



**An Anthropological Study on the Use of Natural Flavoring Agents in
Sri Lankan Traditional Food Culture**

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ABSTRACT

There is no universal definition for the term 'flavorings'. Yet, spices, herbs, condiments, and seasonings altogether are known as natural flavoring agents, including coloring sources, tart flavorings, preservative spices, aromatic flavorings, and appetizers. In this study, main objective was to identify culinary spices, herbs, condiments, and seasonings that are being used, and their form of usage. This study covered purposively selected 100 Divisions out of 256 Divisions to represent selected Divisional Secretariats. Each 25-household was selected from Divisional Secretariats via snowball sampling method representing 100 D.S. Divisions. The required data were collected from 2500 households through semi-structured interviews. Identified Sri Lankan natural food flavoring agents are divided into three main categories based on their sources: plant-based, animal-based, and mineral-based. 61 natural flavoring agents were identified in this study and this constitutes the highest number of natural flavoring agents used in Sri Lanka. Majority of the identified flavoring agents belonged to the plant-based 55(N) (90%) category. Mineral-based 3(N) (5%) and animal-based 3(N) (5%) natural flavoring agents were identified during this study. In addition, spices 23(N) (38%), herbs 17(N) (28%), seasonings 12(N) (19%), and condiments 9(N) (15%) were also identified in this study. Considerably, flavoring mixtures (thunapaha) play a notable role in Sri Lankan traditional cuisine. Similarly, 'Thuna' is one mixture made out of three ingredients (cumin, fennel and coriander) and 'Paha' is another mixture made out of five lumps (pepper, garcinia, mustard, turmeric and chili). Today, people have limited the use of flavoring agents because of the lack of traditional knowledge and the disappearance of the traditional practices related to cooking from modernized societies.

1. Introduction

Human beings are the only species in the world that consume food after a process that is known as cooking. In the beginning, the process of cooking seemed to be very simple. According to the archeological and anthropological view, the most simplistic method of cooking was burning on fire (Wrangham, 2009). But with the development of human civilization, the basics of cooking were changed via many aspects such as cooking style, use of ingredients, and further modifications. (Withanachchi, 2019; Levinson, 2004). Salt was the very first flavoring the modern *Homo sapiens* added to change the natural taste of food, and almost all societies in the world today use salt as a natural flavoring (Levinson, 2004). Different societies around the world use different types of natural flavoring agents for several purposes. There is no universal definition for the term 'flavorings'. Yet, spices, herbs, condiments, and seasonings altogether are known as natural flavoring agents (Withanachchi, 2019). Natural food coloring sources, tart flavorings, preservative spices, aromatic flavorings, and appetizers are also considered as the sources of natural flavoring agents (Withanachchi, 2019). These natural flavoring agents have been used for multiple reasons since early days, such as; to enhance the flavor of the food, to add or enhance medicinal and culinary values, to enhance the color of the food, to soften the food, to preserve the food, to prevent indigestions, to speed up the cooking process, and to change the nature of the food (Amoah et al., 2022).

Sri Lanka holds a key place in world history when spices are concerned. Sri Lankan cuisine is renowned for its diverse and complex flavor profiles, achieved through the use of a wide variety of flavoring agents. The island's location along the ancient trade routes of the Indian Ocean has resulted in a unique blend of culinary influences from India, Southeast Asia, the Middle East, and Europe. One of the most essential

components of Sri Lankan cooking is the spices. These aromatic ingredients are used to add depth, complexity, and a burst of flavor to dishes. Among the Sri Lankan agricultural exports, 56% is covered by spices, allied products, and essential oils. Among the spices, some major spices had a huge demand in the global market between 2000 - 2020. They are; Ceylon cinnamon, catering to the majority of the world market, Ceylon pepper, satisfying approximately 2% of the global demand, and Cloves, fulfilling approximately 8.5% of the global demand. Further, Nutmeg and Mace met 5% and 7% of global demand respectively, and Cardamom fulfilled 0.1% of global demand (Thana Global, 2022). Sri Lanka has been renowned for the supply of the world's best cinnamon and black pepper to the global market since ancient times (Standage, 2009). Many types of natural flavorings are used around the world and most of the flavoring plants were unique and endemic to different geographical areas (Seidemann, 2005). With the industrial revolution, some of these selected plant varieties were used to cultivate on large scale to fulfill the demand in the global market for spices. Hundreds of types of plant varieties and other sources have been used as natural flavorings in different regions because of their availability and accessibility (Withanachchi, 2019). Some of these flavoring plant varieties are not used at present because knowledge and awareness of utilizing these plant varieties heavily relied on traditional cooking practices (Wrangham, 2009). The disappearance of the traditional knowledge and practices related to cooking is a huge obstacle, especially at a time when people are more conscious about their health and the food they consume. Most people had to limit the types of natural flavorings they used. Besides, an island-wide research has not been conducted to identify the sources and natural settings of the natural flavoring agents. This research gap motivated the researcher to conduct an island wide survey to identify the types of natural flavoring agents; mainly, the culinary spices, herbs,

condiments, and seasonings that are being used and their form of usage.

1.1 Literature Review

Natural flavoring agents (spices, herbs, condiments, and seasonings) have been widely used in traditional food cultures around the world, including Sri Lanka. These natural flavoring agents play a significant role not only in enhancing the taste and aroma of foods but also in preserving and medicinally treating various health conditions (Kapoor, 2017). In the literature review, the researchers explored the anthropological aspects of the usage of natural flavoring agents in Sri Lankan traditional food culture, with a focus on their historical, cultural, social, and economic significance.

1.2 Historical and Cultural Significance

Archaeological evidence suggests that spices and herbs were used in Sri Lanka as early as 500 BCE, and trade routes such as the Spice Route played a crucial role in connecting Sri Lanka with the rest of the world for the exchange of these valuable commodities (Kapoor, 2017). The cultural significance of natural flavoring agents in Sri Lankan traditional food culture can be seen in various aspects of daily life. For example, spices and herbs are used in everyday cooking, religious rituals, and social gatherings. Traditional Sri Lankan dishes, such as rice and curry, are typically prepared with a combination of spices, herbs, and other natural flavoring agents to create a unique and distinct taste profile (Rasaputra et al., 2019). These natural flavoring agents are also used in Ayurvedic medicine, a traditional system of medicine practiced in Sri Lanka, for their therapeutic properties (Gunathilaka et al., 2018).

