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AN OVERVIEW OF HERBS, SPICES AND PLANT EXTRACTS USED AS SEASONINGS IN FOOD AND MEAT PROCESSING

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ABSTRACT

Man resorted to meat preservation as a means of keeping meat to be used at a later date. This he must do with appropriate, affordable and simple technologies to suit this need. This is particularly needful in developing nations as scarce food must not be allowed to waste, especially as the protein demand of the ever increasing population is rising. Salting and drying of meat dates back to antiquity, where the early man salted meat cuts on the exposed surfaces and hung them in the air to dry. Salt (a chief curing agent) in meat, and pepper form the basis of virtually all seasoning formulae. All other agents in seasoning (ingredients which improve the flavour of meat and foods) are supplementary to these as they form the integral part of various cuisines all over the world. Seasonings include Spices such as pepper, herbs such as the leaves of cloves and bay, vegetable bulbs such as garlic and onions, sweeteners such as sugar and monosodium glutamate, and plant extracts such as that of *Ocimum grattisimum or* 'scent leaf'. Spices are the bark, roots, seeds, buds or berries of plants, most of which grow naturally only in tropical climates.They are mostly used in their dried form, rarely fresh and are available whole or ground. Spices vary greatly in composition but the aromatic and pungent principles that render them valuable reside in their volatile oils, resins, or oleoresins. Herbs on the other hand refer to the larger group of aromatic plants whose leaves, stems or flowers are used to add flavour to foods. Herbs and spices in addition possess potential health benefits by inhibiting lipid peroxidation. Some of these seasonings include pepper, capsicum, turmeric, ginger, cloves, african nut meg, curry, the leaves of ocimum, cloves, thyme, onions and garlic. This paper seeks to give an overview of herbs and spices commonly used in tropical meat seasoning, their prospects and benefits to man's health and well being.

Key words: Seasoning, spices, herbs, salt, meat

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INTRODUCTION

Origin and Composition

Spices were grown principally in the tropical Islands of the East and West Indies, the Malay archipelago and in India, China, the Malaysia States and Japan. Some are obtained in Europe and Africa, and a few are grown in North America. Various parts of plants are used as spices, for example, the flower bud is used in the case of cloves, the fruit of pepper and nutmeg; the aril (external fleshy covering of the seed) of nutmeg or mace; the bark of cinnamon, and the

rhizome (underground stem) of ginger. Also included in spices are the aromatic seeds of cardamom, coriander and mustard.

Spices vary greatly in composition, but the aromatic and pungent principles that render them valuable probably reside in volatile oils, resins, or oleoresins. There is what is referred to as the active and the pungent principle of spices. The "active principle" are usually very small proportions of the spice as a whole. Separating this active principle and using it for flavour instead of using the spice from which it is obtained have achieved some successes (Kairalee, 2003). www.kaira lee.com (accessed 2003).

Man's desire to preserve meat for consumption at a later date brought about meat preservation. Today's techniques for meat preservation are sophisticated, requiring reliable power supply as found only in developed countries. However for developing countries, appropriate technologies that are affordable, simple and applicable are needed to suit each local environment in terms of social and economic conditions (Ogunsola and Omojola, 2008).

Processed meat products unlike its fresh counterparts include those in which the properties are modified by the use of one or more procedure like grinding, chopping, addition of seasoning, heat treatment, drying and other processing or preservative processes (FAO, 1995).

Nowadays spices and herbs are valued for their antimicrobial activities and medicinal effects in addition to their flavour and fragrance qualities (Marija *et al.*,2009). The extracts of many plant species have become popular in recent years and attempts to characterize their bioactive principles have gained momentum for varied pharmaceutical and food processing applications (Malgorzata and Jacek, 2009).

The role of seasonings in processing and preservation of meat is the focus of this review. It was undertaken to identify and evaluate the principal seasonings used in the meat processing industry with particular reference to meat products of the tropics. The present review highlights the important role of these seasonings to humans and their contribution to nutrition and wellbeing.

