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Study on the acid lime products and their consumption in the rural and urban areas of households in the Vijayapura district, Karnataka, India

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Abstract

The study investigates the consumption patterns and perceptions of acid lime-based products among rural and urban households, highlighting socio-economic and cultural differences. Urban households demonstrate a higher demand for acid lime-based products, spanning food, cleaning and cosmetic categories, reflecting greater market access, purchasing power and product awareness. In contrast, rural households prioritize essential applications, such as acid lime pickle (46.67%) and dishwashing liquids (56.67%). Urban households exhibit broader preferences, favouring products like acid lime juice (45.34%) and flavoured snacks (23.33%), as well as specialized cleaning solutions, including floor cleaners (83.33%) and glass cleaners (62%). Consumption analysis across life stages shows adults (19-60 years) as the primary consumers in both rural (36.67%) and urban households (40.67%). Urban households display greater acceptance of acid lime for children (18.36%) and older adults (18%), unlike rural households (2.67% and 6%, respectively). Urban areas also report slightly higher usage among pregnant and lactating women. Perceptions of acid lime's health benefits reveal its use for managing fever, digestive issues and weight control, with urban households reporting wider applications, including skin problems, diabetes, anaemia and scurvy. Rural households emphasize their role as an immunity booster (35.33%) but exhibit limited awareness of its potential for other conditions. These findings underscore urban households' broader utilization of acid lime products, driven by health education and product accessibility.

Keywords: Acid lime, products, consumption patterns, rural households

Introduction

Acid lime (*Citrus aurantifolia*) is a widely cultivated citrus fruit known for its versatile applications in culinary, medicinal and industrial contexts. Its rich content of vitamin C, antioxidants and bioactive compounds makes it highly valued for promoting health and well-being (Dalssgard *et al*., 1997) [4]. Acid lime is utilized extensively in food products, cleaning agents and personal care items due to its unique flavour, preservative properties and antimicrobial benefits.

This study explores the consumption patterns and perceptions of acid lime-based products across rural and urban households, focusing on food, cleaning and cosmetic categories. It also examines acid lime consumption across various life stages and its perceived health benefits during illnesses (Bisen *et al*., 2012) [2]. By analysing data from diverse socio-economic groups, the study aims to uncover disparities in usage, accessibility and awareness between rural and urban populations.

Understanding these patterns provides insights into the factors shaping consumer behaviour, such as purchasing power, cultural influences and health awareness. The findings highlight the broader integration of acid lime into urban households' daily lives, while rural households tend to exhibit more selective consumption (Ciriminn *et al*., 2017) [3]. This research emphasizes the need for targeted educational initiatives and improved product availability to bridge these disparities, ensuring equitable access to acid lime's benefits. The study contributes to the understanding of acid lime's potential as a functional food and its role in enhancing health and sustainability.

Materials and Methods

The study was conducted during the year 2023-24 in the Vijayapura district of Karnataka, India, to examine the purchasing behaviour and quality preferences of households for acid lime fruits. Specific parameters, such as fruit colour and appearance, were assessed following the DUS (Distinctness, Uniformity and Stability) guidelines for citrus crops. Additionally, data on fruit maturity were collected based on the purchasing habits of the households.

A structured interview schedule was developed to align with the study's objectives and variables. The schedule was designed through consultations with experts and by reviewing relevant literature. It underwent pretesting in a non-sample area to ensure its applicability and relevance. Necessary adjustments were incorporated into the final schedule based on the pretesting results.