1.3 Economic Significance

Sri Lanka is known for its production of spices such as cinnamon, cardamom, and cloves,

which are exported to international markets (Liu et al., 2020). The spice trade has played a crucial role in shaping the country's economy and cultural identity, and Sri Lanka has a long history of being a global spice hub (Kariyawasam and Jayasinghe, 2020). The economic significance of natural flavoring agents in Sri Lankan traditional food culture is also evident in local livelihoods, as many farmers and traders rely on spice production and trade for their income (Ranasinghe and Jayawardena, 2018).

1.4 Traditional Knowledge and Practices

This traditional knowledge is often transmitted orally or through practical demonstrations, and it plays a vital role in the selection, preparation, and use of natural flavoring agents in Sri Lankan cuisine (Goonawardhana et al., 2021). For example, traditional Sri Lankan healers, known as '*vedamahaththayas*,' use their knowledge of spices and herbs to prepare remedies for various ailments, and their expertise is highly valued in local communities (De Silva et al., 2018). Traditional practices related to the usage of natural flavoring agents in Sri Lankan food culture also encompass seasonal harvesting, processing techniques, and storage methods that have been developed and refined over time to ensure optimal flavor, aroma, and medicinal properties (Wijeratne et al., 2020).

1.5 Culinary Techniques and Recipes

Culinary techniques such as tempering, roasting, grinding, and blending are commonly used in Sri Lankan cooking to unlock the full potential of natural flavoring agents and create complex and harmonious flavors (Jayawardena et al., 2019). Traditional recipes, handed down through generations, often include specific combinations of spices, herbs, condiments, and seasonings that are carefully balanced to achieve the desired taste profile. For example, '*curry powder*,' a blend of roasted and ground

spices, is a fundamental ingredient in Sri Lankan cuisine and is used in a wide range of dishes (Silva et al., 2018). Culinary techniques and recipes related to the usage of natural flavoring agents in Sri Lankan traditional food culture are an important aspect of the intangible cultural heritage of Sri Lanka and are passed down through families, communities, and cultural institutions (Premathilake and Weerasooriya, 2021).

1.6 Changing Food Culture and Global Influences

Sri Lanka has been influenced by various foreign cultures throughout its history, including Portuguese, Dutch, and British, which have left an indelible mark on its cuisine (Mendis et al., 2017). Globalization and modernization have also impacted Sri Lankan food culture, with changes in lifestyle, dietary patterns, and food preferences influencing the usage of natural flavoring agents. For example, urbanization and migration have led to the adoption of new culinary practices, ingredients, and cooking techniques, which have influenced the traditional usage of natural flavoring agents (Wickramasinghe et al., 2019). Westernization and the influence of processed and convenience foods have also impacted the usage of natural flavoring agents in Sri Lankan traditional food culture, with a shift towards pre-packaged, standardized, and mass-produced food products that may not always adhere to traditional culinary practices and recipes (Munasinghe et al., 2018).

As mentioned by Ashurst, flavorings would have to be:

- i. Stable to heat in aqueous media.
- ii. Completely soluble in aqueous media.
- iii. Uniformly dispersible in aqueous or oil phase or even throughout a colloidal matrix of a food.
- iv. Capable of producing an agreed taste/aromatic profile.

- v. Unique-to provide the same uniqueness to the end-product (this could necessitate time spent in formulation or in raw material search).
- vi. Stable during prolonged storage (Ashurst, 1991, p.6).

Whereas in prehistoric times, only herbs and spices could be employed for flavoring purposes, today a broad spectrum of flavorings is available, not only for use in the individual household, but especially for the production of food on an industrial scale (Ziegler, 2007). The roots of flavoring pathway date back to the evolutionary periods of early humans.

Due to trade and globalization, numerous cuisines around the world use many of the same basic foods, but may season those foods in distinctive ways (Center for Ecoliteracy, 2015). In the book *Herbs and Spices of the World* (2013), van Wyk mentioned that the cuisines of India and those of its close neighbors such as Nepal, Sri Lanka, Pakistan and Bangladesh represent an astounding mosaic of regional traditions, based not only on many interesting local food ingredients and spices, but also on religious and cultural principles. The famous East Indies (including India, Sri Lanka, Malaysia and Indonesia) supplied important tropical spices such as cardamom, cinnamon, cloves, ginger, mace, nutmeg and especially pepper to satisfy the huge demand in Europe, where the lack of a tropical climate prevented local production (Wyk, 2013). Since Sri Lanka being a tropical country, the island owns an extensive variety of natural flavorings which have been functioning for multipurpose.

Despite the extensive historical and cultural significance of natural flavoring agents in Sri Lankan traditional food culture, there is a notable lack of comprehensive, systematic research on the contemporary usage, knowledge preservation, and potential shifts in the utilization of these agents due to modern influences. While previous studies

have documented the economic impact and some historical aspects of spice production and trade in Sri Lanka, there is limited anthropological research that delves deeply into the day-to-day practices, traditional knowledge transmission, and evolving culinary techniques associated with these natural flavorings.

There is a scarcity of detailed documentation on the traditional knowledge and practices related to the use of natural flavoring agents in Sri Lankan cuisine. Much of this knowledge is transmitted orally, and there is a risk of it being lost as older generations pass away without recording their expertise. While some studies touch upon the cultural significance of spices and herbs in rituals and social gatherings, there is a gap in understanding the deeper cultural and social contexts in which these flavoring agents are embedded. This includes their role in daily life, religious practices, and community identity. The influence of globalization, urbanization, and changing dietary patterns on the traditional use of natural flavoring agents is under-researched. There is a need to explore how contemporary culinary practices are evolving in response to global culinary trends and the increasing prevalence of processed foods.

