



GEOGRAPHICAL ANALYSIS OF BYADAGI CHILI AND IT'S GEOGRAPHICAL INDICATION TAG

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Abstract

The climate of Karnataka comprises a wide range of weather conditions across a vast geographic scale and varied topography. Due to its varying geographical conditions encouraged to grow different types of agricultural products. Byadgi chili is mainly consumed as ground spice powder in cuisine. In production of pickles, masala products and chili powder, Byadgi chili is preferred as it allows to bring out the best colour naturally and at the same time, avoid their products being too pungent for consumption. The Byadgi chili is also very useful due to its bright red colour, and is used as coloring agent. Byadgi chili is heavily used in extraction of oil called, oleoresin. The demand for Byadgi chili is increasing enormously due to its application as natural red colour in food industry. The oleoresin manufacturers in the international (Sri Lanka, Bangladesh, America, Europe, Nepal, Indonesia, Mexico) market are using Byadgi chilies as a substitute for paprika. The traders of Byadgi chili are mainly supplying Byadgi chili to the leading exporters located at Cochin (Kerala), Tamil Nadu, West Bengal and in turn, after value addition, product like Paprika Oleoresin is exported.

Introduction:

Byadgi chili is a famous variety of chili grown in Karnataka state. It is named after the town, Byadgi, which is Taluk headquarter in the Haveri district of Karnataka. Byadgi chili is a long (12-15 cm) and thin, bright red variety of chili characterized by wrinkles on the pods (Fig. 3.1). Byadgi chilies are famous for its aroma and deep red colour. Byadgi chilies have the highest colour values of 150000 to 250000 CU (Colour Units) or 80-130 ASTA colour units. Byadgi chilies have mild pungency and moderate seed content. The capsaicin (which gives hot and spicy kick to chilies) content of Byadgi chilies varies from 0.8 to 1.3% ,and pungency varies in the range of 8000-15000.

Study Area

Byadgi taluk is located between 14°-15' and 14°-46' north latitudes and 75°-15' to 75°-35' east longitudes and situated in the central portion of south western part of Haveri district. Byadgi is at a distance of 323 k.ms. from Bangalore and about 18 kms. from Haveri city by road. The taluk is bound by the Haveri taluk to the north, Hangal to the west, Hirekerur to the south and Ranibennur taluk to the east. The Byadgi taluk covers an area of 43,656 hectares. There are 63 villages with total population of 1,27,944 (2001). (Fig.1)

LOCATION MAP OF BYADGI TALUK

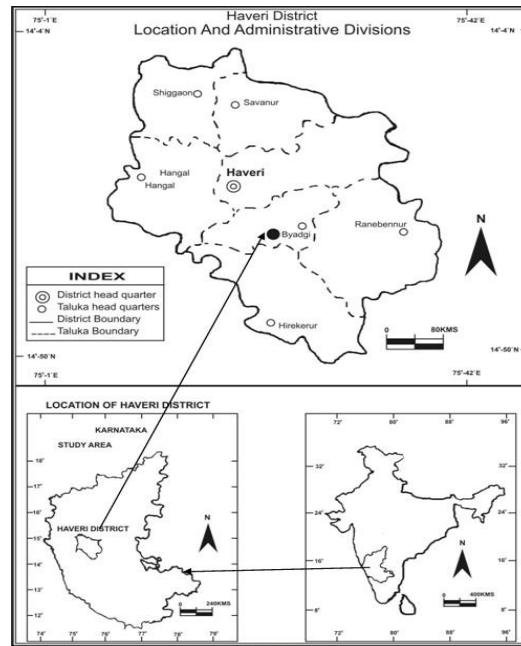


Fig - 1

Objectives:

- 1) The main objective of this study is to know the Geographical analysis of Byadgi Chili.
- 2) To know the Specification for Geographical Indications tag to Byadgi Chili.

Database and Methodology:

The present paper aims to study the geographical analysis of byadagi chili and its geographical indication tag based on secondary data obtained from journals, Legal books, magazines and newspaper articles, reports of the governments and GI Registry Office, Chennai. The methodology includes the preparation of photographs of activities.

Specification:

- Grown only in Karnataka, near Byadagi region
- Grown on black cotton soil with pH value of 5.5to6.5
- Known for high colour value-1,50,000 – 2,50,000CU
- Less pungent, even sweet smelling at times.
- Have wrinkles on pods.

