lotus petals as the main ingredient. The study focuses on preparing a lotus squash mix that is refreshing, safe, and suitable for regular consumption. By using natural ingredients, the product aims to provide both taste and nutritional value to consumers.

1.3 BENEFITS OF LOTUS SQUASH MIX FOR HEALTH AND ENVIRONMENT:

The lotus plant offers several benefits for both human health and the environment. Different parts of the lotus, such as the seeds, roots, and leaves, are rich in nutrients, antioxidants, and vitamins that support digestion, improve heart health, boost immunity, and help reduce stress. Lotus is also used in traditional medicine to control blood sugar and promote overall wellness. Environmentally,

the lotus plant helps improve water quality by absorbing pollutants and providing oxygen to aquatic ecosystems. It also supports biodiversity by offering shelter and food for fish, insects, and other aquatic organisms.

1.4 LOTUS SQUASH MIX IN THE WORLD MARKET:

The global market for herbal and functional beverages is growing rapidly due to increasing consumer awareness about health, natural antioxidants, and plant-based products. Lotus (*Nelumbo nucifera*) is widely used in Asian countries for traditional drinks, herbal teas, and wellness beverages. Countries such as China, Japan, South Korea, Thailand, Vietnam, and Middle Eastern nations show strong demand for lotus-based food and drink products. Lotus mix squash has good export potential as it combines refreshment with health benefits like antioxidant and antimicrobial properties. The global preference for natural, chemical-free beverages supports the expansion of lotus squash in international markets.

1.5 LOTUS SQUASH MIX IN THE (INDIAN) MARKET:

India is one of the major producers of lotus due to its favourable climate and abundant water bodies. Lotus petals, seeds, and stems are traditionally used in Indian food systems and Ayurveda. With the rising demand for natural health drinks and indigenous products, lotus mix squash has strong potential in the Indian market. Increasing urban lifestyles, preference for herbal beverages, and government support for value-added agro-products and food processing industries further promote the commercialization of lotus-based squash. India also has opportunities to export lotus squash as a value-added product rather than raw lotus materials.

1.6 REVIEW OF LETERATURE:

1. Akihiko Omata, A., & ETAL. (1991). Chemical characterization of *Nelumbo nucifera* 'Shinny Oren' flowers via GC and GC/MS identified seventy compounds, with hydrocarbons constituting over 75% of the extract. The study pinpointed 1,4-dimethoxybenzene, 1,8-cineole, terpinen-4-ol, and linalool as the essential volatile components defining the characteristic lotus scent. Comparative headspace analysis across 44 *N. nucifera* cultivars and *N. pentapetala* revealed that while 1,4-dimethoxybenzene levels increase daily during anthesis, concentrations are significantly higher in the American *N. pentapetala* than in Oriental *N. nucifera* varieties.

2. Wang, L., & ETAL. (2003). This study investigated the antioxidant and safety profiles of methanol extracts from lotus plumule and blossom. Both extracts demonstrated significant reducing power and free radical scavenging abilities; however, only the plumule extract exhibited ferrous ion chelating capabilities. This specific chelating action allowed the plumule to provide superior protection against fatty acid peroxidation and plasmid DNA damage compared to the blossom. Furthermore, Ames testing confirmed that neither extract possessed mutagenic properties in *Salmonella typhimurium* strains (TA98 and TA100), regardless of metabolic activation (S9 mix). These findings validate the traditional use of lotus components as safe, natural sources of antioxidants for potential therapeutic or nutraceutical applications.

3. Suzuki, S., & ETAL. (2007). This study utilized *Lotus japonicus* as a model system to demonstrate how genetic engineering of the carotenoid biosynthesis pathway can alter floral aesthetics. By overexpressing the β gene (encoding β -carotene ketolase) from the marine bacterium *Agrobacterium aurantia*, researchers successfully shifted petal colour from light yellow to deep yellow or orange. Chemical analysis (HPLC/TLC) confirmed the accumulation of novel ketocarotenoids, including astaxanthin, adonixanthin, canthaxanthin, and echinenone. These results prove that introducing bacterial oxygenase genes can effectively redirect plant metabolic pathways to produce vibrant, non-native pigments for the ornamental plant industry.