Few studies have conducted a comparative analysis of historical and contemporary practices in the use of natural flavoring agents. Such an analysis is crucial to understand how traditional methods have adapted or been replaced over time. Sri Lanka's diverse geographical regions may exhibit different traditional practices regarding the use of natural flavoring agents. However, there is limited research that captures these regional variations comprehensively.

There is a critical need to systematically document and analyze the traditional and contemporary uses of natural flavoring agents in Sri Lankan traditional food culture,

examining their historical evolution, cultural significance, and the impact of modern influences, to ensure the preservation and continued relevance of this culinary heritage in the face of globalization and modernization.

This research problem emphasizes the importance of capturing and preserving traditional knowledge, understanding the cultural and social roles of natural flavoring agents, and assessing the shifts in culinary practices due to contemporary influences. Addressing this problem will contribute to safeguarding Sri Lanka's rich culinary heritage and inform strategies to maintain its authenticity in a rapidly changing world.

1.7 Research Objectives

1.8 Main Objective

To comprehensively examine the utilization of natural flavoring agents in Sri Lankan traditional food culture, with a focus on understanding their cultural significance, historical roots, and contemporary relevance.

1.9 Specific Objectives

- i. To investigate the historical evolution of natural flavoring agents in Sri Lankan traditional cuisine, exploring their origins, development, and cultural adaptations over time.
- ii. To assess the cultural and anthropological significance of specific natural flavoring agents in traditional Sri Lankan dishes, examining how they contribute to the identity and heritage of the cuisine.
- iii. To examine the contemporary practices and preferences related to the use of natural flavoring agents in Sri Lankan traditional cooking, considering any shifts or adaptations in response to modern influences or global culinary trends.

2. Materials and Methods

Sri Lanka is a tropical island with a population of 22 million people, covering a land area of approximately 65,000 square kilometers (km²). Geographically and demographically, Sri Lanka is a diversified country. Administratively, Sri Lanka has 9 provinces, 25 districts and 256 Divisional Secretariats. The research was carried out from August 2018 to October 2022. Referring to the type of inference, the proposed research stands out with inductive approach. Observations and semi-structured interviews were the prime methods of data collection. This study purposively covered 100 Divisions out of 256 Divisions, representing a diverse cross-section of traditional food cultures, including Sinhala, Tamil, and Muslim communities. Each Divisional Secretariat was represented by 25 households, selected via the snowball sampling method, ensuring comprehensive coverage across the 100 Divisions. This approach captured the varied use of natural flavoring agents, encompassing the unique culinary practices of different ethnic groups, such as the Sinhala, Tamil and

Muslim. This diverse representation is crucial for drawing conclusions that accurately reflect the rich and multifaceted nature of Sri Lankan traditional food culture, including specific regional practices such as the Jaffna food culture. The required data were collected from 2500 households through semi-structured interviews. The semi-structured interview schedule contained 15 questions for the identification of natural flavoring agents in Sri Lanka. Interviews were conducted at field sites such as the participants' residences. The researchers have used Sinhalese and Tamil language as the prime communication tool to conduct interviews which lasted around 30 - 45 minutes. Nevertheless, the duration varied depending on the amount of knowledge the contributors were willing to share.

3. Results and Discussion

To grasp the big picture of the study, the identified natural flavoring agents are divided into four categories: spices, herbs, condiments, and seasonings.

Table 01. Flavoring agents of Sri Lanka

No	Name of the flavoring	Source			Type				Function				
		Plant	Animal	Mineral	Spices	Herbs	Condiments	Seasonings	Coloring	Tart flavorings	Preservative spices	Aroma	Appetizers
01	Cinnamon (<i>Cinnamomum verum</i>)	✓			✓						✓	✓	✓
02	Turmeric (<i>Curcuma longa</i>)	✓			✓			✓					
03	Cumin (<i>Cuminum cyminum</i>)	✓			✓								✓
04	Coriander (<i>Coriandrum sativum</i>)	✓			✓								✓
05	Fennel (<i>Foeniculum vulgare</i>)	✓			✓								✓
06	Onion (<i>Allium cepa</i>)	✓			✓								✓
07	Garlic (<i>Allium sativum</i>)	✓			✓								✓

08	Dried mango (<i>Mangifera indica</i>)	✓		✓			✓			
09	Dried lime (<i>Citrus aurabtiifolia</i>)	✓		✓						
10	Pepper (<i>Piper nigrum</i>)	✓		✓	✓	✓		✓		✓
11	Mace (<i>Myristica fragrans</i>)	✓		✓						
12	Nutmeg (<i>Myristica fragrans Houtt</i>)	✓		✓						
13	Fenugreek (<i>Trigonella foenum-graecum</i>)	✓		✓						✓
14	Cardamom (<i>Elettaria cardamomum</i>)	✓		✓						
15	Mustard (<i>Brassica juncea</i>)	✓		✓						
16	Ginger (<i>Zingiber officinalis</i>)	✓		✓						
17	Dried bilin (<i>Averrhoa bilimbi</i>)	✓		✓						
18	Nigella (<i>Nigella sativa</i>)	✓		✓						
19	Tamarind (<i>Tamarindus indica</i>)	✓		✓	✓	✓	✓	✓		✓
20	Galangal (<i>Alpinia galangal</i>)	✓		✓						
21	Garcinia (<i>Garcinia gummi-gutta</i>)	✓		✓		✓		✓		✓
22	Dried chilies (<i>Capsicum abyssinicum</i>)	✓		✓						
23	Curry leaves (<i>Murraya koenigii</i>)	✓			✓					✓
24	Pandan leaves (<i>Pandanus amaryllifolius</i>)	✓			✓					✓
25	Lemongrass (<i>Cymbopogon citratus</i>)	✓			✓					
26	Mint leaves (<i>Mentha piperita</i>)	✓			✓					
27	Coriander leaves (<i>Coriandrum sativum</i>)	✓			✓					
28	Anise leaves (<i>Pimpinella anisum</i>)	✓			✓					
29	Cinnamon leaves (<i>Cinnamomum verum</i>)	✓			✓					✓
30	Raw papaya (<i>Carica papaya</i>)	✓			✓					
31	Hummingbird tree leaves (<i>Sesbania grandiflora</i>)	✓			✓					
32	Spinach (<i>Spinacia oleracea</i>)	✓			✓					
33	Bark of drumstick tree (<i>Moringa oleifera</i>)	✓			✓	✓		✓		
34	Vinegar	✓				✓				
35	Lime (<i>Citrus aurantiifolia</i>)	✓				✓		✓		
36	Tomato (<i>Solanum lycopersicum</i>)	✓				✓		✓		
37	Bilin (<i>Averrhoa bilimbi</i>)	✓				✓				
38	Orange (<i>Citrus sinensis</i>)	✓						✓		
39	Tamarind leaves (<i>Tamarindus indica</i>)	✓						✓		✓
40	Hibiscus flowers (<i>Hibiscus</i>)	✓								
41	Butterfly pea (<i>Clitoria ternatea</i>)	✓					✓			
42	Clove (<i>Syzygium aromaticum</i>)	✓								✓
43	Kithul flour (<i>Caryota urens</i>)	✓					✓			
44	Kithul jaggery (<i>Caryota urens</i>)	✓					✓			

