# World of Spices: by Dr. J. S. Pai

When one walks into a food store, there is a myriad of bottles and pouches of multicoloured powders or sometimes the whole spices. Herbs and spices are known to mankind even before the recorded history as people searched for adding tastes to foods, preserving foods and treating ailments by observing effect of natural ingredients. Over centuries, the interest in herbs and spices has varied with highest in 16$^{th}$ to 18$^{th}$ centuries where they were traded as near currencies and continents discovered for acquisition of spices. In 20$^{th}$ century the interest paled due to synthetic products. Now again due to technological advances benefits of spices and herbs that were known to our ancestors are being rediscovered.

**Spices in World History**

If the spices were to reflect their importance in the world history, they would be represented along with diamonds, rubies, emeralds and gold. When you open a bottle of a spice its fragrance would billow softly throughout the room. This mystical fragrance has been the inspiration for trade, exploration, war and poetry since the beginning of civilisation. Since quite early, spices played a prevalent part in man's daily life – and death. Archaeologists discovered spices in Egyptian tombs as early as 3000 BC. The strong preservative quality of many spices bade them ideal for embalming. Nutmeg has a Sanskrit name and is referred to in ancient scripts. Ancient Indian epic Ramayana mentions cloves. Throughout history, spices have claimed attention for their mystical properties. People were also no longer happy with spices growing in their own backyards and wanted to explore uncharted territories for the search of new and exotic spices from exotic lands.

The spice trade developed throughout the Middle East around 2000 BC with cinnamon and pepper. Nutmeg was introduced in Europe in 6$^{th}$ century BC. Romans used cloves in the 1$^{st}$ century AD. Arabs controlled routes of spice trade between Asia and Europe. Pepper was the most common spice, the most exclusive being saffron for its colour and flavour. Other commonly traded include cinnamon, cassia, cumin, nutmeg, ginger and cloves imported from Asia and Africa.

Control of trade routes and spice-producing regions was the main reason for Portuguese navigator Vasco da Gama sailing to India in 1499. Around the same time, Christopher Columbus returned from the New World and described many new spices available there.

**World Spice Trade**

The world today imports of spices are about 525,000 tonnes worth US$ 1.5 billion (growing at 4%) against the world production of 8.5 million tonnes worth US$ 25 billion. Thus most of the spices grown are consumed domestically. Bulk of export is of whole or unground spices, while only 15-20% are ground spices and their mixtures, essential oils and oleoresins. Increase in spice demands especially in Europe, USA and Japan is due to shift to natural products. Although this market is small at present, growth is 25-30%.

India is the largest producer of spices with annual production in 2000 was about 2.3 million tonnes which was almost half the world production of about 5 million tonnes. Other major producers of spices are China with 0.5 million tonnes, Indonesia 0.26, Pakistan 0.20, Nigeria and Bangladesh around 0.15 and Ethiopia 0.12 million tonnes. India's estimated production is around 4.22 million tonnes valued at about US $ 5 billion. Because of varying climates from tropical to sub-tropical to temperate – almost all spices grow quite well in India. Since early history, India has been leading spice exporter. It exported about 375 thousand tonnes valued at about US$ 800 million in 2006-07 and had 47% world spice trade in volume. Some of the leading spices exported were chilli, pepper, turmeric, cumin, coriander, garlic, tamarind, fenugreek, ginger, curry powder as well as oils and resins. The current year's target is over 400 thousand tonnes with a value of over US$ one billion.

There has been a greater emphasis on the export of value-added products like spice oils and oleoresins. Many production units have been producing high quality value-added spice products using modern technology and machinery. Traceability and compliance are two critical aspects that will substantially affect food trade in the future. As quality standards for food products become stricter world over, traceability will be a key factor for success in the market. Spice processing and food manufacturing companies are trying to establish backward linkages in this respect.

**Spices & Herbs**

Spice refers to seasoning made from dried seed, fruit, root or bark. The word herb comes from Latin "herba" meaning grass. Herbs are usually leafy, green plant parts often used fresh. These are mainly used for flavouring purposes and sometimes as a preservative to prevent harmful bacteria. Many of these substances are also used for other purposes, such as medicinal, religious, cosmetic, perfumery etc. Turmeric is used as preservative. Licorice is medicinal. More recently even garlic has been shown to have medicinal properties.

Herbs may be used fresh and commonly chopped into small pieces before adding to food. Spices are commonly dried and often ground or grated into a powder. Small seeds like fennel, coriander or mustard may be used both whole and in powder form.