Herbs and spices as seasonings

Spices are aromatic plant substances used as flavouring, condiments and aromatics. This classification includes: Spices such as pepper, herbs such as the leaves of Bay and Sage, vegetables such as garlic. Spices can further be classified: By their flavour and colour, i.e., hot (pepper), pungent (garlic), aromatic (clove), colouring (turmeric) and herbaceous (sage) and according to their taste, such as sweet, spicy, sour, bitter and astringent. Because spices have very low calorie content and are relatively inexpensive, they are reliable sources of antioxidants and other potential bioactive compounds in diets (Muthulakshmi *et al.,* 2009).

Classification of herbs and spices

1. According to the usage: classified in four parts as Medicinal herbs, culinary herbs, aromatic herbs, and ornamental herbs.

   1.1 Medicinal Herbs: Medicinal herbs have curative powers and are used in making medicines because of their healing properties.
   1.2 Culinary Herbs: Culinary herbs are probably the mostly used as cooking herbs because of their strong flavors like mint, parsley and basil.
   1.3 Aromatic Herbs: Aromatic herbs have some common uses because of their pleasant smelling flowers or foliage. Oils from aromatic herbs can be used to produce perfumes, toilet water, and various scents. For e.g. mint, rosemary, basil etc.
   1.4 Ornamental Herbs: Ornamental herbs are used for decoration because they have brightly colored flowers and foliage like lavender, chives. (Ceylan and Fung, 2004); http://ezinearticles.com/?expert=Nena_Richardson

2. According to the active constituents present in them: Herbs are divided into five major categories: Aromatic (volatile oils), Astringents (tannins), Bitter (phenolic compounds, saponins, and alkaloids), Mucilaginous (polysacharides), and Nutritive (food stuffs).

3. According to the period of life: herbs also can be classified as annuals, biennials, and perennials. Annuals bloom one season and then die. Biennials live for two seasons, blooming the second season only. Once established, perennials live over winter and bloom each season.

General Overview of Herbs and Spices In Meat Processing In The Tropics

Pepper: Both white and black pepper are from the same plant – *Piper nigrum,* family Piperaceae. It is widely used for its characteristic aroma and pungent taste and known as the "king of spices" Peppercorns vary in size, colour, pungency and flavour. Whole peppercorns will last indefinitely if kept dry while fresh green pepper is sometimes used for preparing pickles. Black pepper (*Piper guineense)* is the unripe fruit, picked when it begins to turn red and dried. The locality in which the black pepper is grown gives it its name. Decorticated pepper is the dried black pepper from which the dark skin has been removed. Black and white pepper are among the major condiments employed for seasoning freshly cooked and prepared vegetables, it is also used in the meat industry for curing and preservation of meat. White pepper has similar flavor to black pepper but is less pungent.

Pepper is an extensively used spice both in Eastern and Western food. It has an impressive antioxidant and antibacterial effect and helps with digestion and weight loss because it stimulates the breakdown of fat cells. Black pepper or its active principle piperine has been experimentally demonstrated by a number of independent investigators to possess diverse physiological effects. Piperine has been demonstrated in *in vitro* studies to protect against oxidative damage by inhibiting or quenching free radicals and reactive oxygen species (Vashanti and Parameswari, 2010).

Capsicums: These include a wide variety of essential spices among which are hot red pepper, cayenne pepper, paprika, chilli pepper, crushed red pepper. The principal species *Capsicum annum* (family Solananceae), is said to be botanically related to tomatoes. The genus capsicum, embraces a wide range of forms as to size, shape, colour, colour extraction value, pungency and heat or bite. The spices are produced from the dried fruit of the various plants. The small-fruited varieties are "hotter" or more pungent while the large fruited are sweeter or milder. The pungency of this spice is due to the Capsicum that is present in the specie (Purseglove, 1981) which is said to increase as the plant matures. Chilies are the only cuisine that can initiate pain and pleasure in one sitting. They are also said to exhibit addictive qualities. (Coon, 2003).