Name of Geographical Indication

BYADAGI CHILLI

Byadgi chillies have been tagged with Geographical Indication



(GI application No. 129) product of Karnataka.

Fig.2. Matured and dried Byadgi chillies

In Karnataka, Bydagi chili is grown in Dharwad, Gadag and Haveri districts under rainfed conditions. The yield of chilies in these districts is 0.5-1.25 MT/ha. Other districts like Bellary, Raichur and Gulbarga where Guntur variety chilies used to be grown, have shifted to growing Byadgi variety as it has high eroleoresin content with an optimal yield of 3.75-5.00 MT/ha. Even in adjacent state of Andhra Pradesh, it is grown in districts of Karnool and Adhoni.

Varieties of Byadgi chili:

There are several types of Byadgi chili. The two main types are The Byadgi Kaddi and Byadgi Dabbi.

- 1) The Byadgi Kaddi has a length of 10 to 15 cms, with negligible pungency. It is slender, linear, light green in colour and at maturity turns to deep red colour developing the characteristic wrinkles at the ripening stage. This variety possesses the highest colour value and is suitable under rain fed conditions. It has its calyx covering its Pod, and is reasonably resistant to pests and diseases.
- 2) The Byadgi Dabbi is another variant of Byadgi Dabbi type and suitable for green chili and dry chili purpose. The fruits are of medium length (8 to 10 cms.), a little curved at the apex, and slightly bulged at the base of the calyx. This variety is more susceptible to pests and diseases. The quality parameters for the Dabbi Chili are on the same lines as the Byadgi Kaddi.
- 3) The Dyavanur Delux is a variant of recent origin of Byadgi Dabbi and might have been selected from Dyavanur Dabbi. The fruits are similar to Dyavanurdabbi but the size of the fruit is a little bigger and more bulged at the calyx. The fruit length ranges from 10 to 12 cms, the fruits are light green in colour and turn to an attractive shiny deep red colour on maturity. On complete drying, this variety also develops wrinkled surface on the fruit. At present fruits of this variety are most in demand in the markets.
- 4) Noolvi Dabbi, Kubhsi Dabbi, Antur Bentur Dabbi types are some of the variants which are similar in their quality parameters including pungency and colour values and widely grown in this region.
- 5) The Byadgi chili plant grows to a height of 1m. With a spread of 1m. Leaves are thin and light green in colour. It is a branching type. Fruits attain deep red colour on maturity and develop wrinkles on the surface. The average Byadgi chili fruits are 12 – 15 cms. long and thin but not very pungent. Plant and quality characters of the main varieties of Byadgi chili are presented in Table 3.1.



Fig. 3 Byadgi Kaddi



Fig.4. Byadgi Dabbi

Table 1 : Plant and quality characters of the main varieties of Byadgi chili

Characters	Varieties of Byadgi chilli		
	Byadgi Kaddi	Byadgi Dabbi	Dyavanur Delux
Plant height, cm	100	100	100
Plant spread, cm	85-90	85	90
Leaves	Thin, light green	Thin	light green
Branching habit	High	High	High
Flower	Solitary, white medium size	Solitary, white medium size	Solitary, white medium size
Days to 50% flowering	65-70	65-70	65-70
Fruit length, cm	16-17	13-14	14-15
Fruit width at the shoulder, cm	0.8-1.0	2.0-2.5	1.5-2.0
No. of fruits/plant	150	50	65
Average fruit weight, g	1.30	1.65	1.55
Dry fruit surface	Wrinkled	Wrinkled	Wrinkled
Colour of dried chilli	Deep red	Deep red to chocolate	Deep red to chocolate
Colour, ASTA units	150-160	180-200	180-200
Pungency	Negligible or nil	Negligible or nil	Negligible or nil
Oleoresin, %	12-14	12-15	12-15

Geographical Requirements:

- The Byadagi chili crop requires a warm and humid climate during the growing period and dry weather during the period of maturation of fruits.
- Byadagi chili can be grown in varied soil types but well drained loamy soils (black and red lateritic soils rich in potash having a pH of 5.5-6.5) are ideal soils.
- Byadagi Chili can be grown in tropics and sub tropical regions receiving 500 – 800 m.annual rainfall.
- The ideal temperature requirement is 20 – 38° C with warm humid conditions which improve the growth while dry conditions enhance maturity.