Statistical Tools Employed

To analyze the collected data, the following statistical measures were utilized (Panse and Sukhtame, 1954) [9]:

1. **Mean:** The arithmetic mean was calculated to summarize data by dividing the total sum of observations by the number of observations. This measure was used to classify independent variables of low, medium and high levels. Formula: $$\bar{X} = \frac{\sum X}{N}$$ Where:
   - X¯\bar{X} = Mean
   - ∑X\sum X = Sum of all observations
   - NN = Number of observations
2. **Frequency:** Frequency analysis was performed to determine the distribution patterns of respondents across selected variables, allowing a clearer understanding of their importance based on respondents' perceptions.
3. **Percentage:** Percentages were calculated to facilitate simple comparisons of data.
4. **Standard Deviation:** Standard deviation was employed to measure the extent of data dispersion around the mean. This tool was instrumental in categorizing variables into low, medium and high groups

Formula: $$SD = \sqrt {\frac{\sum (X - \bar{X})^2}{N}}$$ Where:

- SDSD = Standard Deviation
- XX = Individual observations
- X¯\bar{X} = Mean
- NN = Number of observations

Results and Discussion

The purchasing patterns of acid lime-based products reveal significant rural-urban differences across various categories, providing insights into consumer preferences and socio-economic dynamics. Urban households exhibit a higher demand for acid lime-based food, cleaning and cosmetic products, likely to reflect differences in lifestyle, access and purchasing power. In the food category, acid lime pickle is popular among both rural (46.67%) and urban households (38%), suggesting it holds cultural significance. However, urban households show greater preference for acid lime juice (45.34%) and lime-flavored snacks (23.33%), compared to rural households (34% and 12.67%, respectively), as in Table 1. This trend may indicate urban consumers' inclination toward convenience-oriented and diverse options (Ciriminn *et al*., 2017) [3].

Cleaning products demonstrate stark contrasts in adoption between rural and urban households. Dishwashing liquids are highly popular across both groups but dominate urban households (94%). Similarly, detergents (89.33%) and floor cleaners (83.33%) are more prevalent in urban areas, reflecting greater emphasis on specialized cleaning solutions in cities. The preference for products like glass cleaners, air fresheners and Vim gel in urban households underscores their awareness and access to varied hygiene products, as opposed to rural households, where demand for these items is considerably lower (Penniston *et al*., 2008) [10]. In cosmetics, urban households significantly outpace rural ones in purchasing acid lime-based shampoos, soaps (82.67%), face washes (51.33%), moisturizers (38%) and hand sanitizers (44.67%), as in Table 1. Rural consumption of these items remains modest, except for shampoos and soaps (38%), reflecting limited access or preference for simpler alternatives. Urban preferences for cosmetics may be driven by lifestyle factors, brand marketing and higher disposable incomes (Ghimire *et al*., 2023) [5].

These findings underscore the role of socio-economic factors in shaping consumer behavior. Urban households' broader variety and quantity of acid lime-based product purchases highlight their access to diverse markets and stronger purchasing power. In contrast, rural households show selective consumption patterns tied to practicality and necessity.

Table 1: Acid lime-based products purchased by households (N=300)

Sl. No.	Food products	Rural (n_1=150)		Urban (n_2=150)	
		f	%	f	%
	a. Food products				
1.	Acid lime pickle	70	46.67	57	38.00
2.	Acid lime juice	51	34.00	68	45.34
3.	Acid lime flavored snacks	19	12.67	35	23.33
	b. Cleaning products				
1	Floor cleaner	73	48.67	125	83.33
2	Dish washing liquids	85	56.67	141	94.00
3	Glass cleaners	35	23.33	93	62.00
4	Air freshener	19	12.67	93	62.00
5	Detergents	97	64.67	134	89.33
6	Vim gel	65	43.33	145	96.67
	c. Cosmetics products				
1	Face washes	14	9.33	77	51.33
2	Skin toners	9	6.00	35	23.33
3	Moisturizers and lotions	13	8.67	57	38
4	Face masks	3	2.00	25	16.67
5	Body washes and shower gels	11	7.33	23	15.33
6	Shampoos and soaps	57	38.00	124	82.67
7	Hand sanitizers	54	36.00	67	44.67

