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Incredible Spices of India: from Traditions to Cuisine

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Abstract: A spice is a dried seed, fruit, root, bark or vegetative material used in nutritionally insignificant amount as a food supplement for the reason of flavoring. Spices are defined as "a strongly flavored or aromatic substance of vegetable origin, obtained from tropical plants, commonly used as a condiment". In ancient times, spices were as valuable as metal gold; and as noteworthy as medicines and perfumes. No country in the world cultivates as a lot of kinds of spices as India with quality spices come from Kerala, an Indian state. Because of the varying climates in India-from tropical to sub-tropical, temperate-almost all spices are grown in this country. In almost all of the 28 states and seven union territories of India, at least one spice is grown in profusion. Spices and herbs are good not only for our taste buds but also for our health. They supply calcium, iron, vitamin B, vitamin C, carotene and other antioxidants. Besides herbs and spices have very low fat, so you can eat them to your hearts pleased. Rajasthan, a state of India is an important producer of spices including seed spices such as fenugreek, cumin and coriander among others. The Rajasthani chilly varieties, especially from the State's Jodhpur regions are popular not only in the country but also appeal to the taste buds of the Indian Diaspora abroad. The special quality and special flavour of Rajasthani spices are usually accredited to the favourable climatic conditions and natural methods being used here for ages. Rajasthan has the distinction of producing 17 of the total 60 varieties of Indian spices which are being regularly utilized for special desert cuisines most common of them is panchkuta.

Key words: Spices, Conservation, Biotechnology, Aroma, Industry

INTRODUCTION

Indian Spices are well-known all over the world for their taste and strong aromatic flavor. There are around 80 types of spices grown throughout the world but India alone produces about 50 types of them (Anonymous). The history of spice is almost as old as human civilization. It is a history of lands discovered, empires built and brought down, wars won and lost, treaties signed and flouted, flavours sought and offered and the rise and fall of different religious practices and beliefs. Spices were among the most valuable items of trade in ancient and medieval times. Ancient Egyptians were using various spices for flavouring food, in cosmetics and for embalming their dead. The use of spices spread through the Middle East to the eastern Mediterranean and Europe. Spices from China, Indonesia, India and Ceylon (now Sri Lanka) were originally transported overland by donkey or camel caravans. Arab middlemen controlled the spice trade, until European explorers discovered a sea route to India and other spice producing countries in the East [1].

The spices that India offers in abundance are pepper, ginger, turmeric, chilli, cardamom, celery, fenugreek, fennel, cumin, coriander, cinnamon, ajwain (bishop's weed), cassia, clove, nutmeg and mace. Interestingly, each of the spice has its own flavour, medicinal value and other interesting facts to go with it. In fact, the very commonly used word ‘AROMA’ is the ancient Greek word for spice. Spices can improve the palatability and the appeal of dull diets or spoiled food. Piquant flavors stimulate salivation and promote digestion. Spices may be used ground or whole, fried or roasted, dry or as paste, at the end or in the beginning of the cooking, alone or with combination [2]. Having the right spices and ingredients in your kitchen will help you get started to try out the wonderful Indian recipes. Indian grocery stores offer almost all spices and grains that are necessary for Indian cooking. Indian spices can be mixed in specific amounts to make Spice Mixtures used in daily cooking, for example, Garam Masala. Spices add zest to food, enhance the taste and delight the gourmet. Spices are even used as preservatives, aphrodisiacs and in traditional medicines.

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Spices are derived from different parts of plants e.g. flowers, fruits, leaves, seeds, rhizomes, roots, buds and even the bark. India produces almost all the spices, largely owing to its varying climate and soil conditions. The classic Indian curry often combines the following spices-coriander, turmeric, cumin, ginger, garlic as well as other spices. Spices are used as flavoring agent in food or drinks, although many spices have additional commercial uses, e.g., as ingredients of medicines, perfumes, incense and soaps [3]. It is also used as a condiment. Spices are taken from the part of the plant richest in flavor, bark, stem, flower bud, fruit, seed, or leaf. Spices and herbs are good not only for our taste buds but also for our health. They supply calcium, iron, vitamin B, vitamin C, carotene and other antioxidants.