Table 2: Specifications of Byadgi chili

Product Name	Byadgi chili
Style	Dried
Flavour	Less spicy
Colour	Red
Pungency in SHU	8000-15000 (Heat)
Colour in ASTA	80-130 Max
Length	10-12 cm max
Breadth	1.0-1.5 cmmax
Skin	Thick
Capsaicin content	0.8-1.3% max
Pods with Stalks	1% maximum
Broken chillies	2% maximum
Loose Seeds	2% maximum
Damaged & Discoloured pods	2% maximum
Foreign Material	1% maximum

Moisture	14% maximum
Quality	A/C Best
Appearance	Fully Wrinkled
Packing Details	5, 10, 15, 20, 25 & 40 kg Cartoon / Jute / PP

Geographical Area of Production :

Byadagi Chili is extensively cultivated in the transition belt of Dharwad, Haveri, and Gadag, districts of Karnataka. It is grown in Dharwad, Gadag and Haveri districts in rain-fed condition. Among the districts of Karnataka, Dharwad has the maximum acreage.

Latitude	Longitude	Altitude	Temp. range	Rainfall	Humidity
14° 48'N to 15° 25'N	75° 24'E to 75° 42'E	500 to 700 m. Above sea level	20 to 38° C	500 to 800mm	65 to 95%

Soil and climate :

Sl. No.	Ge o-climatic features Data	
1.	Soil -type	Well drained loamy soils – black or red lateritic soils, rich in potash
2.	Soil pH	pH of 5.5 to 6.5
3.	Average Temperature in region	20 to 38°C
4.	Warmth and Humidity	Required during growth for vegetative and reproductive growth of chili
5.	Dryness	Required during maturation
6.	Rainfall	500 800 mm. annual rainfall

- The plant grows to a height of 1m. with a spread of 1m. Leaves are thin and light green in colour.
- The Byadagi chili which belongs to the species *Capsicum annum*, which is most grown commercially and in which improvement in the crop is achieved largely by hybridization and selection within *Capsicum annum* itself.
- Byadagi chili is best gr
- own in Tropical and subtropical regions, with annual rainfall of 500 to 800mm, temperature of 20 to 38°C, in well drained loamy soils (black and red soils rich in potash having a pH of 5.5-6.5) and with warm humid conditions which favour the growth with dry conditions during maturity of the crop. These conditions subsist in the transition belt of North Karnataka districts. It is stated that these chilies alone have the above qualities which are not seen in any other chilies, and this contributes to the uniqueness of the Byadagi chili.
- The pesticide usage in Dharwad, Gadag and Haveri districts is very low being a rain fed crop in these places. Hence the produce from these areas is most preferred even though the yield is very low (200-500 kgs./acre or 500 – 1250 Kgs/hect.).

District wise Area and Production of Byadagi Chili in Karnataka

In Karnataka, Byadagi chili occupy an area of 1,45,000 ha. Covering Dharwad, Gadag and Haveri districts with the production of 87,000 tones. District wise details given below.

S.No.	Name of District	Area (Hect.)	Production (MT)
1.	Dharwad	71000	47000
2.	Haveri	34000	20000
3.	Gadag	40000	20000

Transplanting:

Seedlings may be transplanted when 40-45 days growth on a well-prepared land. The optimum spacing for planting in the main field is 90 to 120 cm which is done by using markers. Spot application of FYM (Farm Yard Manure) before transplanting is being done wherever lines are intercrossed. 'Ridges and furrows system' is followed, and planting may be done in the furrows and the plants earthed up later. Transplanting may be done preferably on a cloudy evening. In the case of the irrigated crop, transplanting is done immediately after irrigation.

Fertilizers:

Recommended dosage of NPK (Nitrogen, Phosphorous & Potash) for rainfed crop is 100:50:50 and for irrigated crop is 150:75:75. The Byadagi chili crop responds well to nitrogen and potash application rather than phosphorus application. Usually phosphorus and potash fertilizers are applied in one dose normally 15 days after transplanting while nitrogenous fertilizers are applied in two or three splits at 15 days after transplanting and a month after first application of fertilizers. The fertilizer requirement of irrigated crop is higher than that of rain fed crop. Fertilizers are applied both as basal dose and top dressing. For a rain fed crop fertilizer at a dose of 60 kg N, 30 kg P and 50 kg K per hectare may be applied as a basal dose. In the case of irrigated crop, a basal application of 60 kg P and 60 kg K per hectare may be given during the last ploughing. Depending upon the region and soil type, about 120 – 150 kg N per hectare may be top-dressed in 3 – 6 split doses commencing from 30 days after planting at monthly or fortnightly intervals, half of K may be applied as top dressing during flowering depending upon the soil type.