Turmeric: is a rhizome or underground stem plant and is usually available in a bright yellow, fine powder form. It is a natural, non-synthetic and one of the most easily available and cheapest spices. Turmeric is also very commonly used as a food coloring spice and as a basic ingredient for various curry powders. The most popular medicinal benefit of turmeric is that it is used as an antiseptic for curing skin problems. Turmeric is also considered to be a digestive bitter and when served with rice and beans it can improve digestion and reduce gas and bloating. Moreover, it stimulates bile production in the liver and is also suggested for chronic digestive weakness or congestion.

Ginger: Ginger is the washed and dried cleaned rhizome of the rootstock of *Zingiber officinale.* It is obtained from the root of a well known tropical flowering plant. It has a pale yellow fibrous interior. Fresh ginger usually, is plump and firm with smooth skin; it retains this freshness if kept under refrigeration for a month. Ginger owes its pungency to a volatile (essential) oil (ginger oil) and to resinous matter. It has a special affinity for chicken, beef and curries. It contains the enzyme, Zingibain for tendering meat (Lee *et al.,* 1986). It can also be dried and ground giving a yellow powder (widely used in pastries) but its flavor is special and not as sweet as fresh ginger.

Kim and Lee (1995) have shown that –"crude ginger rhizome extract at 0.5 to 1.0% levels in the marination of marginally acceptable lean beef improved meat tenderness by 20-30% in the absence of 2% salt and by 35-45% in the presence of 2% salt". Marinating in fresh ginger clearly significantly tenderizes rather tough cuts of lean beef (www.naturalhub.com).

Cumin Seed: Cumin seeds have a distinctive aroma and taste which adds a nice flavor to the food items. Apart from its culinary uses, cumin seeds also have many medicinal uses.

Bay leaf and Clove Leaf: Clove leaf has a color changing property when extracted and beaten from trees. It has a fresh spicy essence and is fairly strong in terms of taste. Its oil is applicable as a flavor ingredient in different types of food, alcohol and soft drinks. It is also highly useful in dental preparations of as a fragrance component of toiletries and cosmetics.

African Nutmeg (*Monodora myristica*): Nutmeg, though more commonly used in many European cuisines, particularly pastries and sweets, are also important in meat and savory dishes. Nutmeg and mace come from the yellow plum like fruit of a large tropical evergreen. When the fruit is dried and opened, it reveals the seed known as nutmeg while the outer bright red lacy skin coating is dried to make a spice called Mace. Whole nutmegs are oval and rather look like a piece of smooth wood. It gives a strong and sweet flavor and aroma. A small quantity provides a

great flavour. It is usually grated directly into a dish when needed because once grated it loses flavor rapidly.

Curry powder: There are as many different formulae as there are manufacturers. The typical ingredients in curry powder are black pepper, cinnamon, cloves, coriander, cumin, ginger, mace and turmeric.

Groundnut: Botanical name is *Arachis hypogaea,* also known as peanuts or earthnut. Groundnuts give a pleasant tasting oil for direct human consumption and are used as salad oil for cooking. The oil can be further processed into margarine. The roasted nuts can be ground and used to season, or coat meat products such as tsire (Suya) and Kilishi. The left over cake from oil extraction is useful in the animal feed industry and for human snack as *kulikuli.* This popular snack is got when groundnuts are roasted, ground, oil is extracted and the residue is spiced and refried in the extracted oil. Groundnuts well harvested and kept can be stored for a period of one year (Hacket, 1982)

Thyme Extract: Thyme is used as a fresh and dried herb in various cuisines due to its distinct aroma. The extract obtained is used in aromatherapy because of its therapeutic and medicinal uses. Thyme extract is known for its antispasmodic, antiseptic, aromatic, anti-inflammatory, carminative properties.

Condimental vegetables

Onion: is an underground plant with a vertical shoot that is grown for food storage. Onions can be used with normally any food type be it cooked, a salad or as side spicy garnish. They are hardly eaten on their own; they are used as an additional garnish accompanying a main dish. Onions are available in different varieties. The different varieties differ in characteristics, such as sharp, spicy, tangy, pungent, mild, and sweet. Onions also contain chemical components such as quercertin which gives it anti-inflammatory, anti-cholesterolic, anticancerous, and antioxidative properties.