Wars have been fought and countries discovered because of treasured spices. Marco Polo's stories of his trip to China in the late 1200s told of the spice trade in these then unknown lands and brought many Europeans in search of spices. In the 15th to 17th centuries the Spanish, English, Portuguese and Dutch traders competed in the spice trade from the Far East. By the 1800s America was involved in the spice trade. America's first millionaires made their money in the spice trade [4]. Many families in the colonies had their own herb gardens. Herbs and spices were also imported. These were used for cuisine specialties, as preservatives for the food supply and for special medications. Better processing techniques have done much to solve this problem. In the early 1900s many salesmen went from door-to-door selling spices; Golden Rule, Watkins, Raleigh and McNess were some of the well-known brands [5].

Definitions of Herbs and Spices: Definitions of herbs and spices vary somewhat but can be identified as follows: *Herbs* are leaves of low-growing shrubs. Examples are parsley, chives, marjoram, thyme, basil, caraway, dill, oregano, rosemary, savory, sage and celery leaves. These can be used fresh or dried. Dried forms may be whole, crushed, or ground (Fig. A).

Spices come from the bark (cinnamon), root (ginger, onion and garlic), buds (cloves, saffron), seeds (yellow mustard, poppy and sesame), berry (black pepper), or the fruit (allspice, paprika) of tropical plants and trees. Many dehydrated vegetable seasonings are available. These include onion, garlic, sweet peppers, mint, mixed vegetables and freeze-dried chives and shallots [1].

Condiments are usually a combination of herbs and spices blended in a liquid form. Examples are prepared mustard, catsup, Worcestershire sauce, tabasco sauce and many of the steak sauces and specialty vinegars. Many of these contain sodium.

Seasoning blends are mixtures of spices and herbs. Check spice companies for exact mixtures. Some examples of seasoning blends are-*Chili powder* (red pepper, cumin, oregano, salt and garlic powder), *Curry powder* (coriander, turmeric, cumin, fenugreek seed, white pepper, allspice, yellow mustard, red pepper and ginger), *Poultry seasoning* (white pepper, sage, thyme, marjoram, savory, ginger, allspice and nutmeg), *Pumpkin pie spice* (cinnamon, ginger, nutmeg, allspice and cloves).

Packaging and Storage of Spices: Whole herbs and spices last much longer than crushed or ground forms. Many consumers prefer to buy the whole form and crush or grind as needed for greater freshness. Herbs and spices can be crushed with a mortar and pestle, by using a rolling pin with spices between two cloths, or by using the back of a spoon in a cup. Check ground or crushed herbs and spices for freshness at least once a year. If no aroma is detected after crushing, the seasoning needs to be replaced. Mustard seed and poppy seed aromas will be difficult to detect. Buying the smaller size instead of the economy size container will save money if the large package is not used while it is still fresh. Store spices in an air tight jar away from moisture. Prepacked ground Indian spices which included pepper, turmeric, chilli and coriander are usually contaminated with bacteria and molds. Red chilli has been found to be the most contaminated spice. The bacterial population consisted mainly of spores. A dose of 10 kGy has been suggested to be effective in destroying these microbes in prepacked spices without affecting their quality attributes. To eliminate mold contamination a dose of 5 kGy is said to be sufficient. During a six-month storage study of irradiated and unirradiated spices, the irradiated spices retain their quality. Dampness causes caking and a loss of quality [2]. Store spices in tightly covered (air tight) containers. Use clean, dry spoons for measuring. Store in a cool place. Do not store in a window or in sunlight, or near heat sources such as the cooking areas or the dishwasher. In hot climates, store spices such as paprika, red pepper and chili powder in the refrigerator to maintain quality.