Multiple responses are possible, f - Frequency, % - Percentage

The perception and consumption of acid lime across different stages reveal significant variations between rural and urban households, reflecting socio-economic, cultural and lifestyle differences. Adults (19-60 years) are the primary consumers in both groups, with slightly higher consumption reported among urban households (40.67%) compared to rural ones (36.67%). This pattern underscores the recognition of acid lime's nutritional and health benefits by working-age individuals, who may perceive it as a refreshing or health-enhancing addition to their diets. Adolescents (13-18 years) form the second-largest consumer group, with urban households (32.67%) significantly outpacing rural households (18.67%), as in Table 2. The higher consumption by urban adolescents may be attributed to greater exposure to diverse food habits, promotional campaigns and enhanced access to acid lime-based products (Bisen *et al*., 2012) [2].

Interestingly, urban households exhibit a more inclusive approach to encouraging acid lime consumption among children (4-12 years) and the elderly (60+ years). Urban children (18.36%) and older adults (18%) show higher consumption rates compared to their rural counterparts (2.67% and 6%, respectively). This trend could be linked to

greater health awareness and the availability of acid lime in convenient forms, such as juices or supplements, in urban settings. Consumption by pregnant and lactating women is notably low across both groups, although urban households show slightly higher percentages (6% and 11.56%, respectively) compared to rural ones (3.33% and 10%), as in Table 2. These results may reflect caution about dietary choices during sensitive life stages or limited dissemination of information on the potential health benefits of acid lime for these groups (Bassan *et al*., 2013) [1].

Overall, urban households demonstrate broader acceptance and higher consumption of acid lime across all life stages. This disparity is likely influenced by factors such as increased nutritional awareness, diverse product availability and stronger purchasing power in urban areas (Khanal *et al*., 2023) [6]. Rural households, on the other hand, show selective consumption patterns, potentially tied to limited access, economic constraints, or traditional dietary practices.

Table 2: Perception of households towards consumption of acid lime during different stages of life(N=300)

Sl. No.	Life stages	Rural(n_1=150)		Urban(n_1=150)	
		f	%	f	%
1	Children (4 -12 years)	4	2.67	27	18.36
2	Adolescents (13-18 years)	28	18.67	49	32.67
3	Adults (19-60 years)	55	36.67	61	40.67
4	Pregnant women	5	3.33	9	6.00
5	Lactating mother	15	10.00	17	11.56
6	Old age (60 + years)	9	6.00	27	18.00

Multiple responses are possible, f - Frequency, % - Percentage

The perception of acid lime consumption during illnesses highlights notable differences between rural and urban households, revealing socio-economic and health awareness dynamics (Dalsgard *et al*., 1997) [4]. In both groups, acid lime is widely recognized as beneficial in managing fever, with urban households (44.67%) showing higher usage compared to rural households (30%), as in Table 3. This trend indicates urban households' broader acceptance and accessibility to acid lime as a natural remedy.

Urban households also associate acid lime with addressing digestive disorders (48.67%), weight management and obesity (39.33%), skin problems (46%), diabetes (35.33%) and anaemia (22%) as in Table 3, showing greater health awareness and diverse usage compared to rural households. These differences reflect urban populations' exposure to dietary trends, health campaigns and the availability of acid lime-based products.

Interestingly, urban households show higher usage of acid lime for scurvy (26%), asthma and bronchitis (14%), dehydration and electrolyte imbalance (18%) and supporting heart health (18%) as in Table 3. Such perceptions likely stem from better access to nutritional information and a willingness to explore alternative remedies for health management. In contrast, rural households demonstrate higher belief in acid lime's role as an immunity booster (35.33%), reflecting a reliance on traditional health practices and natural remedies. However, their limited association with broader health benefits points to gaps in information and accessibility (Sharama *et al*., 2023) [11].

Promoting educational initiatives that emphasize acid lime's health benefits across diverse conditions, coupled with improved distribution networks, could help rural households recognize its broader potential during illnesses. Bridging awareness gaps may ensure equitable health opportunities and enhance acid lime's utilization in both rural and urban settings (Sirananthan *et al*., 2023) [12].