Some examples of common spices and herbs: Leaves or branches of aromatic plants:- basil, bay leaf, parsley, thyme, oregano, coriander leaves, curry leaves, mint, etc.; Ripened fruits:- kokam, nutmeg, tamarind, cardamom, vanilla etc.; Seeds:- fennel, coriander seeds, fenugreek, mustard, black pepper, ajowan, anardana, caraway, cumin, poppy seeds etc.; Roots or bulbs:- garlic, onion, celery, ginger, turmeric etc.; Flowers: saffron; Bark: cinnamon, cassia etc.; Miscellaneous: clove, asafoetida etc.

This is just a short list as ISO has identified over 100 spices and herbs out of which India produces about 75 commercially. There are many which are grown and used but not sold so they are not accounted for. The above is not a standard classification and some may classify in different ways.

**Spice Industry in India**

India has about 45% share of world market, exporting some 50 spices in whole form and over 80 products in value added form. Currently, 33% of total export by value is in value added forms like spice oils and oleoresins, curry powders and mixes, speciality extracts and blends. Some of the major hurdles for increased exports are inadequate surpluses for exports and insufficient quantities of quality spices. India exports only 8% of the total production. There is severe shortage of exportable varieties as domestic demand has substantially increased. Even productivity is low e.g. pepper productivity is around 300 kg/ha whereas it 1500 to 2000 kg/ha in Malaysia, Indonesia and Vietnam.

Small and poor farmers find it difficult to participate in the market economy. Some processors have contract farming that will sustain small farmers as well as process house gets assured supply of the variety needed for market.

Application of biotechnology including tissue culture for rapid propagation of species like cardamom, ginger, vanilla, curry leaf, turmeric and cloves has shown promise to meet increases in demand for planting material as well as ensuring genetic purity. Consumers in many countries are demanding organically grown spices so standards and accreditation processes are being set up to meet these requirements. Export markets demand spices of high quality with respect to microbial load and chemical contamination including pesticide and other farm chemicals. Farmers need to be made aware of this if there is to be a large increase in exports fetching higher revenues.

**Post-Harvest Handling**

This involves drying, curing and primary packing. Good post-harvest practices reduce problems of contamination. Traditional practices are still predominant in spice production and so the problems in quality of spices for exports. Some countries are able to supply aflatoxin-free or low-microbial load spices. Use of hygiene, mechanical devices, better storage practices etc. improves the microbial quality of spices that would improve competitiveness in export market.

**Value-added Products**

Value addition has been practiced in Indian spice industry as raw whole spices would not yield as much revenue. Preparing some of the products not only reduces bulk to be handled but the product becomes more stable in most cases and its convenience in various applications improves tremendously. Spice powders, mixed spices and curry powder, spice oils and oleoresins are some of the value-added products that are currently prepared. Further processing to prepare colorants and isolates have applications in many other industries like pharmaceuticals, cosmetics etc.

**Spice Powders**

Spices are ground not only to prepare standardised products that are convenient to pack and use, they can also be further processed to prepare various value-added products. One of the major applications is powders is preparation of mixed spices like curry powders or masalas. Common spices used in curry powder are coriander, turmeric, chillies, cumin, pepper, ginger, cinnamon, cassia, clove etc. Other ingredients like salt and starch may be added. Sometimes further products may be prepared such as curry pastes and seasonings. These mixes and preparations are used in a variety of food preparations like chicken, fish, meat, vegetables, tea and noodles.

**Spice Oils & Oleoresins**

Spice oils are volatile components in spices and give the aroma of the spice. They are commonly extracted by steam distillation although there are other methods developed. They have advantage over spices due to standardisation, consistency and hygiene. Spices normally have quite varied properties because of the natural, regional and climatic variation. Spice oils can also be custom-made to meet rigorous requirements of the user. They are used in food, medicines, cosmetics, perfumes and personal hygiene products like toothpaste, mouthwashes etc.

Oleoresins represent the total flavour profile of the spice. They contain volatile as well as non-volatile constituents. They can replace whole or ground spices without impairment of flavour and aroma characteristics. They are prepared first by distilling out spice oils and then by extracting spices with non-aqueous solvents followed by removal of solvent. Finally spice oils are added back to give complete flavour substances. They can be complete and balanced, consistent and standardised. They are more cost-effective than spices and control of food quality is easier with them. They are free from contamination and are quite stable. They are used in

processed meat, fish and vegetables, soups, sauces, chutneys and dressings, cheeses and other milk products, bakery products, confectionery and snack products as well as beverages. Common oleoresins prepared are chilli, pepper, ginger, turmeric etc. but more recently products are prepared from basil, fennel, mustard, fenugreek, nutmeg, onion, garlic, rosemary, cinnamon, clove, coriander, curry leaves etc. Even blended oleoresins are prepared for use like curry powder etc.