Garlic: This is the bulb of *Allium sativum*. Its principal constituent is the garlic oil. Garlic has a pungent odor and strong taste, its strength varying according to its source, variety, age and condition. Fresh garlic is juicy. When stored after 6 months it loses 20% of its weight by evaporation of moisture and some of the flavour. It gets spoilt with prolonged storage. Several epidemiologic studies have indicated that certain diets are associated with low risk of cardiovascular disease and that these diets are rich in fruits, herbs and spices; the common spice among them is garlic (Stavric, 1994) Garlic oil is extracted from the garlic plants and is used for treating various health problems. Fresh garlic is mainly used as seasoning and condiment in cuisines all over the world. Garlic oil is also used in cooking due to its medicinal properties and a distinct pungent, spicy, flavor. Of the many benefits of garlic oil, it is extensively used for treating respiratory problems, poor digestion, regulates blood sugar level, lowers high blood pressure, reduces cholesterol levels, reduces yeast infections, is rich in anti-oxidants, has excellent anti-fungal and anti-viral properties

Extracts from herbs and spices : Some of the antimicrobial components that have been identified in spices and herbs are: eugenol from cloves, thymol from thyme, allicin from garlic, cinnamic aldehyde from cinnamon, etc.

Prospects of herbs, spices and plant extracts as seasonings in food and meat products

Reducing the need for antibiotics, controlling microbial contamination in food, improving shelf-life extension technologies to eliminate undesirable pathogens and/or delay microbial spoilage, decreasing the development of antibiotic resistance by pathogenic microorganisms or strengthening immune cells in humans are some of the benefits linked to having anti-cancer properties. Herbs and spices have preserving capacity. Kim *et al* (2011) in their study of 13 spices,reported that several spices were found to have high levels of antioxidant capacity and total phenolic compounds. Moreover, the antioxidant capacity, total phenolic content and flavonoid contents of the 13 selected spices- were different from each other. Clove, thyme and rosemary extracts exhibited higher DPPH (2,2-Diphenylpicrylhydrazyl) radical scavenging activities. Interestingly, clove and turmeric showed the highest total phenolic content and flavonoid content, respectively, associated with the relatively higher antioxidant activities among these spices. These results suggest that several spices extracts have potential as possible functional ingredients in meat products.

It has been reported *that* the presence of eugenol and cinamic aldehyde which have preserving action specific to some spices and essential oils, increases the shelf life of meat products, thus increasing profit marginalization in the meat industry as they control natural spoilage process (food preservation) and prevent or control growth of micro-organisms, including pathogenic micro-organisms (Tajkarimi *et al*., 2010., Tapsell *et al.*2006., Zaiki, 1998).

The problems of herbs, spices and plant extracts

They may produce favourable conditions for some other microorganisms especially for substances that have only one mode of action. They may alter the standardized flavour and taste of products when the exact weight is not added.

Some spices cause food intolerance allergy which makes some people react negatively to herbs and spices when added to their food. As with almost all food allergies, allergic reaction to spice often involves a combination of symptoms. Some of these symptoms include hives, swelling of the throat and skin, rashes, stomach ache, diarrhea, indigestion, asthma, vomiting itching of the tongue, lips and/or face, severe lowering of the blood pressure, difficult breathing and the risk of unconsciousness or death in severe cases where anaphylaxis occurs. Spices have numerous "performance characteristics" that make them a ready vehicle for contamination and illness. Three important things about spices are; They are generally dried products that have a long shelf-life, they are ubiquitous and widely-sold and the Salmonella bacteria, which is far and always the most prevalent contaminant of spices, is a hearty bug capable of surviving for long periods in a dry environment (e.g. a container of spices). In the reported spice outbreak in Germany (1993), spice samples kept and tested 8 months after the contaminated product was identified produced positive results for viable Salmonella bacteria (Clark, 2011).