45	Corn flour (<i>Zea mays</i>)	✓					✓						
46	Rice flour (<i>Oryza sativa</i>)	✓					✓						
47	Kithul treacle (<i>Caryota urens</i>)	✓					✓						
48	Finger millet flour (<i>Eleusine coracana</i>)	✓					✓						
49	Wild ginger (<i>Zingiber cylindricum</i>)	✓			✓		✓						
50	Palmyrah flour (<i>Borassus flabellifer</i>)	✓					✓						
51	Long pepper (<i>Piper longum</i>)	✓			✓	✓							
52	Leek (<i>Allium porrum</i>)	✓				✓							
53	Country borage (<i>Coleus amboinicus</i>)	✓				✓							✓
54	Ceylon citronella (<i>Andropogon citrosus Steud.</i>)	✓				✓							✓
55	Wild coriandum (<i>Ambulia micrantha (Nutt.) Raf</i>)	✓				✓							
56	Salt			✓			✓	✓					
57	Lime (<i>Hunu</i>)			✓					✓				
58	Quartz			✓									
59	Bee honey		✓					✓					
60	Maldive fish		✓				✓						
61	Dried fish powder		✓				✓						

According to the analyzed data, three main sources of flavoring agents can be identified within the Sri Lankan context; plant based flavoring agents, animal based flavoring agents and minerals based. The majority of the flavoring agents belonged to the category of plant-based flavoring agents, illustrating 55(N) (90%) because Sri Lanka is a tropical country that owns huge and diversified plant population. As a result, the island experienced a rich biodiversity which is helpful for the growth of the plants. About 3368 plant species belonging to 1294 genera and 132 families have been identified in Sri Lanka. About 800 of these are endemic to Sri Lanka, while the rest species have been brought to Sri Lanka from the various regions at different times (Rajapaksha, 1998). Another identified significant fact was that the use of natural flavorings with minerals is higher than the use of animal-based flavoring agents. According to the research findings, three mineral-based 3(N) (5%) natural flavoring agents were identified (lime, quartz, and salt). Similarly, three animal-based 3N (5%) natural flavoring agents were identified from this study;

maldive fish, dried fish powder and bee honey. According to the literature sources, both ingredients (maldive fish and fish powder) have been in use since recently.

Analyzed data emphasized that, among the types of natural flavoring used within the Sri Lankan cuisine, four main types can be identified: (1) spices, (2) herbs, (3) condiments, and (4) seasonings.

According to the Sri Lankan context, most of these natural flavorings are being used as spices, 23(N), followed by seasonings, 12(N), herbs, 17(N) and condiments, 9(N). However, this study identified 55 plant species that produce plant-based natural flavoring agents. Additionally, three types of mineral-based natural flavoring agents and two animal-based natural flavoring agents (derived from fish and bees) were identified from Sri Lankan sources. Accordingly, 61 natural flavoring agents were identified during this study.

