Quality Bird's Eye Chili Production: a Retrospective

R. Chatterjee[1], P. K. Chattopadhyay[1], T. Chongtham[1*], V. Hnamte[1], S. K. Datta Ray[2] and P. S. Munsi[3]

[1*]Department of Spices and Plantation Crops[1], [2]Department of Fruits and Orchard Management, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal (741 252), India
[3]Pallisiksha Bhavana,Viswa-Varati, West Bengal (731 236), India

Article History

Manuscript No. 279
Received in 22nd February, 2012
Received in revised form 26th August, 2012
Accepted in final form 5th September, 2012

Correspondence to

E-mail: chongthamt@gmail.com

Keywords

Bird's eye chili, quality production

Abstract

Bird's eye chili (*Capsicum frutescens* L) is still a neglected crop which has many similarities with commercial cultivated chili species (*Capsicum annum* L). Like all other chilies, bird's eye chili is also rich in β Carotene (pro-vitamin A), ascorbic acid (vitamin C) and contains tocopherol (vitamin E) whose role as a vital antioxidant is well known. Capsaicin (N-varillyl-8-methyl-6-nonera-mide ($C_{18}H_{27}NO_3$) and di-hydro capsaicin contributes 69% to its pungency. Bird's eye chili grows best at soil pH between 6.0 and 7.0. It thrives in climate with growing season temperature in the range of 18-27°C during the day and 15-18°C during the night. Most bird's eye chilies are processed to extract the oleoresin for sale to the food and pharmaceutical industries due to its' high pungency, color and medicinal properties. It is used in the manufacture of curry powder, pickle, curry paste, hot sauces etc. Despite its wide usage, bird's eye chili is yet to draw considerable attentions from the farming community. In North Eastern India the crop is grown commercially. Dry chilies with high pungency are in demand in the market of the European Union, the United States and Japan. Awareness program to promote bird's eye chili cultivation is necessary for useful exploitation of the crop.

1. Introduction

Bird's eye chili (*Capsicum frutescens* L) is called by many other synonyms like African pepper, chili pepper, goat's pod, Mexican chili, red pepper, Tabasco pepper, Zanibar pepper and Cayenne pepper whose small, very pungent fruits separate easily from calyx and are dispersed by bird's. The plant originated in South America. It is a wild form of chili and often used to denote any small sized, pointed chili of high pungency because of the similarity to an avian pupil. Bird's eye chili has been grown as a neglected crop in very few pockets of the world and in India. Probably the main reasons for this are its wild habitat and lack of awareness among the farming community. So efforts are required to promote it's cultivation on a large scale. Capsaicin (N-Varillyl-8-methyl-6-nonera-mide, [$C_{18}H_{27}NO_3$] or CAP and di-hydro capsaicin (DHC) are major contributors to pungency and forms about one-third of the total capsaicin, whereas non-di-hydro capsaicin (NDC), homo-capsaicin and homo-di-hydro capsaicin are minor capsaicinoid, which also contribute to its pungency. The capsaicin content ranges from 0.26 to 1.21% w/w or 1,00,000-1,50,000 scoville units (indicates amount of water required to neutralize the burn and the ASTA (American Spice Trade Association) color value is 41.7. Carotenoids control pod color. The keto carotenoids capsanthin, capsorubin and cryptocrypsin are unique capsicum carotenoids. The red color in pod comes from carotenoids, capsanthin and capsorubin while the yellow orange color is from beta carotene and violaxanthin. Capasanthin, the major carotenoid in ripe fruits, contributes up to 60% of the total carotenoids. Capsanthin and capsorubin increase proportionally with advanced stages of ripeness (Bosland, 1993). Different products like curry powder, curry paste, hot sauces, chili sauces can also be prepared from it. Capsaicin is used as a chemical in many pain balms, carminative tonics, etc. and as color additives in food industry. Like all other chilies, BEC is also rich in betacarotene (pro-vitamin A), ascorbic acid (vitamin C) and contains tocopherol (vitamin E), also contains capsaicin, and capsanthin, responsible for its pungengy and color. Like other chilies, it also contains moisture, protein, fat, minerals, fibers and CHO in minute quantity (Blum et al., 2002). The fruit of the bird's eye chili is popularly used as spice in South-east Asian cuisine. It can also be used to flavor vinegar. The leaves are also edible and can be eaten as a vegetable. The fruit is eaten raw or in processed form as powder. It is also used for medicinal

purposes and in the control of pests and diseases. In medicine, the bird's eye chili was traditionally used to ease arthritis and rheumatism, and also as a cure for dyspepsia, flatulence and toothache. It can also be used as a natural insect repellent or pesticide when mixed with water.

2. Growing Condition

2.1. Soil

Bird's eye chili grows best on well drained moderately fertile soil. Crop grows best at soil pH between 6 and 7. To reduce risk from *Verticillium* wilt and other diseases where other solanaceous crops were grown previously should be avoided.

2.2. Climate

Bird's eye chili thrives in climates with growing season temperatures in the range of 18-27^{0}C during the day and 15-18^{0}C during the night. Lower night temperatures result in greater branching and more flowers, warmer night temperatures induce earlier flowering and this effect is more pronounced as light intensity increases. High yields are obtained with rainfall of 600-1,250 mm well distributed over the growing season. Heavy rainfall during the flowering period causes flower shedding and poor fruit setting and during the ripening period rotting of fruits.