Nutrition :

There is a practice of providing minimum nutrition to chili crop in this area mainly because of large holdings and rainfed cultivation. The university recommends 25 tons of FYM/ha and 100:50:50kg NPK/ha with nitrogen in two equal splits for rain fed cultivation. However farmers adopt their own dosages viz., 1 bag of urea + 1 bag of potash OR 1 bag of DAP + 1 bag of Potash. However few farmers are in the habit of applying complex fertilizers. Only few progressive farmers apply a combination of urea, SSP and MOP in recommended proportions. Since the availability of organic waste and FYM is very scarce, farmers apply FYM as spot applications or they broadcast 1 to 2 tractor loads of FYM/ha which would be sufficient.

Weeding :

Since the chilli is being cultivated on black soils, very light harrowing is required. The common weeds found in this area are *Parthenium Amaranthus* sp, Wild *Ocimum* sp, *Cynodon* sp and *Cyprus* sp. Majority of farmers keep their land 100% weed free which is achieved by repeated harrowing coupled with one or two hand weeding by their own family members. None of them is seen to use the weed iced for control of weeds in chili plots. As a result of repeated harrowing in black soils, the soil moisture regime is sufficiently maintained apart from achieving the weed free conditions. Top dressing followed by earthing up of the crop is also practiced when the crop is about 30 to 45 days old. During this period the seeds of marigold are broadcasted here and there with the aim of getting the flowers during Diwali and Dusshera festivals without knowing the beneficial effect of marigold as it acts as a "trap crop" to control fruit borers and nematodes in the soil.

Flowering :

The flowering of Byadagi chili commences 40 days after transplanting with a peak flower production at 60 to 80 days after transplanting. Peak flower production in chili is influenced by soil moisture, soil fertility and incidence of pest especially trips and mites. In Byadagi cultivar there are two peaks of flowering at 50 and 70 days of transplanting. On an average, Byadagi cultivar produces about 200 flowers per plant.

Root system:

The root system of the Byadagi chili plant is restricted to upper soil layer of 30 cm. depth. Application of organic manures and fertilizers enhances root activities. Root system of the chili crop is highly branched with a tap root at the centre. Water stagnation is detrimental to chill plants.

Sowing methods:

Transplanting is the most common method of sowing Byadgi chilies although direct sowing in lines is followed under rainfed conditions. In direct sowing, seed are sown on a well prepared field during end of March to first 2 weeks of April at the seed rate of about 2.5 kg/ha. The gap filling and thinning operations are conducted 4-5 weeks after sowing. In transplanting, seedlings are grown in nursery on conveniently long raised beds of 1 m width with 30 cm wide drainage channels in between the beds. The seed rate for Byadgi chili for transplanting is 1.0-1.25 kg/ha. 40-45 days old seedlings are transplanted during May- June months at the spacing of 90-120 cm using row markers. Ridges and furrows system is followed. Seedlings are planted in furrows, and the plants earthed up 30-45 days after transplanting.

Harvesting:

The flowering of Byadgi chili commences 40 days after transplanting with a peak flower production at 60 to 80 days after transplanting. There are 2 peaks of flowering in Byadgi chilies at 50 and 70 days of transplanting. On an average, Byadgi chili produces about 200 flowers per plant.

Harvesting season for Byadgi chilies starts from November to January. The fruits are plucked by hand in the ripe or nearly ripe stages along with the fruit stalks at regular intervals (Fig. 3.4). The fruits are generally picked when they turn bright red colour. The number of pickings varies from 6-10 distributed over a period of 3-4 months.

Chilies being perishable in nature, they require more attention during harvest, storage and transportation. Harvesting should be done at the right stage of maturity, and it depends on the market need. Fully grown immature chilies are harvested for selling freshly harvested chilies (vegetable purposes) in local market. Fully mature red chilies are harvested for canning purpose. Fully matured ripe dry fruits are harvested for making powder.

Post-harvest operations :

The post-harvest operations involve primary processing of Byadgi chilies to obtain clean dried chilies with stem, and include operations like drying, grading, cleaning, packaging, transportation and preserving at a suitable place.