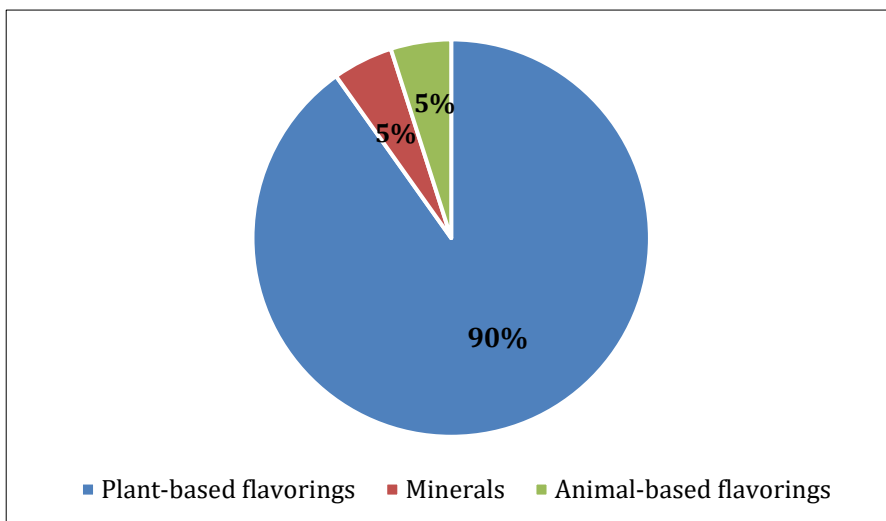


Figure 01. Sources of flavoring agents

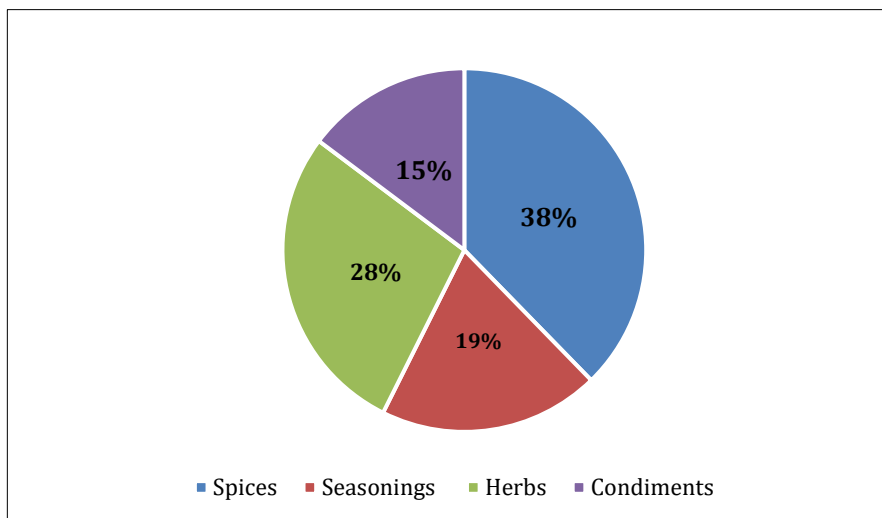


Figure 02. Percentage of types of use of natural flavoring in Sri Lankan food culture

3.1 Natural Flavoring Agents in Sri Lanka

3.1.1 Spices

The word 'spice' derives from the Latin term '*Spices aromatacea*' and in etymology it refers to the phrase 'Fruits of the earth.' The Geneva-based International Standards Organization (ISO) defines spices as

vegetable products or mixtures thereof, free from extraneous matter, used for flavoring, seasoning and imparting aroma in foods (Peter, 2001). Spices are a group of flavorful and aromatic plant products that are used to enhance the taste and aroma of food. Spices are typically derived from the seeds, fruits, roots, or bark of plants, and are used in various forms, such as ground, whole, or as a paste. Some common spices include black pepper, cinnamon, cumin, ginger, paprika,

turmeric, and cloves. These spices are used in various cuisines around the world, and each has its unique flavor and aroma. Spices not only add flavor to food but also have health benefits. For example, turmeric contains curcumin, a compound that has anti-inflammatory properties, and cinnamon has been shown to help regulate blood sugar levels. When considering the global market and the distribution of herbs, Asia has been well known as the 'Land of Spices' (Chomchalow, 1996). Sri Lanka, formerly known as Ceylon, is famous for its spices and has a long history of spice cultivation and trade. The country's location on ancient trade routes made it a hub for the spice trade, and it was one of the first places where Europeans established colonies to control the spice trade. According to the early written sources, spices can be classified into four main categories: Species Aromata, Species Thumiamata, Species Condiments, and Theriacea (Withanachchi, 2019).

Overall, 23 cooking spices have been identified in this study which is the highest record for the identification of natural spices used in Sri Lankan cuisine. Most identified spices belonged to the apiaceae and zingiberaceae botanical families. A similar study conducted on apiaceae botanical family revealed that many plants of this family are condiments or vegetables with some of them having medical properties (Tamokou et al., 2017). Likewise, another study has indicated that zingiberaceae, also named as the ginger family, is the largest family of the order zingiberales. It is divided into about 53 genera, and made up of more than 1300 species (Kress et al., 2002) where many species that belong to the ginger family have been widely used as spices or flavoring agents, due to its aromatic odors, pungent and spicy taste (Zhou et al., 2017).

Another significant finding was that specific ingredients used as spices also serve as tart flavorings or other flavor types, such as dried mango and tamarind, which are both used as

spices and tart flavorings. Sri Lankan spices, particularly cinnamon and black pepper, are highly valued and unique, holding a significant demand in the global market. The Portuguese invasion of Ceylon aimed to cement a monopoly on cinnamon, with the best cinnamon coming from Sri Lanka (Bilderback, 2007).

However, one of the most significant issues is the decline in the consumption of many traditional spices. While the primary reason for this decline is the inadequate transmission of traditional culinary knowledge from older to younger generations, other factors also play a role. Cultural assimilation, globalization, and modernization have influenced dietary habits and preferences, leading to a reliance on fewer spices. These influences have introduced new culinary practices and ingredients, often favoring convenience and standardization over traditional methods. As a result, the rich diversity of Sri Lankan spices is at risk of being overshadowed by global food trends and modern dietary patterns.

3.1.2 Herbs

Herbs are a group of plants that are commonly used as flavoring agents in cooking due to their aromatic and flavorful properties. They are used to enhance the taste of a variety of dishes, from savory to sweet. Herbs can be used either fresh or dried, and the way they are used can vary depending on the dish and the cook's preferences. Some herbs are best used as a garnish, while others are better suited to being cooked with the dish to release their flavors. Consequently, there is no globally established or agreed definition for culinary herbs and spices, but in some literature sources herbs and spices are simply defined as; herbs are obtained from the leaves of herbaceous (non-woody) plants, and spices are obtained from roots, flowers, fruits, seeds or bark and they are native to warm tropical climates and can be woody or herbaceous plants (Opara and Chohan, 2021).

The term herbs come from Latin meaning 'Grass' and herbs are defined as the leaves and stems of soft-stemmed, non-woody plants. Overgeneralizing, culinary herbs are temperate leafy shoots used culinary to flavor other dishes (Duke et al., 2002). Sri Lankan cuisine is known for its bold and aromatic flavors, and herbs are an essential component of many Sri Lankan dishes. Since ancient times, Sri Lankan traditional cuisine has been strongly linked to nutritional, therapeutic and pharmacological considerations of nutrients and cooking methods (Dushmantha et al., 2021). Herbs 17(N) (25%) are the second category of natural flavoring agents used in the Sri Lankan food culture.

3.1.4 Condiments

Condiments are an important part of human history and nutrition and have played an important role in the development of most cultures around the world (Garcia-Casal et al., 2016).

