MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

सत्यमेव जयते

PM Formalization of

Micro Food Processing Enterprises (PMFME) Scheme

HANDBOOK

FOR

BYADGI CHILLI PROCESSING

AATMANIRBHAR BHARAT

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ABBREVIATIONS & ACRONYMS

Sr: No.	Abbreviations &Acronyms	Full Forms
1.	Al	Aluminium
2.	BOPP	Biaxially Oriented Polyproplene
3.	FPOs	Farmer Producer Organizations
4.	FIB	Flexible Intermediate Bulk Containers
5.	FSS	Food Safety and Standards
6.	FSSAI	Food Safety and Standards Authority of India
7.	FoScoS	Food Safety Compliance System
8.	GST	Goods and Services Tax
9.	HCL	Hydrogen Chloride
10.	HDPE	High-density polyethylene
11.	MoFPI	Ministry of Food Processing Industries
12.	LDPE	Low- density polyethylene
13.	MET	Metalized Polyester
14.	PA	Polyamide
15.	PET	Polyesters
16.	PE	Polyethene
17.	PP	Polypropylene
18.	SHGs	Self Help Groups

CHAPTER 1
INTRODUCTION

Chilli (*Capsicum annuum* L., *Capsicum frutescene* L.) is also called red pepper, and it belongs to the genus capsicum, under the solanaceae family. More than 400 different varieties of chillies are found all over the world, and they are referred to as chillies, chile, hot peppers, bell peppers, red peppers, pod peppers, cayenne peppers, paprika, pimento, and capsicum in different parts of the world.

Dried chilli constitutes a major share of consumption among the spices. Chillies are red in colour due to the presence of the pigment 'capsanthin'. Chillies have the biting pungency due to the alkaloid, 'capsaicin' present in the pericarp and placenta of fruit. Chillies are rich in vitamins (especially vitamin A and C), potassium, magnesium and iron. Chillies are used for pain relief, and they have the power to boost immune system, lower cholesterol, and helpful in getting rid of parasites of gut.

India is the leading producer and exporter of chilli in the world with the production of over 1 million MT in 2018. The major chilli producing states in India are, Telangana, Karnataka, Madhya Pradesh, Orissa, Gujarat, Assam, Punjab, Rajastan, Uttar Pradesh and Mizoram. Telangana contribute to about 33% of total chilli production in India. Kashmiri, Guntur, Jwala, Byadgi, Boria, Sankeshwar, Naga & Bhut Jolokia, Mathania, Bhavnagri, Kanthari, Longi, Ramnad Mundu and Fhani are the important varieties of chilli grown in India.

1.1 Byadgi chilli

Byadgi (or Byadagi) chilli is a famous variety of chilli grown in Karnataka state. It is named after the town, Byadgi, which is Taluk (*tehsil*) headquarter in the Haveri district of Karnataka. Byadagi chilli is a long (12-15 cm) and thin, bright red variety of chilli characterised by wrinkles on the pods (Fig. 1.1). Byadgi chillies are famous for its aroma and deep red colour. Bydagi chillies have the highest colour values of 150000 to 250000 CU (Colour Units) or 80-130 ASTA colour units. Bydagi chillies have mild pungency and moderate seed content. The capsaicin (which gives hot and spicy kick to chillies) content of Byadgi chillies varies from 0.8 to 1.3%, and pungency varies in the range of 8000-15000

SHU (Scoville Heat Units). Byadgi chillies have been tagged with Geographical Indication (GI application No. 129) product of Karnataka.

Fig. 1.1. Matured and dried Byadgi chillies

In Karnataka, Bydagi chilli is grown in Dharwad, Gadag and Haveri districts under rainfed conditions. The yield of chillies in these districts is 0.5-1.25 MT/ha. Other districts like Bellary, Raichur and Gulbarga where Guntur variety chillies used to be grown, have shifted to growing Byadgi variety as it has higher oleoresin 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.

1.2 Varieties of Byadgi chilli

The Byadagi chilli plant grows to a height of 1 m with a spread of 1 m. 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. There are two main varieties of Byadgi chillies grown. They are, Byadgi Kaddi and Byadgi Dabbi.

The Byadagi Kaddi (*Capsicum annum* Linn var. *Acuminatum Fing*) has a length of 10-15 cm with negligible pungency (Fig. 1.2). It is slender, linear, light green in colour, and the colour turn to deep red at maturity and develops the characteristic wrinkles at the ripening stage. This variety possesses the highest colour value. It has its calyx covering its pod, and is reasonably resistant to pests and diseases.

The Byadagi Dabbi is suitable for green chilli and dry chilli purpose. The fruits are of medium length (8-10 cm), a little curved at the apex and slightly bulged at the base of the calyx (Fig. 1.3). The quality parameters for the Byadgi Dabbi match with Byadagi Kaddi variety. This variety is more susceptible to pests and diseases.

Fig. 1.2. Byadgi Kaddi

Fig. 1.3. Byadgi Dabbi

The Dyavanur Delux is a variant of recent origin of Byadagi Dabbi, and might have been selected from Dyavanur Dabbi. The fruits are similar to Dyavanur Dabbi, but the size of the fruit is a little bigger and more bulged at the calyx. The fruit length ranges from 10 to 12 cm. 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, Dyavanur Delux has the high demand in market.

Noolvi Dabbi, Kubhsi Dabbi, Antur Bentur Dabbi are some of the variants which are similar in their quality parameters including pungency and colour values. Recently, a hybrid variety, Sarpan Byadgi hybrid chilli has been released which is pest and disease resistant, and can withstand low as well as high rainfall. The yield of this variety is 6.25-8.75 MT/ha under rainfed conditions, and it flowers and bears fruit earlier than other varieties.

Plant and quality characters of the main varieties of Byadgi chilli are presented in Table 1.1.

Table 1.1: Plant and quality characters of the main varieties of Byadgi chilli

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

1.3 Soil and climate

The Byadgi chilli crop requires a warm and humid climate during the growing period and dry weather during the period of maturation of fruits. Byadgi chilli 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. Byadgi chilli can be grown in tropics and sub tropical regions receiving 500-800 mm annual rainfall. The ideal temperature requirement is 20-38ºC with warm humid conditions which improve the growth while dry conditions enhance maturity.

1.4 Sowing methods

Transplanting is the most common method of sowing Byadgi chillies 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 chilli

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.

1.5 Harvesting

The flowering of Byadgi chilli 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 chillies at 50 and 70 days of transplanting. On an average, Byadgi chilli produces about 200 flowers per plant.

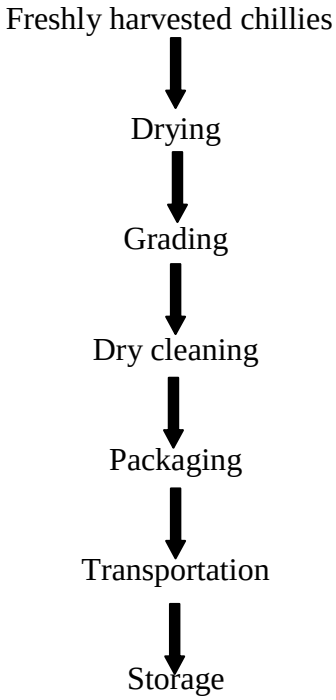
Harvesting season for Byadgi chillies starts from November to January. The fruits are plucked by hand in the ripe or nearly ripe stages along with the fruit stalks at regular intervals (Fig. 1.4). The fruits are generally picked when they turn bright red colour. The number of pickings varies from 6-10 distributed over a period of 3-4 months.