3. Varieties

Bird's eye chili has some important botanical varieties that are under cultivation. They are as follows:

a. *Capsicum frutescens* var. *fasciculatum*: Red cluster pepper
b. *Capsicum frutescens* var. *abbreviatum*: Short pepper
c. *Capsicum frutescens* var. *longum*: Long pepper
d. *Capsicum frutescens longum* var. *conoides*: Cone pepper
e. *Capsicum frutescens longum* var. *cerasiforme*: Hot cherry pepper
f. *Capsicum grutescens longum* var. *baccatum*: Peruvian pepper, bird pepper

Other varieties include Hungarian wax, large cherry, long red cayenne, Maule's red hot, and Tabasco. HPLC analysis of various Indian Chili cultivars identified the 'Tezpur' cultivar (*Capsicum frutescens* var. Nagahari) from Assam as containing the highest amounts of capsaicin and di-hydro capsaicin (4.28 and 1.42% w/w) contributing to a pungency rating of 855000 SHU (Scoville Heat Units) which is the 'hottest chili' known to date (Mathur et al., 2000).

4. Description

Bird's eye chili plant is a small much branched bush with a production life of two to three years. All small highly pungent chilies belong to *Capsicum frutescens* L. The common features of all *frutescens* cultivar are their whitish green flower and their upward directed pedicel. Fruits give their upright position until maturity appearing above the foliage.

5. Propagation

It is propagated through seed and seed rate of the crop is 400-500 g ha^{-1}.

6. Preventing dormancy

To break seed dormancy, seed should be treated with 0.1% potassium iodide solution for 1-1$^1/_2$ h.

7. Planting

Transplanting to main field is done during later March.

8. Spacing

The spacing recommended for sole crop is 1x1 m^2. It is 2x2 m^2 if it is to be intercropped with banana, tapioca and other crops.

9. Irrigation

Irrigation frequencies of 4-7 days are required for the good growth and development. The crop is particularly suitable for drip irrigation where very high yields can be obtained.

10. Weeding

Pre-emergence application of metachlor+metrobromuron at 1.5 + 1.5 kg a.i. ha^{-1} and metachlor + terbutryn at 1.25 + 1.25 kg a.i. ha^{-1} combined spray for effective weed control. Unrestricted weed growth throughout the crop life cycle resulted in 81-90% reduction in potential fruit yield.

11. Nutrition

Application of balanced inorganic fertilizer at 100 kg N, 80 kg P_2O_5, and 50 kg K_2O ha^{-1} and 20-25 t FYM ha^{-1}. Foliar spray of 10 gm urea l^{-1} is recommended before flowering.

12. Growth Regulator

Plant growth regulators are to be sprayed to reduce flower drop and increase the fruit set. Two sprays with NAA @ 10 ppm at flower initiation stage and another one at 15 days later.

13. Pests Control

Control of pests like insects, fungi, bacteria, weeds, and rodents using pesticides is not highly recommended. If required, the following chemical treatments are recommended for nursery plants:

13.1. Aphids

Proportion of 0.5 kg of dry chili fruits pounded or ground is added to 20 l of water. Apply once every two weeks when

aphids are seen in the field, proper scouting is recommended before chemical use.

13.2. Thrips, mites, white fly

A solution of Karate EC (30 ml 20 l^{-1} of water), applied bi-weekly during periods of high mite infestations (generally at the end of the dry season), will control mites as well as thrips and white fly.

13.3. Virus

Use clean seed, traders supplying seed should dress them with tri-sodium phosphate control vectors, like aphids, white flies. Suspected virus-diseased plants (mottled leaves, stunted) from the fields should be removed. In general, a solution of chilli and lime tree leaves is used to spray Birds eye chilli against pests. Using raised beds to improve drainage reduces incidences for fungal diseases like dumping off, phytophthora and leaf spots.

14. Harvesting

Harvesting is done during April-June and October-December. It takes three months from transplanting to first harvest. Only red, ripe fruits are harvested and marketed.

15. Yield

In general, bird's eye chili would yield at least 300 g $plant^{-1}$ $year^{-1}$ (fresh) or 180 g^{-1} $plant^{-1}$ $year^{-1}$ (dry chili). Well managed farms should be able to yield 600 g of fresh chili $plant^{-1}$ $year^{-1}$ or 200 g of dried chili.

16. Processing and Storage

The fruits are dried above the ground usually on a rack with free movement of air. Drying takes 4-7 days. Fruits should be shriveled yet not brittle (moisture content of 7.5-8%). For storage purpose, red ripe chilies are semi-dried for 3-15 days under open sunlight and stored in polythene covered at room temperature of 28-30^{o}C.

17. Marketing

Fruit must be red, not more than 2 cm in length, have less than 8% moisture content, and have high capsaicin content.

18. Present Scenario

The main chili pepper producers in the world are China, Mexico and Turkey, which in total account for more than 70% of the world chili pepper production. The leading global exporters include Mexico, Netherlands and Spain. It is commonly found in Cambodia, Laos, Vietnam, Thailand, Malaysia, Indonesia, the Philippines and Singapore. World demand and supply of chili peppers have been steadily increasing. Between 2000 and 2007, fresh chili and peppers increased on an average 6.6% $year^{-1}$ in the world and 6.3% $year^{-1}$ in Europe. World chili pepper production has grown on an average 3.9% $year^{-1}$ during the last 10 years led by a steady increase of global demand. Top exporters are Indonesia, Brazil, Singapore, Malaysia and India. In India all kinds of bird's eye chilies are found scattered all over the north-eastern region from Sikkim to Arunachal to Assam to Myanmar (Baruah and Barua, 2004).

19. Conclusion

Though grown in coastal parts of Kerala, Karnataka and Tamil Nadu as neglected crop, it is the north-eastern region (NER) of India where bird's eye chili is grown commercially. NER is the major producer exporter and consumer in India. So, developmental program should be taken to improve the productivity and quality of it. It is possible only when production technology, production packages and post-harvest technology are developed and made available to the farmers. There is no doubt if prompt efforts are mooted to improve the crop and made available to the farming community it will become a potential foreign exchange earner of the country.

20. References

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