Some of the value-added products are prepared from oleoresins and spice oils include carrier dispersion in which resins are mixed with salt or other ingredients, spray dried products where resins with carrier may be spray dried into a powder and micro-encapsulation where stabiliser like gum Arabic or starch may be used for coating resins to protect them from aroma loss or oxidative deterioration. Most modern process of use of super-critical fluid extractions using carbon dioxide produces extremely high quality resins with products resembling more closely the flavour profile of the whole spices. Some of the manufacturers in India have adopted this technology for producing high grade products well accepted in western markets.

As the trend for natural ingredients is gaining momentum beginning with western countries, the demand for spices as natural flavour ingredients as well as natural colorants is increasing. In ancient times, spices were used both for their flavour and colour attributes. Many natural colours are prepared from spices. Curcumin in turmeric and carotenoids in chillies have been used for a long time as colorants. Red, yellow and orange colours are being produced using spice ingredients.

**Medicinal Properties**

Herbs and spices are again getting recognition of their health benefits. Although various cultures believed in their medicinal properties, modern science is proving that spices provide healthier life. Many spices have high antioxidant contents and their relation to cancer prevention, heart health and anti-inflammatory action. According to study published in British Journal of Nutrition herbs and spices increase antioxidant capacity of salads. American Institute of Cancer Research suggests that health-protective phytochemicals in spices and herbs can fight cancer and other diseases. Much of clinical research has focused on turmeric, cinnamon, ginger and garlic.

Curcumin is the yellow pigment in turmeric and curry powder. Cell culture and animal studies have shown its components to have antioxidant, anti-inflammatory, antiviral, antibacterial and antifungal properties with potential activity against certain diseases like cancer, diabetes, arthritis, Alzheimer’s disease etc.

Garlic contains allicin, allixin, allyl sulphides, quercetin and organo-sulphur compound, with potential activity against cancer. A large study reported in American Journal of Epidemiology showed that women consuming significant amounts of garlic were less likely to develop colon cancer. Studies of its effect on heart protection yielded mixed results. Garlic has also been linked to anti-clotting and reduction in blood pressure.

Ginger contains health-promoting gingerols, shogaols, beta-carotene, capsaicin, caffeic acid, curcumin and salicylate. Ginger has antioxidant and anti-inflammatory properties that may lower risk of cancer and inflammatory disease. Ginger's most consistently proven benefit is its ability to relieve nausea.

Cinnamon has antimicrobial effects and potential role in insulin activity. Its terpenoids especially eugenol and cinnamaldehyde contribute to its medicinal properties. Studies reported modest improvement in lowering blood glucose with cinnamon supplementation. It also helps in lowering LDL cholesterol.

Herbs like oregano, rosemary, mint and basil are useful due to phytochemical and antioxidant power. Rosemary relieves pain and improves mood. Peppermint has antimicrobial, antiviral, antioxidant, antitumour and anti-allergenic potential. Basil contains hypolipidemic and antioxidant substances having protection against certain cancers as shown in mice. Oregano has been shown to have constituent that destroys Listeria bacteria.

**Future**

Spices have regained its earlier prime position in food industry and in food preparation. People have not only come back for their sensory attributes but also because of many health benefits they offer. Spicy food for some time was not considered desirable but now again they have been considered highly desirable. Even western countries have been craving for curried preparations and such delicacies like chicken tikka. Indian manufacturers have maintained the steady pace of modernisation using newer techniques of preparation of value-added products. There are also newer post-harvest technologies available that are safer than chemical treatments. Radiation processing has emerged as the safest and the most effective processing method that does not cause any adverse changes in the flavour profile of spices.

Research and developmental activities will focus on the health benefits of the spices and spice ingredients. Many research institutes in the US and Europe have been working of some of these aspects as discussed above. Indian researchers need to intensify their research activities to demonstrate the benefits that were shown many centuries ago to validate them using modern scientific tools of research. Further these benefits and products need to be protected for Intellectual Property Rights so others do not exploit them to the disadvantage of people who originally shown it to the world.

❋❋❋