Chillies 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 chillies are harvested for selling freshly harvested chillies (vegetable purposes) in local market. Fully mature red chillies are harvested for canning purpose. Fully matured ripe dry fruits are harvested for making powder.

Fig. 1.4. Harvesting of Byadgi chillies

1.6 Post-harvest operations

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



Post-harvest operations of Byadgi chillies

1.6.1 Drying

Byadgi chillies 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. 1.5). 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. 1.6). Pods are spread out in thin layers for uniform drying with frequent stirring to prevent mould growth and discolouration. 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. 1.5. Byadgi chillies after harvest at the farm

Fig. 1.6. 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 discoloured 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.

Improved CFTRI method

CSIR-Central Food Technology Research Institute (CFTRI), Mysore has developed a four - tier system of wire-mesh trays or a single tray of perforated aluminium. Solar drying of chilli fruits in these trays takes 14 days to dry the fruits having a moisture content of 72-74% to reduce it to about 6% as against 3 weeks required for reducing the moisture content to 15-20% by conventional solar drying method. .

Drying in solar tunnel dryer

Drying Byadgi chillies from the initial moisture content of 77% to 9% in a solar tunnel dryer (Fig. 1.7) at 56ºC temperature required 39 hours as against the 57 hours required for open yard solar drying at 37ºC. The solar tunnel dried samples had less aflatoxin content as compared to open yard solar dried samples.

NIIST method

The Byadgi Chilli, which is known for its high colour is currently processed in the traditional manner which result in loss of carotenoids during the sun drying operation. CSIR-National Institute of Interdisciplinary Science and Technology (NIIST), Thiruvanthapuram, Kerala has

developed a process that employs a fluid bed drier for bringing down the moisture to acceptable levels of fresh chilli hygienically.

Fig. 1.7. Solar tunnel drying of chillies

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 Byadagi chilli 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.

1.6.2 Grading

The cleaned and well dried chillies need to be graded to gain a premium price for high quality packaged products. Byadgi chilli is graded at the farmers' level, regulated market, traders' level and users' level.

Sorting of Byadgi chillies at farmers' level is carried out by hand, where discoloured, white and spoiled chillies are sorted out at the time drying before bringing it to markets. The

damaged, discoloured and immature pods are removed depending on market demand (Fig. 1.8).

Fig. 1.8. Hand sorting of Byadgi chillies at farmers' level

At the regulated market, Byadgi chillies are further graded on the basis of size, colour, taste, etc. Deep and bright red colour chillies and chillies 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 chilli 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 chillies.

End users are mainly of two types - domestic retail users and industrial wholesale users. Industrial wholesale users who prepare chilli 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 chilli is usually decided through tender.

Table 1.2: Specifications of Byadgi chilli

Product Name	Byadgi chilli
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 cm max
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

1.6.3 Cleaning

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

1.6.4 Packaging

Packaging of Byadgi chilli 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. 1.9. 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 chilli in units of 250 g. each. Such packs can be stored at a cool, dark, dry place for about a year. Dried Byadgi chilli is available in market in the packs of 5, 10, 15, 20, 25 and 40 kg.

Fig. 1.10. Consumer pack of Byadgi chillies with stem

1.6.5 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 chilli producers in the area (Fig. 1.11). In case of dispatches from the markets, trucks are the main transport vehicles.

Fig. 11. Transportation of Byadgi chillies in gunny bags as truck load.

1.6.6 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 4-6ºC 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 chilli 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 chilli is stored.

The dried chillies are stored in markets with the commission agents in their shops for 5-30 days. The farmers also store chilli 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.

1.7 Marketing

The marketing of chillies include the following points:

Supply freshly harvested chillies to the local market on the basis of market requirement.

For red chilli production, it is a good idea to contact a nearby chilli powder maker or industry for the bulk sale.

Dry chilli production is more profitable farming over the green because there is always great market demand for it. Producers can really make a big one from it.

Byadgi chillies arrive into markets mostly packed in gunny bags of 30-40 kg. Farmers dry the chillies and store them in gunny bags.

Dried Byadgi chillies are sold in market in different forms like Byadgi chilli with stem, Byadgi chilli without stem, crushed dried red chilli flakes and dried red chilli powder. Byadagi chilli reaches the global market in various forms like dried whole chilli (with and without stem), chilli powder (ground and crushed), chilli paste, chilly chutney and chilli seeds. It is also much sought-after in the oleoresin industry and the oleoresin extracted from it is used in the preparation of food and cosmetic products.

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

1.8 Inspection

Spices Board has implemented the scheme of mandatory sampling and testing for chillies and chilli products exported from India for Sudan dye and aflatoxin. Samples from all over India are collected by authorized sampling agencies / officials of Spices Board, and sent to Quality Evaluation Laboratory at Kochi. Samples are analysed and analytical test reports are issued within 24 hours of sample reaching the laboratory

1.9 Uses of Byadgi chillies

Byadgi chilli is mainly consumed as ground spice powder in cuisine. In production of pickles, masala products and chilli powder, Byadgi chilli 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 Byadagi chilli is also very useful due to its bright red colour, and is used as colouring agent. Byadgi chilli 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 flavour 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 chillies. The oleoresin is used as colouring 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 chilli 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 chillies as a substitute for paprika. The traders of Byadgi chilli are mainly supplying Byadgi chilli to the leading exporters located at Cochin (Kerala), Tamil Nadu, West Bengal and in turn, after value addition, product like Paprika Oleoresin is exported.

CHAPTER 2
PROCESSING AND MACHINERY

Byadgi chilli with stem, Byadgi chilli without stem, crushed dried red chilli flakes, dried red chilli powder, chilli paste, chilli chutney, chilli seeds and chilli oil (oleoresin) are the various processed products of Byadgi chillies. The clean and dried Byadgi chillies with stem obtained after primary processing is used as the raw material for the production of all the products.

2.1 Byadgi chilli without stem

Stems of the clean dry Byadgi chillis are cut either manually using knife or mechanically in a chilli stem cutting machine (Fig. 2.1). The chilly stem cutting machine consists of a rotary hollow cylindrical drum with holes on the outer surface. The dry chillies when fed through the hopper, flows into the drum. As the chillies flow inside the drum, the rotation of drum makes the stem to enter into the holes. The stems projecting through the holes are cut using a blade. The dried chillies without stem flow out through the other end of the drum. Output capacity of the machine depends on the retention time of chillies in the drum and the rotary speed of the drum. The stem cutting efficiency varies in the range of 90-95% at the optimum operating conditions.

Byadgi chillies without stem are used for making chilli powder, paste, chutney and flakes.

Fig. 2.1. Chilli stem cutting machine, its working components and chillies without stem

2.2 Crushed dried red chilli flakes

The clean dry Byadgi chillies are first roasted for 1-2 minutes till they turn into slightly brown colour and give off an aroma. Usually roasting is done in a thick-bottomed pan on low

flame or in various types of ovens. The roasted chillies are cooled to room temperature. The chillies are then ground in spice grinder or a small hammer mill to get coarse flakes (Fig. 2.2). The size of flakes obtained depends on the duration of grinding. The flakes are blown into the cyclone separator and collected. The chilli flakes are packed in printed flexible pouches, pouch in mono-carton boxes, high density polyethylene and Saran / Cello / Saran poly laminate pouches, and composite, plastic and glass jars.