4. Rungnapa Pankla Sranujit, R., & ETAL. (2007). This study characterized the phytochemical profile of lotus petals and evaluated the antioxidant and immunomodulatory effects of ethyl acetate (EA) and ethyl alcohol (ET) extracts. High-performance analysis identified ferulic acid, coumarin, and chlorogenic acid as the primary polyphenolic constituents. Utilizing lipopolysaccharide-stimulated human macrophages to simulate bacterial inflammation, the research demonstrated that both extracts significantly suppress TNF- α secretion by inhibiting the NF- κ B-dependent inflammatory pathway. Combined with high antioxidant capacity, these findings suggest that lotus petal extracts offer potent remedial benefits for managing inflammation and supporting individuals with compromised immune functions.

5. Songhee Jeon, S., & ETAL. (2009). A study on lotus flower essential oil (petals and stamens) demonstrated its ability to stimulate melanin synthesis and tyrosinase activity in human melanocytes in a dose-dependent manner. The oil upregulates the expression of MITF-M, TRP-2, and tyrosinase proteins—likely through the phosphorylation of ERK and CREB signalling pathways—notably without altering tyrosinase mRNA levels. Chemical analysis identified palmitic acid methyl ester (22.66%) as the primary active lipid driving these melanogenic effects. These results highlight the oil's potential as a natural functional ingredient for gray hair prevention and tanning treatments.

6. Chun Fa Huang, C. F., & ETAL. (2011). This study investigated the antidiabetic effects of *Nelumbo nucifera* leaf extract (NNE) and its active constituents, catechin and quercetin. Results showed that NNE stimulates insulin secretion from β cells and human islets by increasing intracellular calcium and activating the ERK1/2 and PKC signaling pathways. In animal models, NNE successfully regulated blood glucose levels in both fasted normal mice and high-fat-diet-induced diabetic mice. While quercetin showed no effect on insulin, catechin was identified as the primary secretagogue responsible for enhancing insulin secretion and reversing glucose intolerance.

7. Supasorn Sakuljaitrong, S., & ETAL. (2012) In this study, the therapeutic potential of *Nelumbo nucifera* flower extract (NNFE) was evaluated for its impact on hematological parameters in streptozotocin-induced diabetic rats. Following an eight-week oral administration of 250 mg/kg, researchers assessed variables including RBC, WBC, Hb, Hct, and various leukocyte differentials. While NNFE maintained overall hematological stability without adverse changes to blood cell morphology, it significantly recovered WBC counts to near-normal levels in diabetic subjects. These findings highlight NNFE's safety profile and its potential as a supportive treatment for managing immune-related blood parameters in diabetes.

8 NaridPrachumrak, N., & ETAL. (2013)..RedLotus (*Nymphaea pubescens* Willd.)” petals were evaluated as a natural photosensitizer for dye-sensitized solar cells (NDSSCs). A methanol extract of the petals exhibited a strong visible light absorption peak at 540 nm. Fabricated cells achieved a power conversion efficiency (PCE) of 0.208–0.281%, with a fill factor (FF) of 0.621–0.668 and an open-circuit voltage (V_{OC}) of 0.506–0.523 V. The results confirm the viability of red lotus pigments as an eco-friendly material for photovoltaic applications.

1.7 SCOPE OF THE STUDY:

This study focuses on the preparation and development of Lotus Mix Squash as a natural beverage product. It explains the use of lotus petals along with natural ingredients to produce a healthy squash with good taste and syrup consistency. The study also covers basic processing methods and the potential use of lotus in value-added food products.

