

## Chilli farming for Indian health and wealth

**India is the largest producer of dry chilli in the world with an acreage of 702,047 ha and annual production of 2049213 tonnes. India being the world's largest producer, consumer and exporter, contributes about 40% of total world's production. Dry chilli contributes 31% among the total spice export from India with 557168 tonnes exported with an economic share of 8429.92 crore rupees. Indian dry chilli is majorly exported to China (Value of ₹3144.53 crores), followed by Thailand, Bangladesh, USA, Srilanka, Indonesia, UAE, Malaysia, UK and Vietnam. In India, the major dry chilli cultivated states are Andhra Pradesh (25.27%), Madhya Pradesh (17.40%), Telangana (12.69%) and Karnataka (12.19%), these four states accounts for 67.55% of total national cultivated area and of 87.62% of total production.**

**F**RESH chilli is mainly cultivated in China, Mexico, Turkey, Indonesia, Spain, USA, Nigeria and India in the world on all the continents. In India, green chilli is cultivated in an area of 364,000 ha acreage with annual production of 3720,000 MT. India exported 52,370 MT of green chillies worth value of 310.44 crores rupees during 2021-22.

Fruits are rich in capsaicinoids, capsinoids and carotenoids which have potential applications in food, spice, phytofeed, cosmeceutical and pharmaceutical industries. Among the different pepper based industries one of the most important is paprika, 70% of which is used as spice in soups, sauces and meat products. Paprika is the ground product from the mild pungent or non-pungent fruited varieties of *Capsicum*, but in international trade paprika always refers to non-pungent fruits or its powder or oleoresin extracts from such fruits. Seasoning with paprika or pepper extracts have a long tradition in many countries worldwide, such as Spain, Hungary, and Mexico. The addition of paprika or pepper powder is also used to enhance the oxidative stability of lipids and proteins in meat patties. Hence besides unique place in

the world diet in its ripe dried form (spice) as well as green fruits (vegetable), pepper is also used as an essential condiment in foods for natural red colour. India is rich in many chilli varieties with different quality attributes and is the leading consumer and exporter of pepper. The main specialty of this additive is the magnitude of its red colour, that positively impacts consumer acceptance as well as commercial value. It was categorized as a food additive (natural dye). Paprika has gained popularity worldwide as spice, primarily used to impart colour, flavour and pungency to foods and dishes, Nitrite replacer, and lipid oxidation inhibitor in pork. Paprika powder was also effective to inhibit nitrite content in meat batters, enhancing their colour and reducing oxidative rancidity, which led to delay of off-odour formation. According to Grand View Research, the global market for oleoresins was valued at US\$1.44 billion in 2018. And it is forecasted that the market will grow at a compound annual growth rate of 4.7% by 2025. Similarly, the global paprika market value was estimated to be at rate of USD 432.7 million in 2018 and is projected to expand further at a CAGR (Compound Annual Growth Rate) of 5.3% to 2025



Naga Mirchi



Byadgi Dabbi



Mizo chilli



Dalle Khursani



Harmal chilli

**Table 1.** List of geographical indication (GI) tags registered for chillies

Name of chilli landrace	Application No	GI certificate date	State
Naga Mircha (chilli)	109	02.12.2008	Kohima, Nagaland
Guntur Sannam chilli	143	28.05.2010	Guntur, Andhra Pradesh
Byadagi Chilli	129	27.01.2011	Karnataka
Mizo Chilli	377	23.03.2015	Mizoram
Bhiwapur Chilli	473	30.11.2016	Nagpur, Maharashtra
Khola Chilli	618	28.08.2019	Goa
Hathei Chilli	592	14.09.2021	Manipur
Dalle Khursani	636	14.09.2021	Sikkim
Harmal Chilli	642	14.09.2021	Goa
Edayur Chilli	662	14.09.2021	Malappuram, Kerala

Source: [www. https://search.ipindia.gov.in/GIRPublic/](https://search.ipindia.gov.in/GIRPublic/)

(<https://www.grandviewresearch.com/industry-analysis/paprika-market>). Among the different pepper-based industries one of the most important is paprika, 70% of which is used as spice in soups, sauces and meat products. Paprika is the value-added product of the mild pungent or non-pungent fruited varieties of *Capsicum*, although completely non-pungent fruited varieties derived paprika are mostly preferred in International market. Pepper derived paprika is also used as an essential condiment in food industry for natural red colour. The main specialty of this additive is the intensity of the colour 'red', enhancing its commercial value for which it was recognized as a food additive. CHSR (Chilli Spent Residue), an oleoresin by-product exhibits immense food value owing to its high total dietary fibre (44.4%), insoluble dietary fibre (34.9%), and soluble dietary fibre (9.5%) and protein content (19.7%). Hence, CHSR can be augmented in bread manufacturing industry for enhancement of physical, sensory as well as nutritional properties of bread. Seeds of chilli are rich in oil (16-25%) which is profound in linoleic acid (68-72%) and palmitic acid (13-15%) content. Seed oil has various applications in healthcare and anti-aging.