Clean dry Byadgi chillies

↓

Roasting

↓

Cooling

↓

Grinding

↓

Packaging

Production of crushed dried red chilli flakes

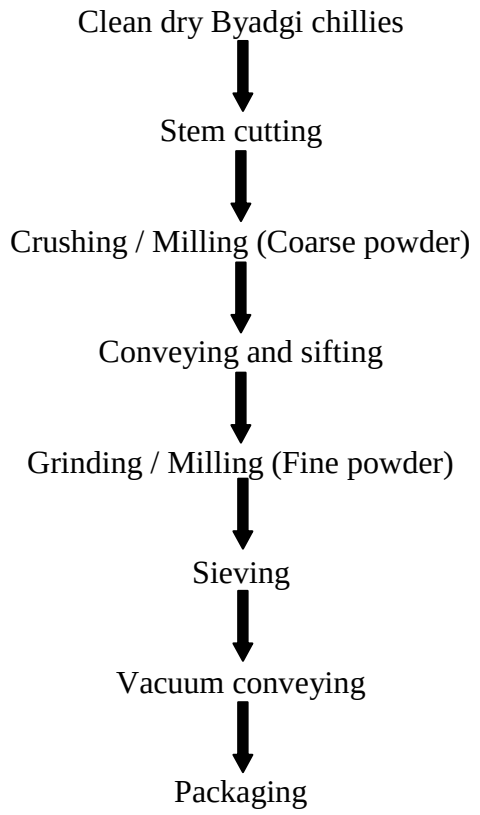
The chilli flakes are widely used in the preparation of snacks, seasoning of pizzas and casseroles, and sometimes used for garnishing (10-30 mesh size). . .

Fig. 2.2. Hammer mill and chilli flakes

2.3 Dried red chilli powder

The stems of the clean dry Byadgi chillies are cut using the chilli stem cutting machine or using a knife. Use of stem cutting machine generally reduces time and labour costs. The process of milling is commonly also known as grinding process. Hammer mill is commonly used for grinding. Either the crushed material is passed 2-3 times through the small hammer mills with centrifugal blowers, cyclone separator and sifting machine along with lump breaker between the hammer mills (Fig. 2.2), or a large hammer mill is used to obtain the fine chilli powder (Fig. 2.3). Electric motor operated kandap machine which work on the principle of traditional pounding of chillies is used obtain the chilli powder with traditional aroma and quality.

Sieving is done in Centrifugal sifter with fine mesh. The internal shaft with rubber blades rotate to break the lumps along with it passing through desired size of fine mesh to get smooth fine chilli powder.



Production of dried red chilli powder

The fine red chilli powder is conveyed from one place to another within the premises using vacuum conveyor. Red chilli powder with moisture content of less than 8% is for safe storage. The chilli powder is packed in printed flexible pouches, pouch in mono-carton boxes,

high density polyethylene and Saran / Cello / Saran poly laminate pouches, and composite, plastic and glass jars.

Fig. 2.3. Hammer mill for the production of chilli powder

Fig. 2.4 . Kandap machine and Byadgi chilli powder in plastic jar

Table 2.1: Nutrition value (per 100 grams approximately) of Byadgi chilli powder

Protein	16.75 g	Sodium	1.23 g
Total fat	13.07 g	Salt	2 g
Total carbohydrate	39.73 g	Energy	343.55 k cal

2.4 Byadgi chilli paste

The clean dry Byadgi chillies without stems are soaked in hot water for about 30-45 minutes. The softened chillies are blended with vinegar and water to prepare the paste. Hot oil is poured and mixed with the paste. The paste is packed in glass jars or printed flexible pouches (Fig. 2.5). The paste is suitable for consumption within one month if preserved under refrigerated conditions. Chilli paste is used in soups and sandwiches to add extra heat and flavour.

Clean dry Byadgi chillies

↓

Stem cutting

↓

Soaking in hot water

↓

Blending with vinegar and water

↓

Addition of hot oil and mixing

↓

Packaging

Production of chilli paste

Fig. 2.5. Red chilli paste

2.5 Byadgi chilli chutney (Ranjka)

The clean dry Byadgi chillies without stems are soaked in hot water for about 30-45 minutes. The softened chillies are blended with jeera seeds, tamarind, jaggery, salt and crushed garlic to prepare the chutney (Fig. 2.6). Hot oil along with spluttered mustard seeds and asafoetida

is poured and mixed with the chutney (Fig. 2.6). The chutney is packed in glass jars. The chutney is suitable for consumption within one month if preserved under refrigerated conditions. Byadgi chilli chutney is used in regular breakfast and meals.

2.6 Chilli seeds

The chilli seeds (Fig. 2.7) can be obtained from the clean dry Byadgi chillies without stem using chilli deseeding machine. The machine has the blades and sieves. The blades cut the chilli into pieces and pass them to the vibrating sieves. The chilli seeds pass through the sieves and fall to the bottom. The chilli pulp is sent to the next processing (oleoresin extraction) plant using belt conveyor. The chilli seeds can be directly packed. The chilli seeds are the best source of antioxidants. The consumption chilli seeds stimulates digesting system, lowers cholesterol level and help in losing weight

Fig. 2.6. Byadgi chilli chutney (Ranjka)