1.8 NEED OF THE STUDY:

Nowadays, consumers prefer natural and healthy drinks instead of artificial beverages. Lotus petals have many health benefits but are not widely used in beverage products. This study is needed to utilize lotus petals effectively by converting them into a Lotus Mix Squash, which can be a nutritious and marketable product.

1.9 METHODOLOGY:

The study is carried out using simple processing methods and secondary data sources. Information related to lotus and its benefits is collected from books, journals, and government publications. The squash is prepared using standard food processing steps, and the results are analysed using descriptive methods.

1.10 COLLECTION OF DATA:

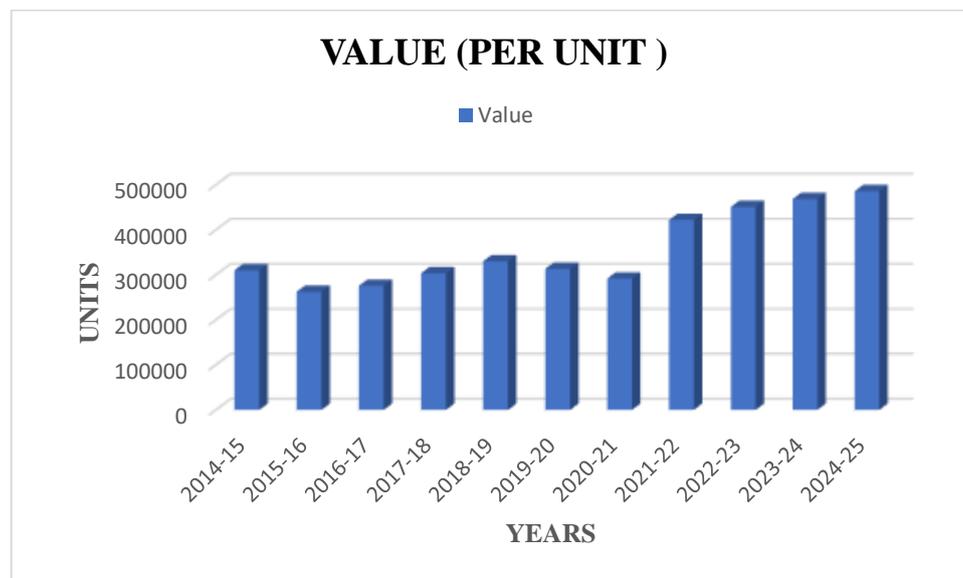
The secondary data were collected through the Ministry of Commerce and Export – Import databank website. Data was collected and analysed over the past ten year to identify trends and predict the future Lotus – based products market.

1.11 EXPORT DATA OF LOTUS IN VALUE AND QUANTITY FROM THE YEAR 2014-2025:

TABLE NO: 1

Year	Value	Percentage (%)
2014-15	3,10,338.48	7.09
2015-16	2,62,291.09	5.99
2016-17	2,75,852.43	6.3
2017-18	3,03,526.16	6.93
2018-19	3,30,078.09	7.54
2019-20	3,13,361.04	7.16
2020-21	2,91,808.48	6.67
2021-22	4,22,004.40	9.64
2022-23	4,51,070.00	10.31
2023-24	4,68,500.00	10.71
2024-25	4,85,900.00	11.1
TOTAL	43,74,535.05	100