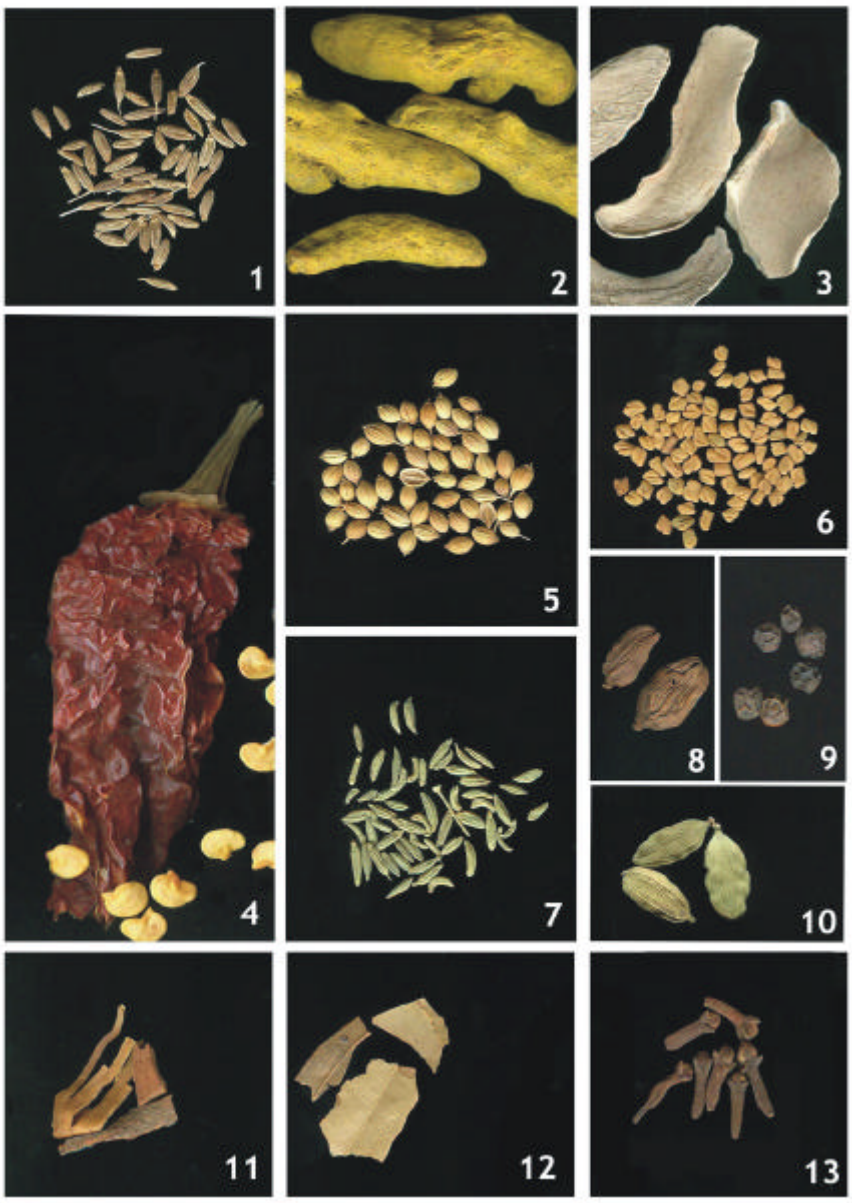

Fig. A: Some of the important Indian spices-1. *Cuminum cyminum* (Zeera) 2. *Curcuma domestica* (Haldi) 3. *Mangifera indica* (Dried Mango) 4. *Capsicum annuum* (Lal Mirch) 5. *Coriandrum sativum* (Dhania) 6. *Trigonella foenumgraecum* (Methi) 7. *Foeniculum vulgare* (Saunf) 8. *Amomum subulatum* (Badi Elaichi) 9. *Piper nigrum* (Kali Mirch) 10. *Elettaria cardamomum* (Choti Elaichi) 11. *Cinnamomum zeylanicum* (Dalchini) 12. *Cinnamomum tamala* (Tejpat) 13. *Syzygium aromaticum* (Laung)

Adding Spices to a Recipe

Whole Spices and Herbs: Tie herbs and spices in a cheesecloth, nylon net or muslin bag, or place them in a tea ring. The bag or ring is easy to remove to stop the seasoning process. Particles that may cause difficulty in chewing or swallowing also can be removed. Add whole herbs and spices at the start of cooking in recipes that will cook for an hour or longer. Examples are soups and stews. Many herbal and spiced teas can be made using whole herbs and spices. Flavoring seeds can be toasted briefly in the oven or on top of the stove to enhance flavor. Whole herbs are usually crumbled and added near the end of cooking.

Crushed and Ground Herbs and Spices: Add about 15 minutes before the end of cooking. The flavors in crushed or ground spices are released quickly. Crushing or grinding whole spices and herbs provides more flavor than the whole form. Ground black pepper in a pepper shaker does not have the zest of freshly ground pepper. Grinding pepper from the pepper corn provides more flavor [4]. For cold salad dressings, mix herbs and/or spices with vinegar for several hours before adding oil in order to develop the flavor.