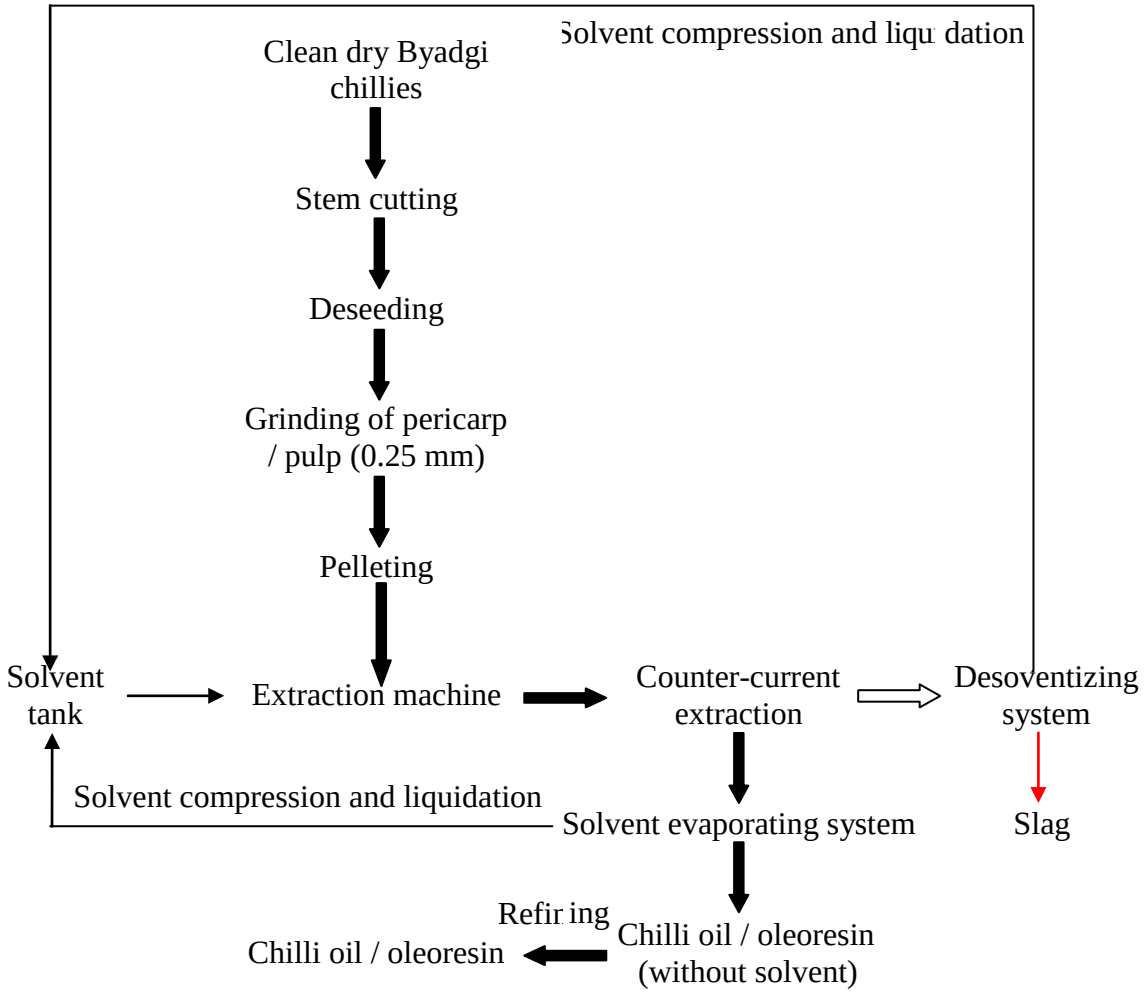
Fig. 2.7. Byadgi chilli seeds

2.7 Byadgi chilli oil (oleoresin)

Oleoresin is obtained by solvent extraction of pericarp (skin of chilli) or pulp. The oleoresin contains a major pungency principle, capsaicin and colouring principles of capsanthin and capsorubin.

The stems of the clean dry Byadgi chillies are removed and deseeded. The pericarp or pulp of the chillies are ground to the size of 0.25 mm. Pellets are prepared from the powder. The chilli oil or oleoresin is extracted in a solvent extraction machine. The main solvent used is liquid propane / butane / dimethyl ether / R134a / liquid ammonia. After the extraction, the solvent is removed. The chilli oil or oleoresin is red viscous liquid with characteristic chilli odour.

The equipment required for solvent extraction are, cabinet dryer, hammer mill, oscillator granulator, sigma mixer, screw elevator, condenser, desolventiser, steam generator, dacetone distillation unit. The oleoresin yield of around 15% of the total pulp weight can be obtained by solvent extraction method.



Extraction of chilli oil / oleoresin from Byadgi chilli pericarp / pulp

Techniques like use of super critical carbon dioxide and enzymes like Pectinases, Cellulases Hemicellulases and Xylanases which help in break open the cell wall, has also been studied with a view to increase the extraction of colour and oleoresin out of the chilli powder. The enzymatic method increased the colour value by 15000 CU and capsaicin content by 0.79-0.82% under optimized conditions.

The oleoresin can be used to obtain deep red colour in any food that has a liquid / fat phase. The typical use levels are in the range of 10-60 mg/kg of finished food, calculated as pure colouring matter.

2.8 Quality Analysis

2.8.1 FSSAI standard for quality analysis

As per the required standards specified by FSSAI for dry chillies and chilli powder, the following characteristics should be analysed:

Characteristics	Method of Test
Extraneous matter	4 of IS: 1797-1985
Total ash	6 of IS: 1797-1985
Acid insoluble ash	8 of IS: 1797-1985
Moisture content	9 of IS: 1797-1985
Crude fibre	13 of IS: 1797-1985
Non-volatile ether extract	14 of IS: 1797-1985
Volatile oil	15 of IS: 1797-1985
Salmonella	IS 5887 (Part 3)
Unripe and marked chilli fruits	Physical separation and weighing
Broken fruits, seed & fragments	Physical separation and weighing
Insect damaged matter	Physical separation and weighing

Brief procedure

Preparation of sample for chemical analysis

The sample is ground to make it pass through IS Sieve of size 1 mm. The sample after grinding is transferred to a clean, dry air-tight container, and should be immediately closed.

Extraneous matter

All mailer of vegetable or mineral origin foreign to the material being examined, that is, foreign to the principal spice shall be regarded as extraneous matter.

Total Ash

The portion obtained after complete combustion of the sample. It indicates the amount of essential minerals (acid soluble) and acid insoluble portion (sand and silica).

Acid insoluble ash

It represents the amount of sand and silica in the sample that is insoluble in acid.

Moisture content

The water content of the sample is analysed by distilling it by an organic liquid, followed by the collection of the distillate.

Crude fibre

It is the residue of plant materials remaining after solvent extraction followed by digestion with dilute acid and alkali.

Non-volatile ether extract

It is a qualitative measure of the flavour component in a spice that is not volatile and is present as fixed oil.

Volatile oil

Clevenger-type with joints is used for determining volatile oil

Salmonella

Selective enrichment-based test as specified by IS 5887: Part 3: 1997 (Methods for detection of bacteria responsible for food poisoning: Part 3 general guidance on methods for the detection of salmonella (Second Revision))

2.8.2 Qualitative assessments of the finished products

According to the FSSAI Food Safety Standards (Food Products Standards & Food Additives) Regulation, 2011 following are the standards which are to be adhered:

Dried Byadgi chilli fruit

1. The pods shall be free from mould, living and dead insects, insect fragments, rodent contamination.
2. The product shall be free from extraneous colouring matter, coating of mineral oil and other harmful substances.
3. It shall conform to the following standards:

4.	Extraneous matter	Not more than 1.0 percent by weight
5.	Unripe and marked fruits	Not more than 2.0 percent by weight
6.	Broken fruits, seed & fragments	Not more than 5.0 percent by weight
7.	Moisture	Not more than 11.0 percent by weight
8.	Total ash on dry basis	Not more than 8.0 percent by weight
9.	Ash insoluble in dilute HCl on dry basis	Not more than 1.3 percent by weight
10.	Insect damaged matter	Not more than 1.0 percent by weight
11.	Microbiological parameter for dry chilli fruits Salmonella should be absent in 25 g sample.	

Byadgi chilli powder

1. It shall be free from mould, living and dead insects, insect fragments, rodent contamination.
2. The powder shall be dry, free from dirt, extraneous colouring matter, flavouring matter, mineral oil and other harmful substances.
3. The chilli powder may contain any edible vegetable oil to a maximum limit of 2.0 percent by weight under a label declaration for the amount and nature of oil used.
4. It shall conform to the following standards:

(i)	Moisture	Not more than 11.0 percent by weight
(ii)	Total ash on dry basis	Not more than 8.0 percent by weight
(iii)	Ash insoluble in dilute HCl on dry basis	Not more than 1.3 percent by weight
(iv)	Crude fibre	Not more than 30.0 percent by weight
(v)	Non-volatile ether extract on dry basis	Not less than 12.0 percent by weight

CHAPTER 3
PACKAGING AND LABELLING

3.1 Deteriorating factors

In order to select a suitable packaging material / type of package, it is essential to know the factors which affect the quality of dried Byadgi chillies / Byadgi chilli powder

3.1.1 Moisture content

Dried chilli fruits and chilli powder are hygroscopic in nature and picks-up moisture from the atmosphere resulting in sogginess and caking/ lumping of the powder. Pick-up of moisture also results in loss of free-flowing nature of the chilli powder.

1. Loss of aroma / flavour

Dried Byadgi chilli fruits and powder contains volatile oils, which impart the characteristic aroma/flavour to the product. Losses in the volatile oil content or oxidation of some aromatic compounds result in aroma and flavour loss.

2. Discolouration

Dried Byadgi chilli fruits and powder contain natural pigments. Light can affect the pigments resulting in loss or fading of colour and deterioration.