Drying :

Byadgi chilies on harvesting have moisture content of 65-80% (w.b.) depending on whether partially dried on the plant or harvested while still succulent. After each harvest, the pods are kept in heaps either indoor or in shade away from direct sun light for 2 or 3 days so as to develop uniform red colour (Fig. 3.5). They are then dried in the sun to retain the colour and reduce microbial growth by spreading them on clean dry polythene sheets / tarpaulin sheets / cemented / concrete drying yards etc. (Fig. 3.6). Pods are spread out in thin layers for uniform drying with frequent stirring to prevent mould growth and discoloration. The dried pods are heaped and covered by clean gunny bags / polythene sheets. The moisture content of dry pods is kept at 8-10%. Byadgi Kaddi and Byadagi Dabbi and its variants with high colour value coupled with 10-11% moisture level gets premium price. Drying by this conventional sun drying procedure takes 5-15 days depending on prevailing weather. Out of 100 kg of fresh fruits, 25-35 kg of dried fruits may be obtained.



Fig. 5. Byadgi chilies after harvest at the farm



Fig. 6. Solar drying

Fresh produce dried on open spaces like roadsides remain exposed to weather for the entire drying period (5-15 days), and may cause contamination with dust and dirt, damaged by rainfall, animals, birds and insects. The losses may range from 70 to 80% of total quantity. Poor handling of fruits results in bruising and splitting. Bruising causes discolored spots on pods, splitting leads to an excessive amount of loose seeds in a consignment. Improved drying system could be used to ensure cleanliness and uniform colour of the product.

The resulting end product will have a 10% increase in colour value when compared to the conventionally processed raw material. The raw material is washed, size reduced, dried in the fluid bed drier and then de-seeded. The contact time in the drier is less than 15 minutes, and the entire operation is automated. All the machineries are interlocked and the manpower requirements are marginal. High pressure steam is used as the heating medium and the plant is engineered to ensure high thermal efficiency. The facility can be set up at a cost of approximately Rs. 2.5 crore for a 20 MT/day fresh red Byadgi chili processing unit. The unit can provide direct employment to 30 people and indirectly benefit a large number of farmers ensuring fair price for the produce.

Grading :

The cleaned and well dried chilies need to be graded to gain a premium price for high quality packaged products. Byadgi chili is graded at the farmers' level, regulated market, traders' level and users' level. Sorting of Byadgi chilies at farmers' level is carried out by hand, where discolored, white and spoiled chilies are sorted out at the time drying before bringing it to markets. The damaged, discolored and immature pods are removed depending on market demand (Fig. 3.8). At the regulated market, Byadgi chilies are further graded on the basis of size, colour, taste, etc. Deep and bright red colour chilies and chilies with low seed content, generally fetch premium price. As regard to size and shape, it depends on individual interest.

At the traders level, the other important quality parameters considered for grading are moisture and stalks. Excessive moisture adds weight to the pods and gives room to various fungi to grow. Similarly, if the stalk of the pods is broken, it exposes the seeds, and the seeds may fall out. On the other hand, in absence of optimum moisture the pods may break and let off the seeds. Thus, the seed and pod ratio in a lot is also a valuable parameter of grade. Specifications of the Byadgi chili sold by a trader are shown in Table 1.2. Apart from the apparent characters of colour, size, moisture and stalk of the pods, the features like, seed and fruit (pod) ratio, seed size and hardness, thickness of the skin of the pod, and pungency have weightage in grading chilies.

End users are mainly of two types - domestic retail users and industrial wholesale users. Industrial wholesale users who prepare chili powder gives preference for colour, pungency, fresh skin and less seeds. The domestic retail users prefer Byadgi variety for different occasions. There are several local and conventional grades followed by the farmers, village merchants and itinerant merchants. The visual assessment of grades the traders by seeing the lots / heaps, picking hand full of pods, analyzing them and assessing the prices is a most common method of grading followed both in open and closed auctions. The price of Byadgi chili is usually decided through tender.

Cleaning :

Dried chilies are cleaned to remove sand, small stones, dust particles, leaf, seeds, stems, broken pods. Vibratory sieves and rotary centrifugal screens are used for cleaning.

Packaging :

Packaging of Byadgi chilly is done to protect it from any damage during storage, transportation and other marketing aspects. Good packaging is essential to facilitate convenience in transportation and storage, and it also enhances the market price of chillies. Packaging is required at every stage of marketing from producer to consumer.

