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Effect of Temperature on Sensory Perception of Different Types of Water

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A B S T R A C T

This research explores the influence of temperature on the taste perception of different bottled-water brands and tap water& natural source water, using sensory evaluation by a consumer panel. The samples were served at room temperature (≈22° C) and cold temperature (≈ 7° C), and evaluated using a 9-point Hedonic Rating Scale (1 = Dislike extremely, 9 = Like extremely). Five water samples—kinley, tap water, Aquafina, Natural source, and Bisleri—were assessed for sensory attribute i.e. taste. The results revealed that cold temperatures enhanced the taste of some water samples. Kinley received the highest rating under cold conditions (6.23, ranked 1st), while Bisleri was rated highest at room temperature (6.23, ranked 1st). Tap water consistently ranked 4th in both temperatures, with relatively scores (6.10 at room, 5.5 at cold). Aquafina maintained stable ratings across temperatures (6.12 in both), suggesting minimal temperature sensitivity. Overall, the findings demonstrate that temperature significantly affects the sensory perception and acceptability of drinking water. Cold water was generally preferred, especially for brands with good initial ratings at room temperature while for the tap water and natural source water room temperature was mostly prefer. These insights can be valuable for water suppliers, restaurants, and public services in optimizing water service temperature to enhance consumer satisfaction.

Keywords: Organoleptic Analysis, Drinking Water, Temperature effect, Bottled water, Tap water, Natural source water, Sensory evaluation, Taste preferences.

Introduction

Clean and safe drinking water is essential not only for health but also for consumer satisfaction, particularly in terms of sensory attributes like taste and smell. Many people often perceive differences between tap water, bottled water, and filtered water. Additionally, the temperature at which water is consumed plays a crucial role in taste perception. Despite the availability of different types of drinking water, few studies have analysed how temperature impacts the sensory experience. This study aims to evaluate the taste and sensory preference of various water sources under two temperature conditions: room temperature and chilled. Water is an essential and universally consumed beverage that plays a vital role in hydration and overall health. Although chemically neutral, the sensory properties of water—such as taste, freshness, and mouthfeel—can vary depending on its source, mineral composition, packaging, and serving conditions. One key physical factor that significantly influences taste perception is temperature. Previous research has shown that temperature can enhance or suppress certain flavor perceptions, thereby affecting overall acceptability. However, limited studies have focused on how this applies specifically to different brands and types of drinking water.This study aims to investigate the effects of temperature on taste perception across different water types, comparing sensory responses at room temperature (~22°C) and cold temperature (~8°C). The evaluation was carried out by consumer sensory panel using a structured approach based on the 9-point Hedonic Rating Scale (1 = dislike extremely, 9 = like extremely).

The research included five distinct water samples:

1. Sample 1 (Kinley) (Coca Cola) a commercially available bottled water brand.
2. Sample 2 (Tap Water) – obtained from the municipal water supply.
3. Sample 3 (Aquafina) (Pepsi Co) – a processed and widely distributed bottled water of brand.
4. Sample 4 (Natural Source Water) – collected from a natural, untreated source.
5. Sample 5 (Bisleri) (Parle) – a popular packaged drinking water of brand in the market.

Each water sample was evaluated under both temperature conditions for sensory attribute i.e. taste. The goal of the research is to determine how serving temperature influences sensory perception across various water types, and whether consumers exhibit a preference for certain water brands or sources at specific temperatures. The findings of this study will contribute to a better understanding of consumer preferences in water consumption, and may have implications for water production, branding, packaging, and service presentation in both domestic and commercial setting.

Objective of the Study.

1. To evaluate consumer's preference concerning different types of water.
2. To determine and analyse consumer perceptions and expectations regarding different water types.

Literature Review

Bruvold and Pangborn (1966) and Bruvold and Ongerth (1969) showed that the taste and the acceptance of water is linked to the total amount of minerals dissolved, which varies among bottled and tap water.

According to Koster EP (1981) discussed about sophisticated and reliable methods of sensory water quality evaluation and special attention was given to the characteristics of the human senses of taste and smell.

According to Teillet Eric (2010) six bottled mineral water and six types of tap water presented to 389 consumers. The study demonstrated that the most likely preferred types of water are those with medium mineralization, which are perceived as tasteless and cooler.