3. Insect infestation

Dried Byadgi chilli fruits and powder is prone to spoilage due to insect infestation, which can be further accelerated due to high humidity, heat and oxygen.

4. Microbial contamination

In high humidity condition of 65% and above, moisture absorption occurs. Beyond a certain level of moisture content, spoilage due to microbial growth sets in.

3.2 Packaging requirements of dried Byadgi chilli fruits and powder

In order to maintain the quality of the dried Byadgi chilli fruits and powder during handling, transportation, storage and distribution, the packaging material to be used is to be selected with care, keeping in mind the functional as well as the marketing requirements

The packaging requirements for dried Byadgi chilli fruits and powder, in general, are listed below:

1. To protect the product from spillage and spoilage.
2. To provide protection against atmospheric factors such as light, heat, humidity and oxygen. The selected packaging materials should have high water vapour and oxygen barriers.
3. The packaging material should have a high barrier property to prevent aroma/flavour losses and ingress of external odour.
4. The volatile oil present in the spice product has a tendency to react with the inner/ contact layer of the packaging material, at times leading to a greasy and messy package with smudging of the printed matter. The packaging material should therefore be grease and oil resistant and compatible with the product.
5. Besides the above functional requirements, the packaging material should have good machinability, printability and it should be easily available and disposable.

3.3 Packaging materials for dried Byadgi chilli fruits and powder

Bulk packaging

In bulk packaging, the current trend is to use Flexible Intermediate Bulk Containers (FIBCs) commonly known as Jumbo bags. These bags have a capacity of up to 1 MT. In general, these bags are made from cloth, but at present mainly from plastic (PP) fabric, which can be laminated or provided with an inner plastic liner bag. The PP fabric is stabilized against UV degradation. The bags are provided with filling and discharge spouts and slings for hanging during loading/ unloading operations.

The FIBCs offer various advantages such as:

1. Bags are flexible, collapsible and durable
2. Can be used for packaging of granules, powder, flakes and any free flowing material
3. Product wastage / spillage and tampering can be avoided
4. Since the handling is mechanised, less labour is required
5. Saving in time for loading and unloading
6. Bags are light in weight and, therefore, freight costs are reduced

Institutional packages

Institutional packs of capacities ranging from 2-10 kg are also used. The traditional materials that were used such as tinplate containers and jute bags are currently being replaced by materials such as laminated flexible pouches and plastic woven sacks. The sacks are usually

BOPP multi-color Printed laminated PP Woven bags. These bags may be gussetted and have window and micro perforation.

Consumer packages

The options available to the traders / exporters of dried Byadgi chilli fruits and powder in the selection of a consumer pack for domestic and export market are quite wide. However, the selection / choice of the packaging material / system depend upon a number of factors, which are broadly listed below:

7. Shelf-life period i.e., the degree of protection required by the product against moisture pick-up, aroma retention, discolouration etc. (this is more critical in case of Byadgi chilli powder)
8. Climatic conditions during storage, transportation and distribution
9. Type/ sector of market
10. Consumer preferences
11. Printability and aesthetic appeal

The package types generally used as consumer packs are:

12. Glass bottles of various sizes and shapes with labels and provided with metal or plastic caps. The plastic caps have added inbuilt features of tamper evidence, dispensing, grinding etc.
13. Printed tinplate container with/without dispensing systems
14. Composite containers with dispensers
15. Plastic containers with plugs and caps with dispensing and tamper evidence features
16. Printed flexible pouches – pillow pouch, gusseted pouch, stand-up pouch.
17. Lined cartons

The printed flexible pouches have recently become very popular due to their easy availability, excellent printability, light weight, machinability and cost-effectiveness. Depending upon the functional and marketing requirements, the laminate / film can also be tailor made to serve a specific need.

The printed flexible pouches are generally laminates of various compositions. Some of the commonly used laminates are:

18. Polyester / metallised polyester/LDPE
19. BOPP / LDPE
20. BOPP / metallised polyester/LDPE
21. Polyester / Al foil / LDPE

3 ply laminates such as 12µ PET / Print / 12µ Met. PET / PE can avoid delamination and prevents smudging and de-figuring of the print.

Polyester and BOPP based laminates are generally more popular for spice packaging due to certain advantageous characteristics of each of these two films.

Polyester used for lamination is generally 10 or 12µthick. The film is highly transparent with excellent clarity, gloss and printability thus enhancing the sales appeal. The film has very low moisture and gas permeability and, therefore, ensures prolonged shelf life of the contents with aroma, flavour and taste retention. The very high mechanical strength (tear, puncture, burst and flex) minimises damage to the contents during handling and transportation. The film has good machinability as well as printability. The latest printing technologies help in improving sales promotions. The film is free from additives and, therefore, does not impart any odour or taint to the sensitive spice product that is packed.

BOPP films may be heat sealable or non heat sealable. The film has high yields, is stable under climatic changes and has excellent moisture barrier. This film is smooth, glossy, crystal clear and has high mechanical strength and non-contamination property for food contact applications.

Table 3.1 shows the packaging specifications for flexible packs of whole and ground consumer spices, framed by the Indian Institute of Packaging. Laminates / Co-extruded films (up to 500 grams capacity)

Table 3.1: Packaging specifications for flexible packs of dried Byadgi chilli fruits and powder

Laminates / Co-extruded films (up to 500 grams capacity)	**Laminates / Co-extruded films (up to 1000 grams capacity)**
50µ HD – LD	50µ HD – LD 62.5µ HD – LD
50µ HD – LD – HD	62.5µ HD – LD – HD
12µ PET / 37.5µ LD	12µ Polyester / 50µ LD
25µ BOPP / 37.5µ LD	25µ BOPP / 50µ LD
12µ PET / 37.5µ PP	12µ PET / 50µ PP
25µ LD – 7.5µ Tie – 25µ PA – 7.5µ Tie – 25µ LD	30µ LD – 7.5µ Tie – 25µ PA – 7.5µ Tie – 30µ LD
The LDPE Inner and Outer layerscould also be LLDPE or EAA or LD-HD	The LDPE Inner and Outer layers could also be LLDPE or EAA or LD-HD

Source: ICPE Packaging of Spices, Indian Centre for Plastic in the Environment

The types of sealing of pouches from flexible plastic based materials could be variable:

- Centre seal formation
- Three sides seal formation
- Four sides seal formation
- Strip pack formation

The vital link in the performance of the pouch is the seal integrity. The performance of the heat seal layer is very important. Even if the film structure has been designed with exceptional properties, with excellence in interlayer lamination, if the sealing of the pouch fails, the product may get contaminated and in some cases become unfit for consumption.