At the producers' level, Byadgi chillies are packed in jute gunny bags (Fig. 1.9). The capacity of gunny bags is generally 20-100 kg. Farmers use old gunny bags to pack chillies before selling. Only the exporters repack them in good new gunny bags and sometime in the gunny bags with polythene liner inside. Byadgi chillies are also packed in polythene bags and cartoons. Fig. 3.9. Packaging chillies in gunny bags at producers' level and wholesaler packing in 3000 gauge low density polyethylene film pouches are done for 100 g consumer unit packs to give a shelf life of 3 to 6 months (Fig. 1.10). Under tropical conditions, 200 gauge low and high density polyethylene films are suitable for packing of whole chilly in units of 250 g. each. Such packs can be stored at a cool, dark, dry place for about a year. Dried Byadgi chili is available in market in the packs of 5, 10, 15, 20, 25 and 40kg.



Fig. 7 Consumer pack of Byadgi chillies with stem

Transportation

Byadgi chillies are mainly transported in gunny bags (old or new). Transport of chillies is done in 2 phases, (i) from farm to assembling market and (ii) from assembling market to consuming markets / places. In the first phase, the producers and village/ itinerant merchants are involved, and in the second phase wholesalers and processors are involved. Head loads, cartloads, tractor trolley and truck loads are generally used depending on the economic status and land holdings by the chilly producers in the area (Fig. 3.11). In case of dispatches from the markets, trucks are the main transport vehicles.

Storage

It is very important to store the harvested chillies at proper place to maintain the pungency and red colour. The cold storage units with vapour compression refrigeration system maintained at a low temperature of 4-6°C and 60-70% RH has been found to retain the colour and purity of Byadgi chillies for 8-10 months. Storing chillies for longer period may lead to deterioration. Storing in cold storage units has also increased the oleoresin extracted from chilly by about 30-40%. Dunnage should be provided to stack the packed bags to prevent moisture ingress from the floor. Care should be taken to stack the bags at 50-60 cm away from the wall. Insects, rodents and other animals should be effectively prevented from getting access to the premises where chilly is stored.

The dried chillies are stored in markets with the commission agents in their shops for 5-30 days. The farmers also store chili in their houses for about 5-15 days. The chillies are mostly stored in gunny bags by the producers, wholesaler and exporters for a period of 1-6 months depending upon the market conditions.

Marketing

The marketing of chillies include the following points:

Following are the marketing channels through which Byadgi chillies are marketed:

Channel 1: Producer → Village Merchant → Middle Men → Commission agent → Wholesaler → Retailer → Consumer

Channel 2: Producer → Retailer → Consumer

Channel 3: Producer → Pre harvest contractor → Wholesaler → Retailer → Consumer

Channel 4: Producer → Commission agent/ Wholesaler → Retailer → Consumer

Channel 5: Producer → Commission agent → Retailer → Consumer

Suggestion:

- Adoption of Hi-tech processing
- Technology and Process Up gradation in processing units
- Upgrade/establish quality facilities/procedures
- Packaging development and Bar coding
- Sending business samples abroad
- Trade promotion tours
- Brochure printing
- Participation in international fairs/seminars

Conclusion:

Byadgi chili is mainly consumed as ground spice powder in cuisine. In production of pickles, masala products and chili powder, Byadgi chili is preferred as it allows to bring out the best colour naturally and at the same time, avoid their products being too pungent for consumption. The Byadgi chili is also very useful due to its bright red colour, and is used as coloring agent. Byadgi chili is heavily used in extraction of oil called, oleoresin. Oleoresin is concentrated form of the spice consisting of the volatile essential oil and the non-volatile resinous fraction representing the flavor and taste of the spice. They are obtained mainly by solvent extraction from the spice. About 50 L of oleoresin can be extracted from about 1 MT of chilies. The oleoresin is used as coloring agent in production of cheese, sauces, spice mixtures, and to deepen the colour of egg yolks. It is also used in confectioneries, cosmetic industry, beverage industry for toning of fresh wine, meat industry, pharmaceutical industry, poultry and cattle feed industry and as a dye in textile industry. The demand for Byadgi chili is increasing enormously due to its application as natural red colour in food industry. The oleoresin manufacturers in the international (Sri Lanka, Bangladesh, America, Europe, Nepal, Indonesia, Mexico) market are using Byadgi chilies as a substitute for paprika. The traders of Byadgi chili are mainly supplying Byadgi chili to the leading exporters located at Cochin (Kerala), Tamil Nadu, West Bengal and in turn, after value addition, product like Paprika Oleoresin is exported.

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