Chilli is used in Ayurveda since a long time. It is known as Raktamaricha (red coloured fruits) and Katuveera (pungent seeds) in Sanskrit. Chilli is classified as laghu (light), ruksh (dry), tikshan (sharp), katu (pungent), virya (potency), ushan (hot) and used in several ways in ayurveda. Pills prepared from chilli paste along with camphor and asafoetida is used to treat cholera. Paste of chilli along with sandalwood paste is used as medicine against headache. Dry powder mixed with sugar or honey or candy in small quantities (3-5 g) is used to relieve sore throat. Powder consumption with buttermilk will improve appetite and digestion. It is also useful in digestion (vipachini) and decreases fat content (medohara).

Carotenoids from pepper are used as natural colourants and capsaicinoids which are unique have wide applications in the food, medicine, pharmaceutical industries as well as for defence purpose. Capsaicin and other capsaicinoids have a vast clinical and pharmacological application due to strong biological activity for the treatment of neurological and musculoskeletal pain, and oxidative and inflammatory disease situation. Capsaicin as Qutenza® is being used as an effective agent to cure neuropathic

pain. New therapeutic approach of capsaicin to combat obesity via increased fat oxidation has been reported. With emerging eco-friendly adoption of consumers and industries, there is a spike in exploration for bioactive compounds and plant extracts as natural ingredients for the cosmetic and pharmaceutical use. The substitution of natural ingredients in place of artificial preservatives could ensure the health properties of the pharmaceutical and cosmetic products, circumventing the contact allergies. There are various cases of paprika oleoresin to be used as cosmetic colourants in bath oils (<https://de.lush.com/search/site/paprika>), shampoo, shower gels, and beauty products such as lipsticks and eye make-up (<http://www.colormaker.com/naturalingredients>). Pepper extracts containing high concentrations of zeaxanthin and lutein carotenoids are often used in facial and skin-care products as a serum or nutritional supplement (<https://zss-skincare.com>). A combination therapy with zeaxanthin as well as lutein enhanced skin elasticity and improved cutaneous hydration. The pepper by-products containing bioactive properties are successfully implemented by cosmeceutical industries for the production of various beauty products with no side effects.

In India, due to continuous cultivation of *Capsicum* sp. for about 500 years and the crop being often cross-pollinated, number of landraces has been evolved. Among landraces, Byadgi chilli for colour and Naga Jalokia for pungency have gained popularity with potential industrial importance. Byadgi Dabbi, a famous local landrace of Karnataka, which is named after the village Bydagi of Haveri district, Karnataka, India, is known internationally

for its deep red colour (150–200 ASTA Colour value) and low pungency. Byadgi pepper got the geographical indications certificate in September, 2010 exhibiting high export value. Bydagi chillies are grown especially in Bydagi area of Haveri district and Dharwad districts of Karnataka. There is huge demand for oleoresin extracted from Bydagi chillies across the globe especially USA, Japan and European countries. Apart from oleoresin, there are more than 25 industries in Bydagi that produce powder and supply to several masala manufacturers and now Bydagi area is known for several small-scale industries based on chilli cultivation providing lot of employment opportunities. The GI status will help to get higher prices and high net income to the farmers and also at International market.

### SUMMARY

Chilli is commercial spice crop having wide industrial applications. Development of good agricultural practices specific to areas of cultivation will help in sustainable chilli production. Achievements made so far in chillies improvement and multidisciplinary approaches will help in transforming chilli cultivation into more sustainable and economical way to keep Indian chillies at pride globally.

For further interaction, please write to:

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## Technology for Propagation of Clonal Rootstocks of Apple through Cutting under Greenhouse in Soilless Beds

Sunken beds of dimensions 2.5 0 ft (76 cm wide) and 1.0 ft (30 cm) depths were prepared. After preparing the sunken beds, the beds were filled with sand and cocopeat. The lower 6 inches (15 cm) of the bed were filled with sand while the upper 6 inches (15 cm) were filled with cocopeat. The purpose of digging out soil from the beds is to fill it with sand and cocopeat to make soilless beds conducive for planting the cuttings, and to avoid weeds and reduce the water requirement considerably. The cuttings of 30 cm size of pencil thickness (8-10 mm) with 8-9 buds were selected and planted in the first week of March in these beds. The lower portion of the cuttings was given a horizontal cut and light cut on either side of the cutting at the base to expose more of the cambium for callusing. Before planting, the cuttings were given fungicidal treatment (Carbendazim 3 g/litre of water) for 20-25 seconds and dipped in rooting hormone Indole Butyric Acid IBA (2500 ppm) for 10-15 seconds. The cuttings were planted in the soilless beds at a spacing of 3 inches (7.62 cm) both in a row-to-row and cutting-to-cutting to accommodate 52 cuttings per sq. meter area. With this technology, 40-45 plants with well-developed root systems were harvested per square meter area of the soilless beds. This technology will revolutionize the production of clonal rootstocks in the country from the wasted portion of the plant. By adopting this technology, the cost of rootstock/planting material will get reduced and dependence on import for quality planting material will decline drastically.



Different stage of Nursery development using by cuttings in soilless beds under protected conditions

Source: ICAR Annual Report 2022-23