Condiments are prepared food compounds containing one or more spices, or spice extracts, which, when added to a food after it has been served, enhance the flavor of the food (Farrell, 1985). Condiments can be either simple (e.g. celery salt, garlic salt, onion salt) or compound (chilli sauce, chutney, meat sauce, mint sauce, prepared mustard, etc.) (Ravindran and Kallapurackal, 2012). Different types of condiments are routinely used in different parts of the world and are widely consumed by populations of all socioeconomic classes (Chavasit and Photi, 2018). Since most basic condiments contain high salt and/or sugar contents, limitation of condiment consumption is globally recommended in order to reduce the risk of increasing non-communicable diseases (Chavasit and Photi, 2018). In a country facing a double burden from non-communicable diseases, Sri Lankans have been accustomed to consuming condiments that are nourished with healthy and nutritious ingredients since ancient times. Researchers have been able to identify 09 different condiments including pepper, tamarind, vinegar, salt, lime, tomato, bilin,

maldive fish, and dried fish powder. Sometimes, these condiments are consumed either as spices or as seasonings according to the dish.

3.1.5 Seasonings

All great meals are about balance; the five tastes - sweet, salty, sour, bitter, and umami, should all complement one another, without any one taste hogging the limelight (Liz, 2017). Seasonings are mixtures of natural substances (including herbs and spices) that are added to food to enhance the flavor and sometimes also to act as preservatives (van WYK, 2013). Seasonings are added in small amounts before or during the cooking. As mentioned by van WYK, there are five types of seasonings; saline (salt, seasoned salt and saltpeter), acid (vinegar, lemon juices), hot (black pepper, chili pepper and other types of pepper), sweet (sugar, honey) and savory or umami (fish sauce, soy sauce, hydrolyzed vegetable proteins, glutamate). It is evident that spices, seasonings, herbs and condiments are used synonymously in most of the contexts, but they are different from each other in meaning (Chavasit and Photi, 2018). Accordingly, garcinia, tamarind, pepper, and vinegar are the identified seasonings used as natural flavoring agents in Sri Lankan cuisine.

3.1.6 Natural Spice-Mixtures used in Sri Lankan Traditional Cooking

In Sri Lankan traditional food culture, natural flavoring mixtures carry a unique and significant value. Two types of traditional mixtures can be identified as *thunapaha* (row) and *thunapaha* (toasted). In Sinhala '*thuna*' means 'three' and '*paha*' means 'five.' Consequently, there are two different mixtures in Sri Lankan traditional cuisine. When using both mixtures together, it is called '*thuna paha*.' As mentioned earlier '*thuna*' is one mixture made out of three ingredients (cumin, fennel and coriander), '*paha*' is another mixture made out of five lumps (pepper, garcinia, mustard, turmeric

and chili). When concerning the Jaffna food culture, they owned very unique mixtures made with garlic, tamarind, mustard, turmeric, cumin, pepper, coriander, chili, ghee, tomato, salt, and curry leaves.

Even though modern people use different mixtures made with traditional ingredients, additional ingredients are often added to enhance the taste of the food and facilitate easier usage. Similarly, Muslim and Tamil communities have been using unique mixtures since early times, specifically comprising pepper, cinnamon, nutmeg, coriander, cumin, cardamom, and clove, among others. According to Sri Lankan culinary history, early Sri Lankans preferred using natural ingredients in their natural form to preserve their natural taste, as they believed overheating would kill the natural flavors. The study's data, collected from 100 Divisional Secretariats across the country, indicate that there are notable geographical differences in the use of these spice mixtures. These differences are influenced by the availability of certain spices, cultural practices, and ethnic traditions prevalent in various regions. E.g. Coastal areas, particularly those with significant fishing communities, such as those in the Southern and Eastern provinces, tend to use spice mixtures that complement seafood. These mixtures often include higher amounts of tamarind and other tart flavorings. In the central highlands, where the climate is cooler and wetter, spice mixtures frequently include a higher proportion of cinnamon, cardamom, and cloves, which thrive in this region. The use of these spices is not just culinary but also tied to the local economy, as these regions are major producers of these spices. Sinhala communities across various regions prefer mixtures that include a balance of coriander, cumin, and fennel seeds, with a lesser emphasis on very pungent spices. The focus is often on enhancing the natural flavors of vegetables and meats without overpowering them. Tamil cuisine, particularly in the Northern Province, frequently uses a higher concentration of pepper, cumin, and

fenugreek. The culinary tradition here is also heavily influenced by South Indian cuisine, incorporating spices that add heat and depth to dishes like curries and sambars.

3.1.7 Natural food flavoring agents: food colorings, tart flavorings, preservative spices, aromatic spices, and appetizers

Pertaining to the analyzed data the below functionalities can be identified within the Sri Lankan natural flavoring agents; food colorings, tart flavorings, preservative spices, aromatic spices, and appetizers. Even though Sri Lankans own an island-wide variation on natural flavoring agents, there is a lack of demand on utilizing those natural flavoring because of the absence of transmitting traditional knowledge and practices related to cooking.

Since ancient times, people have been coloring food which is an integral part of our culture (Kamatar, 2013). Colorant has been added to food products for centuries (Mohamad et al., 2019). Candy makers in ancient Egyptian cities around 1500 BC were adding natural extract and wine to improve product appearance (Downham and Collins, 2000). Worldwide demand for natural colorant is increasing substantially as a result of increasing awareness among consumers regarding the health benefit related to natural food colors (Mohamad et al., 2019). The main factors to evaluate food quality are color, flavor and texture. Color is the most important among them, because if the color is not appealing, consumer will not enjoy the flavor and texture of any given food (Kamatar, 2013). Nowadays, the role of natural colors as food colorant is becoming increasingly important (Jadhav and Bhujbal, 2020). It is estimated that natural food color is the largest segment in food colorant industry, amounting to over 80% of total market revenue (Mohamad et al., 2019). They contribute to the most important attributes of food, both for aesthetic value and for quality

evaluation, but also they tend to give potential health effects, as they have been observed to possess potent antioxidant activities (Jadhav and Bhujbal, 2020). Natural colors are obtained from naturally occurring sources such as plants, animals, insects, and minerals (Meena Devi et al., 2013; Jadhav and Bhujbal, 2020). Turmeric, hibiscus flower, and butterfly pea are the identified famous natural food colorings in Sri Lanka. Another study carried out by Dr. Kamatar (2016),

emphasized 8 specific reasons of adding colorings to food; original appearance, product uniformity, intensifying natural color, product identification, improved stability and reduced wastage in storage, enhanced appearance, antioxidant and nutraceutical improvement, and to color otherwise uncolored food. Turmeric, hibiscus flower, and butterfly pea are the identified natural food colorings used in Sri Lankan food culture.