SOURCE: Import Export Databank Ministry Of Commerce

1.12 GRAPH CHART OF LOTUS FROM 2014-2025:**1.13 EXPORT DATA TABLE:****TABLE NO: 2**

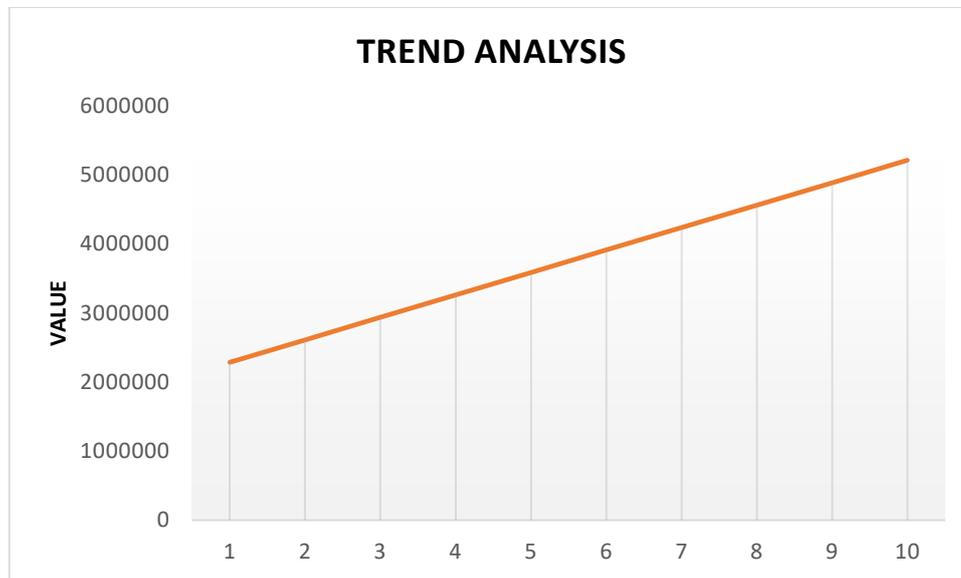
Year	Quantity	Value (₹)	X	XY	X ²
2014-15	310.34	3,10,338.48	-5	-9,31,015.44	9
2015-16	262.29	2,62,291.09	-4	-5,24,582.18	4
2016-17	275.85	2,75,852.43	-3	-2,75,852.43	1
2017-18	303.53	3,03,526.16	-2	0	0
2018-19	330.08	3,30,078.09	-1	3,30,078.09	1
2019-20	313.36	3,13,361.04	0	6,26,722.08	4
2020-21	291.81	2,91,808.48	1	8,75,425.44	9
2021-22	422	4,22,004.40	2	16,88,017.60	16
2022-23	451.07	4,51,070.00	3	22,55,350.00	25
2023-24	468.5	4,68,500.00	4	28,11,000.00	36
2024-25	381.3	4,39,299.00	5	25,00,234.00	34
TOTAL	—	34,28,830.17	0	93,55,377.16	139

SOURCE: Import Export Databank Ministry Of Commerce**1.14 FUTURE PROJECTION TABLE 2025- 2026:****TABLE NO: 3**

Year	X	Value (₹)
2025-2026	6	2286764
2026-2027	7	2611777
2027-2028	8	2936789
2028-2029	9	3261801
2029-2030	10	3586814
2030-2031	11	3911825
2031-2032	12	4236839
2032-2033	13	4561851
2033-2034	14	4886863
2034-2035	15	5211875

Above the table show the growth of Lotus in the global market. After the pandemic the growth of Lotus has slightly declined. Currently, as per our trend analysis, there's positive trend, and in the upcoming years, the development of Lotus will increase a volume way. The forecast is possible way that consumers are more concerned about their health and are looking towards organic nutrition products.

1.15 FUTURE PROJECTION GRAPH CHART 2014-2025:



1.16 CONCLUSION:

This study analyses the overall scope and market potential of Lotus Mix Squash with special reference to its growing demand in the natural and herbal beverage sector. The study highlights the increasing consumer preference for health-based drinks made from natural ingredients such as lotus petals, natural sugar, and lemon. Due to rising awareness about antioxidants and immunity-boosting products, the market for lotus-based beverages is expected to grow steadily in the coming years. This study also indicates that Lotus Mix Squash has strong potential in both domestic and export markets because of its medicinal value, unique taste, and natural composition. Overall, the study emphasizes the need for planning, investment, and innovation in lotus-based food products to support sustainable growth in the beverage industry.

1.17 REFERENCES:

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