Use of Herbs and Spices: Spices' being so versatile in their features are a necessity across the global culinary scene, especially in India. Indians are supposedly one of the warmest, most intense and cultured people. The use of herbs and spices in cooking offers the chance to prepare exotic, gourmet dishes, or cultural meals and a way to cut or save calories and fat in cooking. Using herbs and spices can moderate dietary levels of fat, sugar and sodium. The calories in herbs and spices are far less than in breading, batters, gravies, sauces and fried foods. Cost savings are realized by reducing the number of ingredients in preparation and/or by the possibility of dressing up inexpensive foods for a special meal. Many people are looking for flavors to substitute for salt or sodium. A teaspoon of salt has 2300 mg sodium-almost the amount recommended as the daily requirement. Many other condiments as well as packaged and processed foods contain around 1000 mg salt. Seasoning salts are regular salt with seasoning [4]. A teaspoon of most herbs and spices contains few calories and little or no sodium. Herbs and spices add zest and flavor to unsalted foods. Nutrient composition of eight commonly consumed spices of South India i.e. red chillies (*Capsicum annum*), black pepper (*Piper nigrum*), coriander seeds (*Coriandrum sativum*), cumin seeds (*Cuminum cyminum*), garlic (*Allium sativum*), asafoetida (*Ferula foetida*), dry ginger (*Zingiber officinale*) and ajowan (*Carum copticum*) for minerals, starch, sugars, dietary fibre components, tannins, phytic acid, enzyme inhibitors and amino acids reveals that dry ginger, ajowan and asafoetida had high calcium (1.0-1.5%) and iron (54-62 mg/100 g) levels. The tannin content of spices was also high (0.9-1.3% DM). Dietary fibre ranged from 14-53%. Spices had appreciable amounts of essential amino acids like lysine and threonine. A survey revealed the average per capita consumption of spices to be 9.54 g and at that level, the nutrient contribution from spices ranged from 1.2 to 7.9% of an average man requirement for different nutrients. Indian spices not only add flavour to the food cooked but act as great germ fighters in the body and also are used as preservatives in pickles, sauces etc. Many of them possess medicinal properties and have a profound effect on human health, since they affect many functional processes. For instance, spices intensify salivary flow, they cleanse the oral cavity, they help to check infection and protect the mucous membrane. Spices act as stimuli to the digestive system.

Non-Conventional Approaches for Conservation: We depend on plants for fibers, fuels, pharmaceuticals forages, food, medicine and other products of commerce. They affect the global environment, along to prevent soil erosion an provide oxygen we breathe. To meet the challenges of the new millennium we have to learn how to manipulate plants for sustainable utilization. Medicinal and aromatic plants are also of great importance today and with the new GATT agreement, this becomes important to conserve this natural resource of our country [6].

Plant tissue culture and genetic engineering as components of plant biotechnology are new alternatives for improvement and amplification of crops [7]. Biotechnology can be defined as the provision of useful products and services from biological processes [8]. Plant tissue culture comprises range of technologies integral to both the commercial plant production and research investigation. Micropropagation is now the most efficient and practically oriented plant biotechnology [7]. It can speed up the development of improved products by speeding their release, it also offers a method to rapidly increase both asexually propagated and sexually increased materials. The resulting product can have a high degree of phenotypic uniformly since the plants can be artificially manipulated in the laboratory to yield a large plant population of some growth stage. A phenotypically uniform population can be reproduced from genetically heterozygous selection characterized by its desirable traits. Thus, plant tissue culture has enormous potential to be used as tool for improvement and large-scale propagation of economically important spices and aromatic plants.

CONCLUSIONS

Spices constitute an important group of agricultural commodities which are virtually indispensable in the culinary art. In India, spices are important commercial crops from the point of view of both domestic consumption and export. Besides, huge quantities of spices are also being consumed within the country for flavouring foods and are also used in medicine,

pharmaceutical, perfumery, cosmetics and several other industries. There are over 80 spices grown in different parts of the world and around 50 spices are grown in India. The spices that India can offer in abundant quantities are pepper, ginger, turmeric, chilli, cardamom, celery, fenugreek, fennel, cumin, dill, coriander, cinnamon, ajowan (bishop's weed), cassia, clove, nutmeg and mace. Major spices of export are pepper, cumin, cardamom, ginger, turmeric and chillies. Other minor spices include ajowan, aniseed, celery seed, caraway, fennel, fenugreek, coriander, garlic, onion, saffron, vanilla etc. Among the spices exported, pepper has the leading position in terms of both quantity and value realised. The 'Alleppey Green' Cardamom is considered the best grade available in the world.