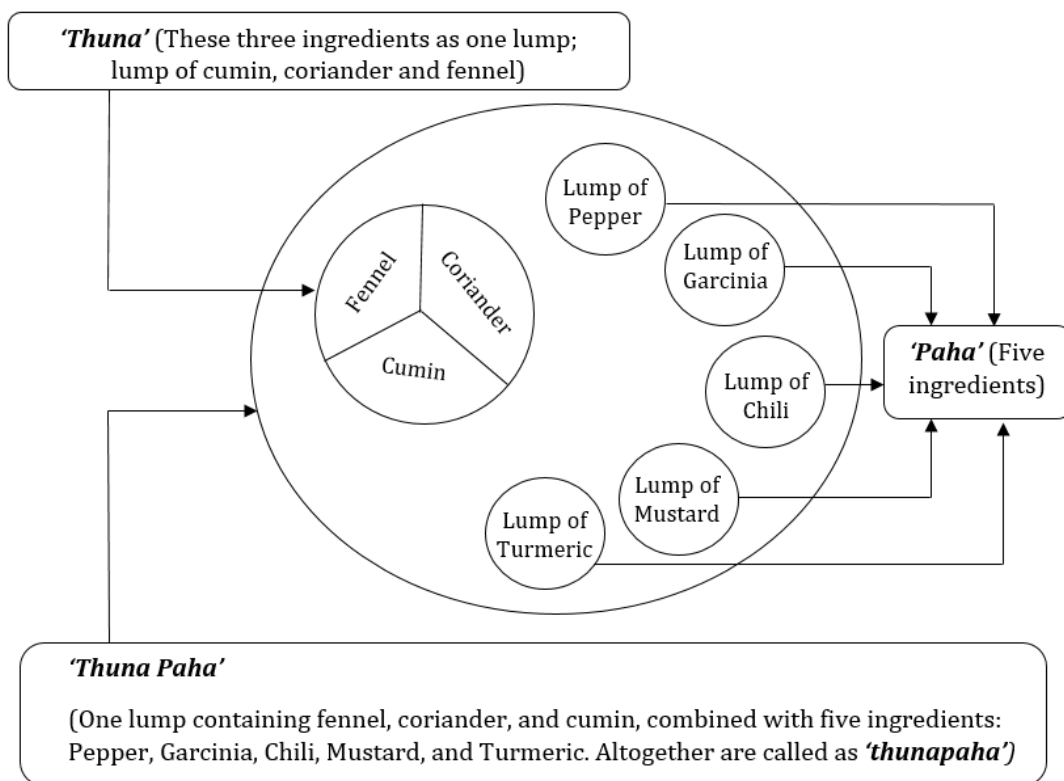


Figure 03. Basic ingredients of the Sri Lankan traditional spice-mixture (thuna-paha)

Tart flavor is another key element in the flavor profile. When concerning the taste of food, a sweet taste indicates energy-rich food; an umami taste indicates the presence of important amino acids (the building blocks of proteins); a salty taste helps to regulate the electrolyte balance in the body; a sour taste may give a signal that the food is fermented and perhaps no longer safe; a bitter taste gives a warning of the presence of natural

toxins - the majority of poisonous substances are intensely bitter (van Wyk, 2013). In his further explanations, tart flavoring or sour taste or acidity is triggered by natural acids such as acetic acid, citric acid and tartaric acid. The most common food sources containing acids are fruit such as apricots, lemons, limes, oranges, grapes, tamarind, sour figs and kokum (van Wyk, 2013). According to the research findings, the most

widely used natural tart flavorings are dried mango, tamarind, garcinia, lime, tomato, orange, and tamarind leaves.

Food flavoring agents are used for flavor, color, aroma and preservation of food or beverages. Nevertheless, as early as 1500 BC, Egyptians used spices to preserve foods. In Europe, the Middle East, and Asia, before the days of refrigeration, spices were used to preserve meats, fish, bread, and vegetables (Raghavan, 2007). Food preservation aims at stopping or slowing down spoilage (loss of quality, edibility or nutritional value) of food (Wakoli et al., 2014). According to Oiyee and Muroki (2002), natural methods of preservation and natural preservatives are receiving increased attention. Spices are commonly used as medicinal and flavoring agents in foods (Wakoli et al., 2014). Spices are used for the preservation of foods by preventing rancidity which could be linked to the processes of enzymic hydrolysis, autoxidation, bond cleavage and enzymic decarboxylation (Pokorny, 1999). Additionally, adding spices to food would increase its shelf-life preventing food loss due to their antioxidant and antimicrobial benefits (Oiyee and Muroki, 2002). Spices often possess dual modes of action (Porter et al., 2013). Some may be antioxidative and/or antimicrobial in nature, e.g. *Cinnamomum zeylanicum* (Cinnamon), *Curcuma longa* (Turmeric) and *Pimenta dioica* (Pimento) are antioxidants (Williams, 2006), while garlic (*Allium sativum*) and thyme (*Thymus vulgaris*) are antibacterial in nature (Marino et al., 1999; Sasaki et al., 1999). Evidence from studies has shown the antimicrobial properties of spices (Wakoli et al., 2014). Arora and Kaur (1999), analyzed the antimicrobial activity of garlic, ginger, clove, black pepper and ground green chilli and their aqueous extracts on human pathogenic bacteria including *Bacillus sphaericus*, *Staphylococcus aureus*, *S. epidermidis*, *Enterobacter aerogenes*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi* and *Shigella flexneri*. In another study by Sakagami et al. (2000), garlic extract

inhibited vero-toxin production by enterohemorrhagic *Escherichia coli*. Maintaining or creating nutritional value, texture and flavour is an important aspect of food preservation. Although use of spices may not be employed as a primary preservative method, addition of spices aid in preserving foods (Wakoli et al., 2014). According to the research findings 5(N), cinnamon, pepper, tamarind, garcinia, and bark of drumstick tree are widely used natural flavoring agents of food preservation in Sri Lanka.