3.4 Labelling

General requirements for labelling

Every pre-packaged food shall carry a label containing information as required here under unless otherwise provided, namely,

1. The particulars of declaration required under these Regulations to be specified on the label shall be in English or Hindi in Devnagri script. Provided that nothing herein contained shall prevent the use of any other language in addition to the language required under this regulation.
2. Pre-packaged food shall not be described or presented on any label or in any labelling manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character in any respect
3. Label in pre-packaged foods shall be applied in such a manner that they will not become separated from the container
4. Contents on the label shall be clear, prominent, indelible and readily legible by the consumer under normal conditions of purchase and use
5. Where the container is covered by a wrapper, the wrapper shall carry the necessary information or the label on the container shall be readily legible through the outer wrapper and not obscured by it

License number shall be displayed on the principal display panel in the following format, namely:

Declaration regarding Food Additives-

i. For food additives falling in the respective classes and appearing in lists of food additives permitted for use in foods generally, the following class titles shall be used together with the specific names or recognized international numerical identifications:

Acidity Regulator, Acids, Anticaking Agent, Antifoaming Agent, Antioxidant, Bulking Agent, Colour, Colour Retention Agent, Emulsifier, Emulsifying Salt, Firming Agent, Flour Treatment Agent, Flavour Enhancer, Foaming Agent, Gelling Agent, Glazing Agent, Humectant, Preservative, Propellant, Raising Agent, Stabilizer, Sweetener, Thickener:

ii. Addition of colours and/or Flavours

a. Extraneous addition of colouring matter to be mentioned on the label – Where an extraneous colouring matter has been added to any article of food, there shall be displayed one of the following statements in capital letters, just beneath the list of the ingredients on the label attached to any package of food so coloured, namely:

CONTAINS PERMITTED NATURAL COLOUR(S)

OR

CONTAINS PERMITTED SYNTHETIC FOOD COLOUR(S)

OR

CONTAINS PERMITTED NATURAL AND SYNTHETIC FOOD COLOUR(S)

Provided that where such a statement is displayed along with the name or INS No. of the food colour, the colour used in the product need not be mentioned in the list of ingredients.

b. Extraneous addition of flavouring agents to be mentioned on the label.

Where an extraneous flavouring agent has been added to any article of food, there shall be written just beneath the list of ingredients on the label attached to any package of food so flavoured, a statement in capital letters as below:

CONTAINS ADDED FLAVOUR (specify type of flavouring agent as per Regulation 3.1.10(1) of Food Safety and Standards (Food product standards and food additive) Regulation, 2011

c. In case both colour and flavour are used in the product, one of the following combined statements in capital letters shall be displayed, just beneath the list of ingredients on the label attached to any package of food so coloured and flavoured, namely:

CONTAINS PERMITTED NATURAL COLOUR(S) AND ADDED FLAVOUR(S)

OR

CONTAINS PERMITTED SYNTHETIC FOOD COLOUR(S) AND ADDED FLAVOUR(S)

OR

CONTAINS PERMITTED NATURAL AND SYNTHETIC FOOD COLOUR(S) AND ADDED FLAVOUR(S)

Provided that in case of artificial flavouring substances, the label shall declare the common name of the flavours, but in case of the natural flavouring substances or nature identical flavouring substances, the class name of flavours shall be mentioned on the label and it shall comply with the requirement of label declaration as specified under the regulation 2.2.2(5)(ii).

Note: When statement regarding addition of colours and/or flavours is displayed on the label in accordance with regulation 2.2.2(5)(ii) and regulation 3.2.1 of Food Safety and Standards (Food Product Standards and Food Additive) Regulation, 2011, addition of such colours and/or flavours need not be mentioned in the list of ingredients. Also, in addition to above statement, the common name or

Name and complete address of the manufacturer

(i) The name and complete address of the manufacturer and the manufacturing unit if these are located at different places and in case the manufacturer is not the packer or bottler, the name and complete address of the packing or bottling unit as the case may be shall be declared on every package of food;

(ii) Where an article of food is manufactured or packed or bottled by a person or a company under the written authority of some other manufacturer or company, under his or its brand name, the label shall carry the name and complete address of the manufacturing or packing or bottling unit as the case may be, and also the name and complete address of the manufacturer or the company, for and on whose behalf, it is manufactured or packed or bottled;

(iii) Where an article of food is imported into India, the package of food shall also carry the name and complete address of the importer in India.

Provided further that where any food article manufactured outside India is packed or bottled in India, the package containing such food article shall also bear on the label, the name of the country of origin of the food article and the name and complete address of the importer and the premises of packing or bottling in India.

Net quantity

i. Net quantity by weight or volume or number, as the case may be, shall be declared on every package of food; and

ii. In addition to the declaration of net quantity, a food packed in a liquid medium shall carry a declaration of the drained weight of the food.

Explanation – 1: For the purposes of this requirement the expression "liquid medium" include water, aqueous solutions of sugar and salt, fruit and vegetable juices or vinegar, either singly or in combination.

Explanation – 2: In declaring the net quantity of the commodity contained in the package, the weight of the wrappers and packaging materials shall be excluded:

iii. Where a package contains a large number of small items of confectionery, each of which is separately wrapped and it is not reasonably practicable to exclude from the net weight of the commodity, the weight of such immediate wrappers of all the items of the confectionery contained in the package, the net weight declared on the package containing such confectionary or on the label thereof may include the weight of such immediate wrapper if the total weight of such immediate wrapper does not exceed –

a) eight per cent, where such immediate wrapper is a waxed paper or other paper with wax or aluminium foil under strip; or
b) six per cent in case of other paper of the total net weight of all the items of confectionery contained in the package minus the weight of immediate wrapper.

Date of manufacture or packing

The date, month and year in which the commodity is manufactured, packed or pre-packed, shall be given on the label:

Provided that the month and the year of manufacture, packing or pre-packing shall be given if the "Best Before Date" of the products is more than three months.

Provided further that in case any package contains commodity which has a short shelf life of less than three months, the date, month and year in which the commodity is manufactured or prepared or pre-packed shall be mentioned on the label.

Best Before and Use By Date

a. the month and year in capital letters up to which the product is best for consumption, in the following manner, namely:

"BEST BEFORE.....MONTHS AND YEAR

OR

"BEST BEFORE.....MONTHS FROM PACKAGING

OR

"BEST BEFORE.....MONTHS FROM MANUFACTURE

(Note: blank be filled up)

ii. In case of package or bottle containing sterilised or Ultra High Temperature treated milk, soya milk, flavoured milk, any package containing bread, dhokla, bhelpuri, pizza, doughnuts, khoa, paneer, or any uncanned package of fruits, vegetable, meat, fish or any other like commodity, the declaration be made as follows

"BEST BEFORE ……DATE/MONTH/YEAR"

OR

"BEST BEFORE.....DAYS FROM PACKAGING"

OR

"BEST BEFORE.....DAYS FROM MANUFACTURE"

Note:

a) blanks be filled up
b) Month and year may be used in numerals
c) Year may be given in two digits

iii. On packages of Aspartame, instead of Best Before date, Use by date/recommended last consumption date/expiry date shall be given, which shall not be more than three years from the date of packing;

iv. In case of infant milk substitute and infant foods instead of Best Before date, Use by date/ recommended last consumption date/expiry date shall be given. Provided further that the declaration of best before date for consumption shall not be applicable

Exemptions from labelling requirements

Where the surface area of the package is not more than 100 square centimetres, the label of such package shall be exempted from the requirements of list of ingredients, Lot Number or Batch Number or Code Number, nutritional information and instructions for use, but this information shall be given on the wholesale packages or multi piece packages, as the case may be.

1. The date of manufacture' or 'best before date' or 'expiry date' may not be required to be mentioned on the package having surface area of less than 30 square centimetres butthis information shall be given on the wholesale packages or multi-piece packages, as the case may be;
2. In case of liquid products marketed in bottles, if such bottle is intended to be reused for refilling, the requirement of list of ingredients shall be exempted, but the nutritional information specified in regulation.

3. “To make a fluid not below the composition of toned milk or skimmed milk (as the case may be) with the contents of this package, add (here insert the number of parts) of water by volume to one part by volume of this condensed milk or desiccated (dried) milk”.
4. In case of food with shelf-life of not more than seven days, the 'date of manufacture may not be required to be mentioned on the label of packaged food articles, but the 'use by date' shall be mentioned on the label by the manufacturer or packer.
5. In case of multi piece packages the particulars regarding list of ingredients, nutritional information, Date of manufacture/ packing, best before, expiry date labelling of irradiated food and, vegetarian logo/non vegetarian logo, may not be specified.

