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# Effects on flavour and aroma of tea during processing and storage in Ri-Bhoi District, Meghalaya

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**Abstract**

This study was conducted in Ri-Bhoi District, Meghalaya, to assess the effects of processing and storage on the flavour and aroma of tea. A total of 130 respondents were purposively selected from twelve villages under Umsning Block, based on the maximum number of tea growers. A structured interview schedule was prepared, and data were collected, processed, and analyzed.

The findings indicate that most tea growers belonged to the middle-age group, had primary-level education, earned medium annual income, and owned 1-2 acres of land. A majority exhibited high knowledge levels regarding the effects of processing and storage on tea quality. Among thirteen independent variables- age, family size, education, income, landholding under tea and other crops, tea-processing experience, training received, social participation, information sources, mass media exposure, economic motivation, and scientific orientation, several significantly influenced knowledge levels.

Major constraints included lack of technical knowledge (33.85%), financial limitations (23.08%), and inadequate access to training and resources. The study concludes that, while tea growers have moderate-to-high knowledge and interest, improvements in infrastructure, regular training, scientific support, and post-harvest handling are essential to preserve tea quality and enhance market value.

**Keywords:** Tea, knowledge, flavour, aroma, processing, storage

## 1. Introduction

Tea (*Camellia sinensis*) is the most consumed beverage globally after water (Shah *et al*., 2016) [9]. Commercial tea production in India began in 1835, and over the last five decades, production has increased by 304%, while the cultivated area expanded by 160%. This growth has been supported by estate owners, government policies, and the labour force.

Despite these gains, Indian tea production faces persistent challenges such as low labour productivity, high production costs, climate change impacts, seasonal fluctuations, injudicious nutrient management, pest and disease outbreaks, and quality inconsistency (Shah *et al*., 2016) [9]. Nevertheless, in 2014, tea exports contributed over ₹4,000 crores in foreign exchange earnings. Opportunities for further growth include mechanization of plucking, use of renewable energy, organic and value-added products, tea tourism, and government-backed infrastructure development.

Meghalaya's tea sector, particularly in Umsning Block of Ri-Bhoi District, benefits from favourable environmental conditions- high altitude, abundant rainfall, and fertile soils—making it ideal for specialty organic teas. Brands such as MegTea™, promoted by the Directorate of Horticulture, Meghalaya, have positioned the state's tea on the premium market. According to the Meghalaya Horticulture Department (2023), the state has approximately 440 hectares under tea cultivation, producing around 2,210 metric tonnes annually. The study area, covering 9.27 hectares, focuses on oolong, green, and black teas.

Tea flavour and aroma are determined by its chemical composition, particularly polyphenols, amino acids, and volatile compounds (Chaturvedi *et al*., 2023; Borse *et al*., 2022) [5, 4]. Volatile oils, esters, and terpenes contribute to aroma, while catechins, theaflavins, and thearubigins influence flavour. These are affected by agronomic factors (e.g., altitude, rainfall, soil pH, leaf maturity) and post-harvest practices, including storage conditions such as duration, packaging, and ambient environment (Zhang *et al*., 2022) [11].

While Assam and Darjeeling dominate India's tea narrative, Meghalaya's tea sector—though less commercialized, holds untapped potential. Studies integrating geospatial tools, field surveys, and chemical analysis to examine post-harvest effects on flavour and aroma remain scarce.

This study investigates the influence of processing and storage on tea's flavour and aroma in Ri-Bhoi District to inform quality optimization, branding, and value chain strategies for small-scale producers.

## 2. Objectives

1. To determine the socio-economic status of the respondents.
2. To ascertain knowledge levels regarding post-harvest technology in tea production and storage.

## 3. Methodology

### 3.1 Locale of the Study

The study was conducted in Ri-Bhoi District, Meghalaya, which has the largest area under tea cultivation in the state. Umsning Block was purposively selected due to the high concentration of tea growers.

### 3.2 Research Design and Sampling

A descriptive research design was adopted. A multi-stage sampling method was used to select 130 respondents proportionately from twelve tea-growing villages.

### 3.3 Data Collection

Primary data were collected using a pre-tested, structured interview schedule aligned with the study's objectives. Surveys were conducted in person. Data were coded, tabulated, and analyzed using descriptive statistics.