The primary functions of natural flavoring agents are to flavor food and to provide aroma, texture, and color. Food aroma is felt by sense of taste and smell by awakening the receptors of taste on the tongue and by smell-receptors in the nasal cavity, that send information to the central nervous system and give a flavor sensation (Swiderski and Waszkiewicz-Robak, 2006). Integration of these sensations is important; sense of taste distinguishes between four basic taste types like sweet, sour, bitter, salt and their combination. Yet, only when it cooperates with the sense of smell, it is possible to feel the flavor sensation (Bogacz-Radomska and Pietkiewicz, 2008). The aroma of food has several functions, not only conveying the essential character of the food and providing variety and interest to what we consume, but also alerting us to rancid and unsafe food, stimulating the appetite as well as providing an emotional link to past experiences (Parker, 2015). In accordance with the results 5(N), cinnamon, cinnamon leaves, clove, pandan leaves, and cardamom are the identified aromatic flavoring agents in Sri Lankan cuisine. The term 'appetizer' refers to any food influencing the food intake initiation by sight or post consumption (Wadikar et al., 2018). Appetite is expressed as the tendency to seek food and consume it (Blundell and Halford, 1998). Most of the natural flavoring agents comprise the nutritious qualities of appetizers. According to the research findings 11(N), garlic, cumin, fennel, coriander, garcinia, tamarind, tamarind leaves, pepper, onion, curry leaves, and cinnamon are the

identified natural food appetizers used in the Sri Lankan cuisine.

3.1.8 Cultural and Anthropological Significance of Natural Flavoring Agents and Contemporary Practices and Preferences

Each ethnic group in Sri Lanka—Sinhala, Tamil, and Muslim—uses unique combinations of spices and herbs, which are integral to their culinary identity. For instance, Tamil cuisine in Jaffna prominently features mustard seeds, curry leaves, fenugreek, chili powder, and tamarind, which distinguish it from other regional cuisines. The use of spices like coriander, cumin, and turmeric in Sinhala cuisine, and cardamom, cloves, and cinnamon in Muslim cuisine, reflects deeply rooted cultural traditions passed down through generations. These practices are not only about taste but also about preserving cultural heritage and traditional medicinal knowledge. In the historical context, spices have been used in Sri Lankan cuisine since ancient times, influenced by trade routes such as the Spice Route. This historical context underlines the long-standing relationship between Sri Lankan culture and its natural flavoring agents. The use of specific spices and herbs helps maintain social identity within ethnic groups. For example, the distinct spicy mixtures in Jaffna cuisine not only define its culinary uniqueness but also reinforce the cultural identity of the Tamil community in the region. However, due to the influence of market economy, the availability of pre-made spice mixtures like curry powder and biryani mixtures have simplified the cooking processes, leading to a reliance on these products and a reduction in the use of individual spices. This shift is driven by convenience and cost-effectiveness. There is a growing awareness of the health benefits associated with traditional spices, which has led to a resurgence in their use. However, the transmission of traditional cooking knowledge is limited, often confined to older generations. Exposure to global culinary

trends has introduced new ingredients and cooking methods, influencing traditional Sri Lankan cuisine. Urbanization and migration have further contributed to the adoption of new culinary practices. The blending of culinary practices from different cultures has led to a hybridization of flavors. For instance, the incorporation of Western ingredients and cooking styles has altered the traditional use of spices and herbs. The use of commercially available spice mixtures has standardized flavors, making traditional dishes more uniform but potentially less authentic. The economic advantage of using pre-made mixtures over individual spices has played a significant role in changing contemporary cooking practices.

4. Conclusion and Recommendations

In early societies, most people have used natural flavorings that are available in their natural settings or the surroundings. For example, to enhance the tart flavoring of the food, people in wet zone usually use garcinia, because garcinia plant population is high in wet zone, but in the dry zone, use of tamarind to enhance the tart flavor is high in demand because tamarind plant population is high in dry zone, when compared to the other regions of Sri Lanka. Consequently, both garcinia and tamarind are used for the same purpose, that is; to enhance the tart flavoring of the food. The above-mentioned, variations of availability have led to the emergence of diversified dishes with different tastes in different parts of the country because these natural flavorings are the major cause of making variations (different tastes) on different dishes. The influence of the market economy on the use of natural flavorings is evident through the increased accessibility, cost-effectiveness, and aggressive marketing of commercial spice mixtures. These factors, combined with the impact of globalization and changing consumer behaviors, have led to a significant shift in traditional culinary practices. While this study primarily focused on cultural and traditional aspects, the role of the market economy provides a crucial

context for understanding the evolving use of natural flavorings in Sri Lankan cuisine. The market economy has significantly influenced the types of natural flavorings used in Sri Lankan cuisine. In the past, spices were used individually based on the specific dish. However, the availability of pre-made spice mixtures such as curry powder, biryani mixture, and toasted curry powder has led to a reliance on these convenient products, resulting in a limited use of individual spices. When concerning the Jaffna food culture, they have their own spicy mixtures and flavoring mixtures, which is very unique to them. Sinhala communities typically use condiments and herbs to enhance the natural flavors of staple foods like rice and vegetables, commonly using coriander, cumin, and turmeric. Tamil cuisine, particularly in Jaffna, uses unique spicy mixtures with high concentrations of mustard seeds, curry leaves, fenugreek, chili powder, and tamarind, reflecting South Indian influences. Muslim communities, especially in the Eastern Province, use rich blends of spices including cardamom, cloves, and cinnamon, emphasizing aromatic and flavorful dishes like biryani. But those mixtures totally differ from the flavoring mixtures, introduced by the competitive spicy market and the market economy. Even though we have identified nearly 61 natural flavoring agents, only several varieties are in use today. This is mainly due to the lack of traditional knowledge, and the disappearance of traditional practices related to cooking from the modernized societies. Another salient fact is that such traditional knowledge and practices have not been transmitted from elder generations to younger generations properly. Therefore, people do not have much awareness or sufficient knowledge related to cooking which had been nourished by our traditional knowledge and practices.

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