CHAPTER 4
FOOD SAFETY REGULATIONS AND STANDARDS

4.1 Registration and licensing of food business

All Food Business Operators in the country will be registered or licensed in accordance with the procedures laid down

Registration of Petty Food Business

b. Every petty Food Business Operator shall register themselves with the Registering Authority by submitting an application for registration in Form A under Schedule 2 of these Regulations along with a fee as provided in Schedule 3.
c. The petty food manufacturer shall follow the basic hygiene and safety requirements provided in Part I of Schedule 4 of these Regulations and provide a self-attested declaration of adherence to these requirements with the application in the format provided in Annexure-1 under Schedule 2.
d. The Registering Authority shall consider the application and may either grant registration or reject it with reasons to be recorded in writing or issue notice for inspection, within 7 days of receipt of an application for registration.
e. In the event of an inspection being ordered, the registration shall be granted by the Registering Authority after being satisfied with the safety, hygiene and sanitary conditions of the premises as contained in Part II of Schedule 4 within a period of 30 days.
f. If registration is not granted, or denied, or inspection not ordered within 7 days as provided in above sub regulation (3) or no decision is communicated within 30 days as provided in above sub regulation (4), the petty food manufacturer may start its business, provided that it will be incumbent on the Food Business Operator to comply with any improvement suggested by the Registering Authority even later.
g. Provided that registration shall not be refused without giving the applicant an opportunity of being heard and for reasons to be recorded in writing.
h. The Registering Authority shall issue a registration certificate and a photo identity card, which shall be displayed at a prominent place at all times within the premises or vehicle or cart or any other place where the person carries on sale/manufacture of food in case of Petty Food Business.

i. The Registering Authority or any officer or agency specifically authorized for this purpose shall carry out food safety inspection of the registered establishments at least once in a year. Provided that a producer of milk who is a registered member of a dairy Cooperative Society registered under Cooperative Societies Act and supplies or sells the entire milk to the Society shall be exempted from this provision for registration.

4.2 Hygienic, sanitary and good manufacturing practices (GMP/GHP) and HACCP

Cleaning and Sanitation

i. Cleaning and sanitizing programmes shall be established at facility to ensure that the food-processing equipment and environment are maintained in a hygienic condition to prevent contamination of food, such as from metal shards, flaking plaster, food debris and chemicals and records of the same shall be maintained. The programme should ensure that all parts of the establishment are appropriately clean, and shall include the cleaning of cleaning equipment.

ii. Master sanitation schedule shall be maintained for overall facility through checklists which includes :

- Areas, items of equipment and utensils to be cleaned
- Responsibility for particular tasks
- Cleaning method and frequency of cleaning
- Monitoring arrangements for checking effectiveness of cleaning
- Person responsible for cleaning
- Persons responsible for monitoring & verification of effectiveness of cleaning
- In case of any deviation what correction & corrective actions being taken.
- Where ever chances of microbial risk with product air count & swab test being recommended.

iii. Cleaning and disinfection chemicals shall be food grade wherever chances of it may come in direct or indirect contact through equipment's or plant surfaces, handled and used carefully and in accordance with manufacturers' instructions, for example, using the correct dilutions, and stored, where necessary, separated from food, in clearly identified containers to avoid the risk of contaminating food.

iv. Cleaning shall remove food residues and dirt and it can be carried out by the separate or the combined use of physical methods, such as heat, scrubbing, turbulent flow and

vacuum cleaning or other methods that avoid the use of water, and chemical methods using appropriate cleaning agents.

v. These facilities should be constructed of corrosion resistant materials, be easy to clean and shall have adequate supply of hot and cold potable water, where appropriate. It is recommended to have different colour for hot and cold pipes. A validation mechanism should be in place for all cleaning programme.

Cleaning procedure should generally involve;

- Removing gross visible debris from surfaces.
- Applying a detergent solution to loosen soil and bacterial film (cleaning)
- Rinsing with water (hot water where possible) to remove loosened soil and residues of detergent.
- Dry cleaning or other appropriate methods for removing and collecting residues and debris and
- Where necessary, cleaning should be followed by disinfection with subsequent rinsing.

Designated area with lock & key provision should be allocated for cleaning equipment's & chemicals. Where ever necessary & applicable CIP procedure should be defined for equipment's cleaning.

House keeping

i. A housekeeping schedule covering manufacturing and storage areas shall be maintained.
ii. The surrounding areas including roads, parking lots and drains should be well maintained.
iii. Walls and floors should be maintained neat and clean. Ceilings and light fixtures should be easy to clean.
iv. Drains should be sufficiently sized and well sloped. Drains should have removable grates installed for ease of cleaning.
v. For 3rd party (contract) cleaning companies, the supplier should define clear scope, details of services and responsibilities.
vi. Waste storage areas should be clearly marked and waste shall be disposed of in a timely manner.

HACCP procedure

Appropriate to the nature and size of the operation and sufficient to assist the business to verify that the HACCP controls are in place and being maintained.

Documentation shall include (as a minimum) the following:

- HACCP team composition
- Product description
- Intended use
- Flow chart
- Hazard analysis
- CCP determination
- Critical limit determination
- Validation process
- HACCP plan

The HACCP plan shall include the following information for each identified CCP:

- Food safety hazard(s) to be controlled at the CCP
- Control measure(s)
- Critical limit(s)
- Monitoring procedure(s)
- Corrections and corrective action(s) to be taken if critical limits are exceeded
- Responsibilities and authorities for monitoring, corrective action and verification
- Record(s) of monitoring.

Records to include

- CCP monitoring activities
- Deviations and associated corrective actions
- Disposition of non-conforming products
- Verification procedures performed
- Modifications to the HACCP plan
- Validation record; Product release records and Testing records.

4.3 Documentation and Record keeping

Every organization has to maintain records of raw material procurement, production processes, and sales. This is to ensure that the business runs effectively and is profitable. Listed below are some reasons why there is a need for documentation:

1. It gives detailed knowledge about running the business.
2. It helps to control product quality.
3. It helps to keep track of the money invested in the business.

4. It helps to identify the separate costs of raw material or product ingredients.
5. It helps to identify the production cost of a particular process.
6. It helps to make sure that all the quality assurance practices were followed during the production.
7. It helps to make sure that the production equipment is running smoothly/effectively.
8. It works as an evidence for legal procedures.
9. It helps to set an appropriate product price.
10. It helps to take corrective measures at the right time.

4.4 How to Keep Records?

Every food processing organization follows a more or less similar way of keeping records. Production records keep a log of the following:

- The quantity and type of raw materials received
- The quantity and type of ingredients used during processing
- The processing conditions in which production took place (e.g. the temperature set or the air pressure applied)
- The product quality produced

Product quality can be maintained only when:

- The same quantity and quality of ingredients and raw materials are mixed in every batch
- A standard formulation is used for every batch
- Standard process parameters are applied for every batch

Every batch of food is given a batch number. This number is recorded in:

- Stock control books (where raw material procurement is noted)
- Processing logbooks (where production process is noted)
- Product sales records (where sales and distribution is noted)

The batch number must correlate with the product code number, which is printed on labels. This helps the processor to trace any fault found in a batch back to the raw material used or

the production process.

FSSAI Quality Standards of Byadagi Chilli

- Chillies and Capsicum (Lal Mirchi) whole - means the dried ripe fruits or pods of the *Capsicum annum* L & *Capsicum frutescens* L.
- The pods shall be free from mould, living and dead insects, insect fragments, rodent contamination.
- The product shall be free from extraneous colouring matter, coating of mineral oil and other harmful substances.