## 4. Results and Discussion

### 4.1 Socio-economic Characteristics

Table 1 presents the socio-economic characteristics of respondents. Most (73.85%) were in the middle-age group (36-55 years) and belonged to medium-sized families (52.31%). The highest education level achieved by most respondents was primary school (37.69%). The majority owned 1-2 acres of land (56.93%) and earned ₹1-2 lakh annually (57.69%). Half of the respondents had over five years of tea-processing experience, yet none reported receiving regular training.

**Table 1:** Distribution of respondents by socio-economic characteristics

| SI. No. | Attribute | Category | Frequency | Percentage |
|---|---|---|---|---|
| 1 | Age | Young (<35 years) | 21 | 16.15 |
| | | Middle (36-55 years) | 96 | 73.85 |
| | | Old (>55 years) | 13 | 10.00 |
| 2 | Family size | 2-3 members | 43 | 33.08 |
| | | 5-10 members | 68 | 52.31 |
| | | >10 members | 19 | 14.62 |
| 3 | Education | Illiterate | 20 | 15.38 |
| | | Primary school | 49 | 37.69 |
| | | Junior high school | 38 | 29.23 |
| | | High school | 9 | 6.93 |
| | | Intermediate | 12 | 9.23 |
| | | Graduate and above | 2 | 1.54 |
| 4 | Landholding | Up to 1 acre | 22 | 16.92 |
| | | 1-2 acres | 74 | 56.93 |
| | | Above 2 acres | 34 | 26.15 |
| 5 | Annual income | Up to ₹1 lakh | 25 | 19.24 |
| | | ₹1-2 lakh | 75 | 57.69 |
| | | Above ₹2 lakh | 30 | 23.07 |
| 6 | Experience in tea processing | <1 year | 11 | 8.46 |
| | | 1-3 years | 20 | 15.38 |
| | | 3-5 years | 34 | 26.15 |
| | | >5 years | 65 | 50.00 |
| 7 | Training in tea processing | Regularly | 0 | 0.00 |
| | | Occasionally | 51 | 39.23 |
| | | Rarely | 46 | 35.38 |
| | | Never | 33 | 25.38 |
| 8 | Social participation | Low | 26 | 20.00 |
| | | Medium | 74 | 56.93 |
| | | High | 30 | 23.07 |
| 9 | Source of information | Low | 20 | 15.38 |
| | | Medium | 53 | 40.76 |
| | | High | 57 | 43.84 |
| 10 | Mass media exposure | Low | 35 | 26.93 |
| | | Medium | 70 | 53.84 |
| | | High | 25 | 19.23 |
| 11 | Scientific orientation | Low | 18 | 13.84 |
| | | Medium | 36 | 27.69 |
| | | High | 76 | 58.46 |
| 12 | Economic motivation | Low | 25 | 19.23 |
| | | Medium | 28 | 21.53 |
| | | High | 77 | 59.23 |

**Interpretation**

Most respondents (73.85%) were middle-aged (36-55 years), with medium family sizes and primary-level education. The majority owned 1-2 acres of land and earned ₹1-2 lakh annually. Half had over five years of tea-processing experience, but none had received regular training. Scientific orientation and economic motivation levels were generally high.

These findings suggest that tea processing in Ri-Bhoi is primarily undertaken by experienced, small-scale growers with limited formal education but high economic motivation.

### 4.2 Knowledge on Tea Processing and Storage

Table 2 shows that 51.53% of respondents had high knowledge levels regarding tea processing and storage.

**Table 2:** Distribution of respondents by knowledge level

| Knowledge Level | Frequency | Percentage |
|---|---|---|
| Low (20-26) | 33 | 25.38 |
| Medium (27-34) | 30 | 23.07 |
| High (35-42) | 67 | 51.53 |

These results align with Bhuyan and Deka (2019) [2], who reported similar findings among small tea growers in Assam, indicating that practical experience contributes significantly to knowledge acquisition.

### 4.3 Constraints Faced

Major constraints identified included lack of technical knowledge (33.85%), financial limitations (23.08%), and inadequate access to training and resources. This highlights the need for targeted capacity-building interventions.

## 5. Conclusion

The socio-economic profile of Ri-Bhoi's tea growers reveals moderate education and income levels, small landholdings, and strong economic motivation. While knowledge on processing and storage is high, application is hindered by infrastructural and financial challenges. Enhancing training opportunities, improving post-harvest infrastructure, and strengthening market linkages can significantly improve tea quality and profitability.

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