According to Gary A Burlingame, Richard L Doty and Andrea M Dietrich (2017), For the past 70 years trained and untrained people have helped check the quality of food and water. While useful, current methods for testing drinking water can be improved for better accuracy and reliability. Proper test handling is important to avoid errors, and humans are still the best for judging water quality.

Research Methodology

1. Research Design

Five types of water were selected for the study: bottled mineral water of three different brands (Kinley, Bisleri, Aquafina), Natural source water from stepwell (Bavri), and filtered tap water using a domestic RO system. Each sample was served at room temperature (25°C) and chilled temperature (7°C). A defined amount of water is filled in glasses at room temperature and for chilled water, the water bottles and natural source water or filtered tap water is chilled for 2 hours at 7°C and then filled in glasses. A total of 100 untrained participants were selected to form the sensory panel. A 9-point hedonic scale was used to evaluate taste. The samples were coded and served randomly to avoid bias.

2. Type of Research

This research relies on the numerical data collected using-

- a hybrid questionnaire to identify the trends in consumer behaviour.
- a 9-point hedonic scale to understand the consumer acceptance.

3. Research Instrument

- Questionnaire
- 9-point hedonic rating scale

4. Sampling Method

Selection of the respondents was carried out through a non-probability convenience sampling technique, based on ease of access and voluntary participation.

5. Sampling Size

The research was conducted with a sample size of 100 respondents, considered sufficient to yield preliminary insights and overarching trends in the market and consumer behaviour.

6. Target population

The target population is everyone who consume different types of water in the age group of 20-30 years of age.

7. Data Analysis

The collected data were systematically tabulated and analysed using statistical techniques such as mean analysis in case of hedonic rating scale. Findings were presented in the form of tables and bar graphs for better understanding.

Data analysis and Interpretation.

We asked some common questions from peoples about their preference over water. Questions are written below.

- Preferred water type at home.

Answer	Number of respondants	Percentage
Tap Water	31	31%
Filtered Tap Water	52	52%
Bottle water	0	0
Other Source	17	17%

Interpretation

Most of the people's drink/use filtered tap water because it is most commonly present in all houses.

- Does temperature change your perception of your taste?

Answer	Number of respondents	Percentage
Yes	53	53%
No	47	47%

Interpretation

Most of the peoples had feel change in their taste perception due to change of temperature.

- Do you believe that bottle water tastes better than tap water?

Answer	Number of respondents	Percentage
Yes	43	43%
No	27	27%
Unsure	30	30%

Interpretation

Mostly peoples say bottled water taste better because firstly it is filtered and sometimes there's addition of minerals in bottled water that change their taste somehow.

- Does packaging/brand influence your expectations of taste?

Answer	Number of respondents	Percentage
Yes	56	52%
No	44	44%

Interpretation

Yes, brand and packaging influence consumers' expectations of taste.

- Would you pay more for water that tastes better?

Answer	Number of respondents	Percentage
Yes	59	59%
No	41	41%

Interpretation

Consumers ready to pay more for water that tastes better and away from toxins, that is filtered.

- Which bottle water brand you prefer most and why?

Bisleri, Because of the marketing of the company and due to its brand name and advertisement.

Key Findings

1. **Brand Preference**
    - Bisleri is the most preferred brand due to its marketing, advertisement and brand value.
2. **Consumption frequency**
    - Most people's drink bottled water only during travelling because of lack of availability of filtered or clean drinking water.

Organoleptic testing on the basis of hedonic scale

Score Preference	**Code**
Like Extremely	9
Like Very Much	8
Like Moderately	7
Like Slightly	6
Neither like nor dislike	5
Dislike Slightly	4
Dislike Moderately	3
Dislike Very Much	2
Dislike Extremely	1