FSSAI Quality Standards of Byadagi Chilli

Dried Byadgi chilli shall conform to the following standards:

(i) Extraneous matter : Not more than 1.0 percent by weight

(ii) Unripe and marked fruits : Not more than 2.0 percent by weight

(iii) Broken fruits, seed & fragments : Not more than 5.0 percent by weight

(iv) Moisture : Not more than 11.0 percent by weight

(v) Total ash on dry basis : Not more than 8.0 percent by weight

(vi) Ash insoluble in dilute HCl on dry basis : Not more than 1.3 percent by weight

(vi) Insect damaged matter : Not more than 1.0 percent by weight

FSSAI Quality Standards of Byadagi Chilli Powder

- Chillies and Capsicum (Lal Mirchi) powder means the powder obtained by grinding clean ripe fruits or pods of *Capsicum annum* L and *Capsicum frutescens* L.
- It shall be free from mould, living and dead insects, insect fragments, rodent contamination.
- The powder shall be dry, free from dirt, extraneous colouring matter, flavouring matter, mineral oil and other harmful substances.
- The chilli powder may contain any edible vegetable oil to a maximum limit of 2.0 percent by weight under a label declaration for the amount and nature of oil used.

FSSAI Quality Standards of Byadagi Chilli Powder

Byadgi chilli powder shall conform to the following standards:

(i) Moisture : Not more than 11.0 percent by weight

(ii) Total ash on dry basis : Not more than 8.0 percent by weight

(iii) Ash insoluble in dilute HCl on dry basis : Not more than 1.3 percent by weight

(iv) Crude fibre : Not more than 30.0 percent by weight

(v) Non-volatile ether extract on dry basis : Not less than 12.0 percent by weight

FSSAI Quality Standards of Byadagi Chilli Paste

- Byadgi chilli paste is a culinary paste, which means a culinary preparation used as an adjunct to food, prepared from edible portion of any suitable fruit/vegetable including, roots, tubers & rhizomes, their pulps/purees, dried fruits, singly or in combination by blending with nutritive sweeteners, salt, spices and condiments and other ingredient appropriate to the product.
- The product may contain food additives permitted in Appendix A of Food Safety and Standards (Food products standards and food additives) Regulations, 2011.
- It may contain caramel but shall not contain any other added colour whether natural or synthetic.
- The product shall conform to the microbiological requirements given in Appendix B of Food Safety and Standards (Food products standards and food additives) Regulations, 2011.
- It shall meet the following requirements:

➢ Total soluble solids (salt free basis), m/m : Not less than 8.0 percent

➢ Acidity percentage : Note less than 1.0 percent

➢ The container shall be well filled with the product and shall occupy not less than 90.0 percent of the water capacity of the container, when packed in the rigid containers.

The water capacity of the container is the volume of distilled water at 20ºC which the sealed container is capable of holding when completely filled

FSSAI Quality Standards of Byadagi Chilli Paste

Additive	Quantity
Acidifying agents	
Acetic acid	GMP
Citric acid	GMP
Fumaric acid	0.3% maximum
Lactic acid	GMP
L-Tartaric acid	GMP
Malic acid	GMP
Anti-foaming agent	
Dimethyl polysyloxane	10ppm maximum
Mono and diglycerides of fatty acids of edible oils	10ppm maximum

Additive	Quantity
Antioxidants	
Ascorbic acid	GMP
BHA	200 ppm maximum
Colours	
Natural chlorophyll	GMP for Caramel only

Flavours	
Natural and artificial flavouring substances	GMP
Flavour enhancer	
MSG enhancer	
Preservatives	
Benzoic acid and its sodium and potassium salt	750 ppm maximum
Sorbic acid and its Cal., Sod., Pot. salt	1000 ppm maximum

Additive	Quantity
Thickening agent	
Modified starches	0.5% max. With declaration lable
Carrageenan	GMP
Guar gum	GMP
Carobbean gum	GMP
Xanthan gum	0.5% maximum
Calcium alginates	GMP
Microbiological requirements	

	Yeast and mould count	Positive in not more than 100 count/g

FSSAI Quality Standards of Byadagi Chilli Chutney

- It shall meet the following requirements :

➢ (i) Total soluble solids (m/m)

- (a) Fruit Chutney : Not less than 50.0 percent
- (b) Vegetable Chutney : Not less than 25.0 percent
- (c) Hot and Sour (Spicy Chutney) : Not less than 25.0 percent
- (ii) Fruits and Vegetable content (m/m) : Not less than 40.0 percent
- (iii) pH : Not more than 4.6
- (iv) Total ash (m/m) : Not more than 5.0 percent
- (v) Ash insoluble in hydrochloric acid (m/m) : Not more than 0.5 percent.

- The container shall be well filled with the product and shall occupy not less than 90.0 percent of the water capacity of the container, when packed in the rigid containers.
- The water capacity of the container is the volume of distilled water at 20°C which the sealed container is capable of holding when completely filled. This requirement shall not be applicable for bulk packs for industrial use.

FSSAI Quality Standards of Byadagi Chilli Chutney

Additive	Quantity
Acidifying agents	
Acetic acid	GMP
Citric acid	GMP
Lactic acid	GMP

	L-Tartaric acid	GMP
	Malic acid	GMP
	Phosphoric acid	GMP
Anti-foaming agents		
	Dimethyl polysiloxane	10 ppm maximum
	Mono and di-glycerides of fatty acids and edible oils	10 ppm maximum
Antioxidants		
	Ascorbic acid	GMP

Additive	Quantity
Colours	
Natural Chlorophyll	GMP
Synthetic	100 ppm maximum
Firming agents	
Calcium chloride	350 ppm maximum only on chilli pieces
Preservatives	
Benzoic acid and its sodium and potassium salts	250 ppm maximum
Sulphur dioxide	100 ppm maximum
Sorbic acid, Calcium sorbate and Potassium sorbate	500 ppm maximum

Additive	Quantity
Thickening agent	
Xanthan gum	0.5%max
Ammonium alginates	GMP
Calcium alginates	GMP
Softening agents	
Sodium bi-carbonate	GMP
Sodium citrate	GMP

Microbiological requirements	
Yeast and mould count	Positive in not more than 100 count/g

CODEX Standards for Byadagi Chilli

ADDITIVES	MAXIMUM LEVEL
Polysorbates	2000 mg/kg
Sucralose	400mg/kg
Sucroglycerides	2000 mg/kg
Sucrose esters of fatty acids	2000 mg/kg
Sucrose oligoesters, type i And type ii	2000 mg/kg
Sulfites	150mg/kg

CHAPTER 5
OPPORTUNITIES FOR MICRO/UNORGANIZED ENTERPRISES

5.1. PM-FME Scheme:

Ministry of Food Processing Industries (MoFPI), in partnership with the States, has launched an all India centrally sponsored "PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)" for providing financial, technical and business support for up-gradation of existing micro food processing enterprises. The objectives of the scheme are :

I. Support for capital investment for up-gradation and formalization with registration for GST, FSSAI hygiene standards and Udyog Aadhar;
II. Capacity building through skill training, imparting technical knowledge on food safety, standards & hygiene and quality improvement;
III. Hand holding support for preparation of DPR, availing bank loan and up-gradation;
IV. Support to Farmer Producer Organizations (FPOs), Self Help Groups (SHGs), producers cooperatives for capital investment, common infrastructure and support branding and marketing.