The analysis of acid lime consumption during illnesses reveals substantial differences between rural and urban households, showcasing disparities in health awareness and usage patterns (Sharma *et al*., 2023) [11]. Fever management emerges as a prominent reason for consumption, with urban households (44.67%) showing higher usage than rural ones (30%), as in Table 3. This difference likely reflects urban households' greater trust in acid lime's therapeutic potential and better accessibility to health-related information.

Urban households demonstrate broader associations of acid lime with digestive disorders (48.67%), weight management and obesity (39.33%), skin problems (46%), diabetes (35.33%) and anaemia (22%), compared to rural households, as in Table 3. These findings suggest urban populations may have higher exposure to its health benefits, reinforced by access to diverse products and dietary trends promoting acid lime. Acid lime consumption for specific ailments like scurvy (26%), asthma and bronchitis (14%), dehydration and electrolyte imbalance (18%) and heart health (18%) is significantly higher among urban households, as in Table 3. This pattern underscores their familiarity with acid lime's role in addressing specialized health conditions, perhaps due to better healthcare access and education (Mohanapriya *et al*., 2013) [8].

Interestingly, rural households exhibit stronger belief in acid lime as an immunity booster (35.33%) compared to urban ones (20.67%), highlighting their reliance on traditional remedies. However, their limited association of acid lime with other illnesses suggests gaps in awareness.

Strengthening health education campaigns in rural areas to emphasize acid lime's versatile health benefits, paired with improved availability, could help bridge these disparities and promote balanced health practices across both populations.

Table 3: Perception of households towards consumption of acid lime during illness (N=300)

Sl. No.	Illness	Rural(n_1=150)		Urban(n_1=150)	
		f	%	f	%
1	Fever	45	30.00	67	44.67
2	Digestive disorders	31	20.67	73	48.67
3	Weight management and obesity	27	18	59	39.33
4	Cold	19	12.67	13	8.67
5	Cough	23	15.33	17	11.33
6	Diabetes	33	22	53	35.33
7	Skin problems	41	27.33	69	46
8	Anemia	17	11.33	33	22
9	Scurvy	13	8.67	39	26
10	Asthma, Bronchitis	11	7.33	21	14
11	Type 2 diabetes	7	4.67	15	10
12	Dehydration & electrolyte imbalance	13	8.67	27	18
13	Boosts immunity	53	35.33	31	20.67
14	Support heart health	9	6.00	27	18.00

Multiple responses are possible, f - Frequency, % - Percentage

Conclusion

The findings of this study reveal distinct disparities in the consumption patterns and perceptions of acid lime-based products between rural and urban households, shaped by socio-economic, cultural and lifestyle factors. Urban households exhibit a broader and more diverse utilization of acid lime-based products, spanning food, cleaning and cosmetics categories, driven by greater access, purchasing power and awareness. In contrast, rural households display selective consumption patterns, prioritizing essential uses and traditional practices. The analysis of consumption across life stages highlights urban households' inclusive approach, with higher acceptance of acid lime for children, older adults, pregnant women and lactating mothers, while rural households primarily focus on adults and adolescents. Furthermore, urban households associate acid lime with a wider range of health benefits, including fever management, digestive issues, weight control, skin problems, diabetes and anaemia. Rural households, though valuing their role as an immunity booster, demonstrate limited awareness of their broader health potential.

These results emphasize the need for targeted interventions to bridge the rural-urban gap in acid lime consumption. Educational initiatives highlighting acid lime's health benefits and versatile applications, coupled with improved product accessibility and affordability, can promote equitable utilization across all socio-economic groups. By addressing these disparities, stakeholders can enhance the role of acid lime in improving health, nutrition and sustainability, ensuring its benefits reach a wider population. This study contributes to a deeper understanding of consumer behaviour and offers valuable insights for public health strategies and market development.

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