Miscellaneous uses of herbs, spices and plant extracts

- Pepper has some nutritional value. An analysis of pepper shows it to consist of moisture 13.2%, protein 11.5%, fat 6.8%, minerals 4.4%, fibre and 49.2% total carbohydrates per 100g. Its mineral and vitamin contents are calcium, iron, phosphorus, carotene, thiamine, riboflavin and niacin. Its calorific value is 304 kcals. The medical importance of pepper has been recognized by the Ayuvuedic system of medicine as it forms an essential ingredient in several prescriptions for a wide range of diseases. Several studies have been undertaken to evaluate the nutritive value of peppers in terms of micro and macronutrients as well as their therapeutic and other properties. All species of pepper have a good amount of calcium. Pepper is also a good source of antioxidants, vitamin C, beta-carotene and essential amino acids.
- Ginger helps to allay motion sickness (nausea experienced by some when travelling) and is used especially in the far east as a digestive aid.
- Clove oil is used as an antiseptic and when rubbed on the gums taste a sore tooth, a pain reliever
- Spices make bland foods taste more exciting
- Garlic – a drink made from garlic can often get rid of pinworm. Also, garlic has a definite bactericidal effect on pathogenic microorganisms. Garlic in its natural form is given orally to suppress intestinal bacterial activity in diarrhea. *Allium*, an antibacterial agent that inhibits the growth of gram-negative and gram-positive bacteria, has been isolated from garlic. Also the Ayuvuedic system of medicine claims that garlic is an effective treatment of arthritis (kairalee, 2003).
- Black pepper is used as stomachic and carminative especially for griping conditions
- Chilies are the only cuisine that can initiate pain and pleasure in one sitting. They are also said to exhibit addictive qualities. (Coon, 2003).

- Spices, and more specifically, essential oils are used to a certain extent in perfumery to make a variety of products. It is well known that the essential oils of black pepper, clove and clove leaves and allspice are used in the manufacture of after shave lotion.

- Cinnamon oil is used in some perfumes, but the quantities must be small due to the risk of skin sensitization. Turmeric oil is used in inexpensive perfumes of the 'oriental' type.

- The perfumery industry also uses component of the essential oils, namely; eugenol and isoeugenol which are present in several spices. The essential oil of pepper contain piperine, which after a variety of relatively simple processes gives piperonal, which is an artificial heliotropin. **Piperonal**, also known as **heliotropin**, is an organic compound that is commonly found in fragrances and flavors.

- Spices were once used for their insect-repellent properties. However, the arrival in the market of an extended range of more effective synthetic products has virtually put an end to this use nowadays.

- An essential oil can also be extracted from nutmeg leaves, either fresh (0.4 to 0.6 per cent) or dried (1.6 per cent). This oil is said to have herbicidal properties.

- The fat contained in the nutmeg (25 to 40 per cent) is extracted after crushing the kernels and expressing it with steam. It is an orange-coloured fat known by the name of 'nutmeg butter' and is used in the pharmaceutical industry. (Fisher and Phillips, 2008; Gaysinsky and Weiss, 2007; Gutierrez, Barry-Ryan, and Bourke, 2008a; Lopez-Malo Vigil *et al.*, 2005).

CONCLUSION AND RECOMMENDATION

The antioxidant activity of culinary Herbs and Spices suggest that in addition to imparting flavor to food (meat products), they possess potential health benefits by inhibiting lipid peroxidation. Research indicates that adding a moderate amount of Herbs and Spices to ones food (meat product) goes a long way towards boosting the health value of a meal. They are therefore a quick and easy way to get a concentrated source of antioxidants and other plant factors - without all the extra calories of whole foods. They are also a quick way to add diversity to our diet. In general, fresh Herbs and Spices taste better and contain higher antioxidant levels compared to their processed counterparts, inhibit the growth and development of microorganisms and increase the shelf life of meat, thereby increasing the profit margin in the meat industry.

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