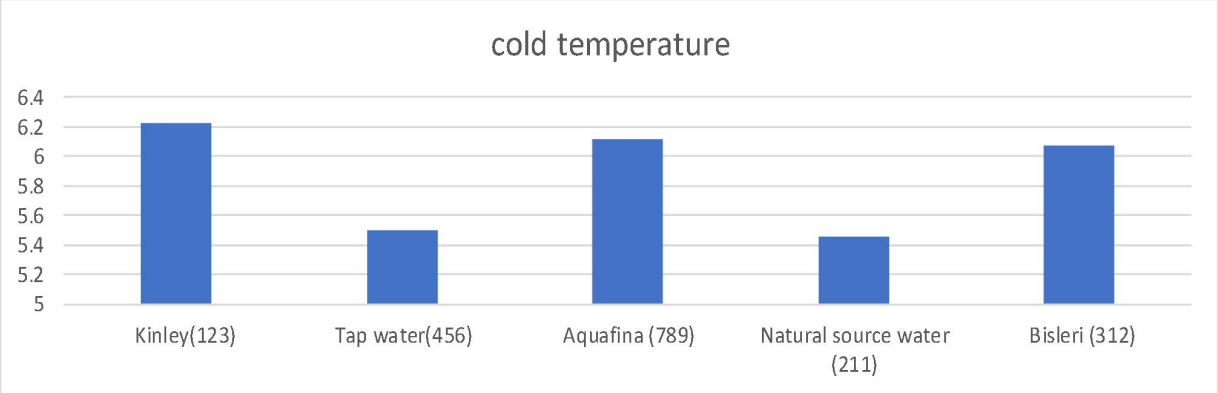
Sample Code/Name	**Room Temperature**	**Cold Temperature**
Kinley (123)	5.9	6.23
Tap Water (456)	6.10	5.5
Aquafina (789)	6.12	6.12
Natural Source Water (211)	6.21	5.45
Bisleri (312)	6.23	6.07

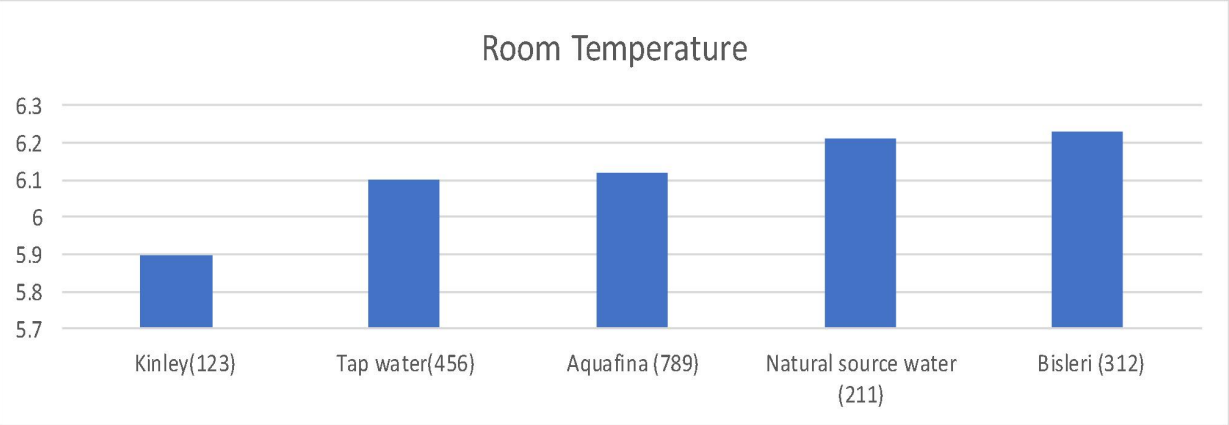
100 participants were involved for organoleptic testing. The results showed that chilled bottled water (Kinley) received the highest average scores across all parameters. Bottled water (Kinley) at room temperature scored the lowest, with participants noting an unpleasant metallic or chlorinated aftertaste. Tap water receives 4th rank at both room and cold temperature, at chilled temperature bottled water (Aquafina) ranks 2nd & at room temperature natural source water from (Bavri) rank 2nd, at chilled temperature bottled water (Bisleri) ranks 3rd & at room temperature bottled water (Aquafina) ranks 3rd and the 5th rank at chilled temperature is natural source water or at room temperature bottled water (Kinley) rank 5th. Filtering improved the taste scores slightly. Temperature significantly influenced the perceived taste, with room temperature samples generally being preferred across all types. The data suggest that lowering water temperature can't supress undesirable changes.

Key Findings

At room temperature Bisleri is most liked water (6.23) and at cold temperature Kinley is most liked (6.23) .

At room temperature Kinley scored lowest (5.9) and at cold temperature Natural source water score lowest (5.5)





Conclusion

Temperature plays a significant role in the taste perception of drinking water. Bottled water, particularly when chilled, was rated highest in terms of acceptability. Tap water scored lowest due to off-flavours that were more apparent at room temperature. The study suggests that source and temperature are key factors influencing consumer preferences in drinking water and in today's hustling life due to health issues most or almost all the peoples considered bottled water and filtered safer for consuming as drinking as compared to other resources of water. Clean and filtered prefer most.

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