With such high biodiversity of spices and increasing demands there is pressure building up on growers and traders. Conventional methods of plant improvement have contributed significantly in increasing plant productivity. The impressive gains of plant breeding resulted in “Green Revolution” that not only prevented hunger and starvation of millions of people but also saved forest lands and other resources. The period from 1930 to 1970 witnessed a phenomenal increase in crop yields. [9], have reviewed the scientific background and the consequences of Green Revolution. Plant biotechnology came in existence as non-conventional method of plant breeding. Development of *in vitro* techniques of cell and tissue culture and molecular biology/molecular genetics/recombinant-DNA technologies, during 1970-1980s enabled scientists to apply these to improve crop yields and quality. Biotechnology is currently playing key role not only in world agriculture and agribusiness but also in saving biodiversity, land resources and wilderness [10, 11]. About 80% of current research in plant biotechnology is directed towards the improvement of food plants, the remaining work is concerned with non-food crops. Plant tissue culture is the cultivation of plant cells or tissues on specifically-formulated nutrient media. Since, it was first developed in the early 1960s, plant tissue culture has become basis of a major industry, providing high-value plants for nurseries. Plants derived from tissue culture are sometimes planted directly in farmer’s fields [12]. Over the years, several attempts have been made to cultivate plant cells in fermented vessels with aims of producing valuable products such as medicines and natural food flavoring [13]. It is important however, that particular method of tissue culture useful for specific crop/plant species must be developed and defined. Appropriate funds and policies are to be announced and implemented by policy makers regularly according to market state for the farmers and traders.

REFERENCES

1. Hadacek, F., 2002. Secondary metabolities as plant traits: current assessment and future perspective. Crit. Rev. Plant Sci., 21: 273-322.
2. Andrews, L.S., K.R. Cadwalleder, R.M. Grodner and H.Y. Chung, 1995. Chemical and Microbial Quality of Irradiated Ground Ginger. J. Food Sci., 60(4): 829-832.
3. Onyenekwe, P.C. and G.H. Ogbadu, 1995. Radiation Sterlization of Red Chili Pepper (*Capsicum frutescens*). J. Food Biochem., 19 (2): 121-137.
4. Sharma, A., S.R. Padwal-Desi and P.M. Nair, 1989. Assessment of Microbiological Quality of Some Gamma Irradiated Indian Spices. J. Food Sci., 54(2): 489-490.
5. Munasiri, M.A., M.N. Parte, A.S. Ghanekar, A. Sharma, S.R. Padwal-Desai and G.B. Nandkarni, 1987. Sterilization of Ground Prepacked Indian Spices by Gamma Irradiation. J. Food Sci., 52(3): 823-824.
6. Sharma, M., 2002. Biodiversity conservation and socioeconomic development: role and relevance of biotechnology. In: Role of plant tissue cuture in biodiversity conservation and economic development. Gyanadaya Pakashan, Nanital, India, pp: 1-9.
7. Altman, A. and B. Loberant, 1998. Micropropagation clonal plant propagation *in vitro*. In: A. Altman (ed.) Agricultural Biotechnology, Marcel Dekker, Inc., New York, pp: 770.
8. Aldridge, S., 1997. Growth Industry. New Scientist (In side Science), 105: 1-4.
9. Jauhar, P.P., 2001. Genetic engineering and accelerated plant improvement: opportunities and challenges. Plant Cell Tiss. Org. Cult., 64: 87-91.
10. Trewavas, A.J., 2001. The population/Biodiversity paradox. Agricultural efficiency to save wilderness. Plant Physiol., 125: 174-179.
11. Borlaug, N., 2002. Agricultural Biotechnology Issues address to Annual Meeting of ASPB, Denver, SA. http://:www.aspb.org/publicationaffairs/agricultural/borlaug.cfm.
12. Ostry, M.E. and K.T. Ward, 2002. Field performance of *Populus* expressing somaclonal variation in resistance to *Septoria musiva*. Plant Sci., 164: 1-8.
13. Raskin, I., D.M. Ribnicky, S. Komarnytsky, N. Ilic, A. Poulev, N. Borisjuk, A. Brinker, D.A. Moreno, C. Ripoll, N. Yakoby, J.M. O'Neal, T. Cornwell, I. Pastor and B. Fridlender, 2002. Plants and human health in the twenty-first century. Trends Biotechnol., 20: 522-531.