Principles and methods of Dehydration of fruits

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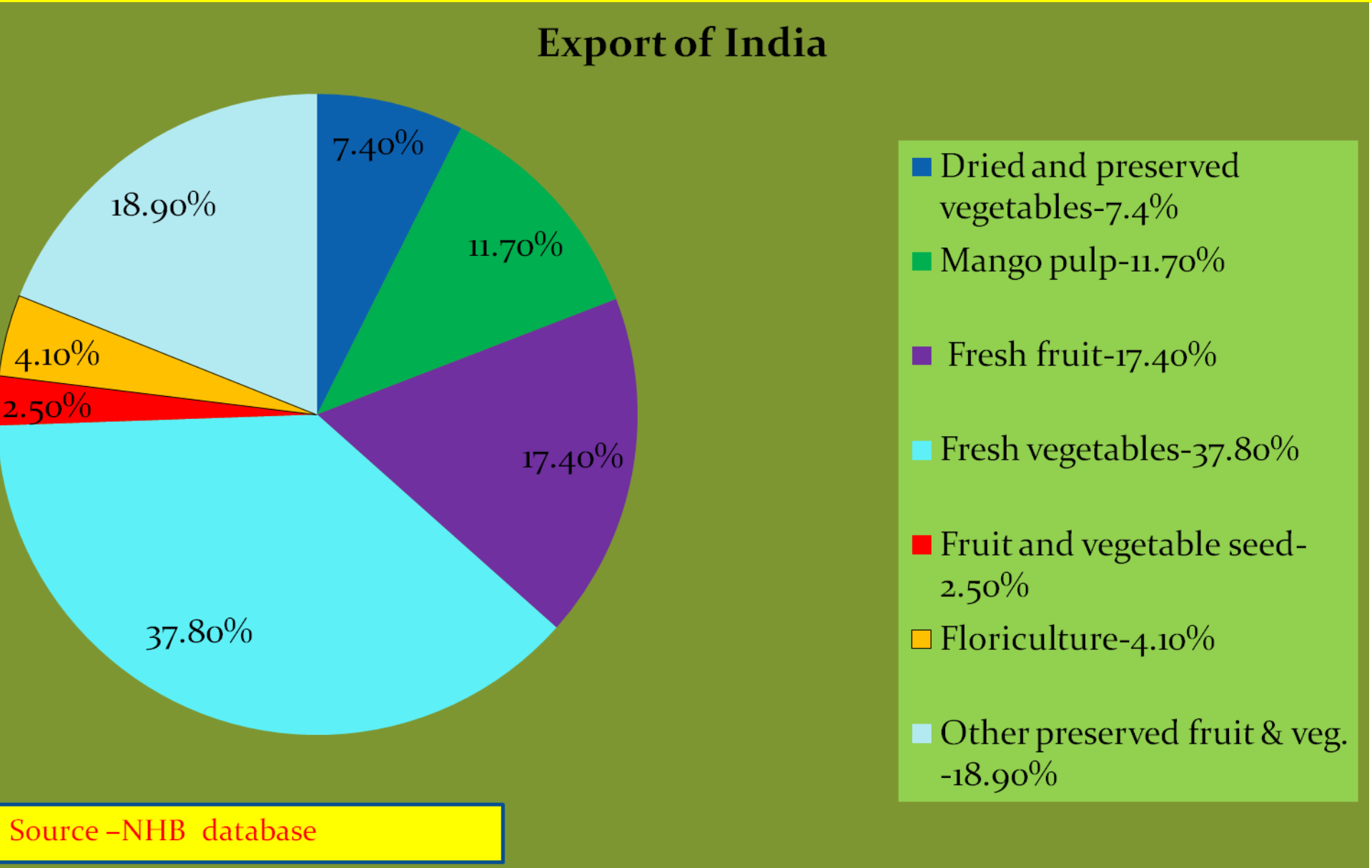
Introduction

1. In India only 1-2% of total production is processed
2. Fruits are highly perishable commodities, where the post harvest losses are, ranging from 30-40 %. Among different technologies used for reducing these losses dehydration is one of most widely used method of preservation.
3. In Dehydration process removal of water content below a certain level at which enzymatic activities and growth of micro-organism is affected.
4. By dehydration Fruits can be preserved for longer period . dehydrated food products save energy , money and space in shipping , packaging , storing and transportation .
5. Generally foods are dried to the final moisture range of 1-5%.

Export of horticultural crops and their products (2020-21)



Source –NHB database

Principles of dehydration

- Heat transfer in : by flow of hot air
- Mass transfer out : remove the mass (water) through the product in the environment.

Type of dehydration/drying

Following type of dehydration/drying process given below :-

- Sun or solar drying.
- Shade drying.
- Osmotic dehydration.
- Mechanical dehydration.
- Vacuum drying.

Objective of dehydration

There are two objective of dehydration / drying :-

- To reduce the bulk and weight – reduce ¼ to 1/9th of the fresh weight.
- To reduce the enzyme activity and chemical reactions.

Quality parameters of dehydrated food

FPO Specification for sun dehydrated fruits are :-

i. The moisture content shall not exceed 20 per cent.
ii. The fruits used for drying shall be clean and free from insect or fungal attack.
iii. Dehydrated may contain permitted preservative.

Pre & Post treatment for dehydration

- Pre-Treatment :-

1. Blanching .
2. Sulphuring.

- Post-Treatment :-

1. Sweating.
2. Screening.
3. Inspection.
4. Heat treatment.
5. Fumigation.

Methods of dehydration

How dehydration proceed

When heat is supplied to drying matter, it distributed throughout the occurrence by condense and mass transferred from the food.

1. Transferring the water to the surface of the food.
2. Removal of water from the surface in to the environment.

Flow sheet for Select fruit dehydration of fruit

Flowsheet for prepration of pineapple candy

Select well developed immature fruits

Washing

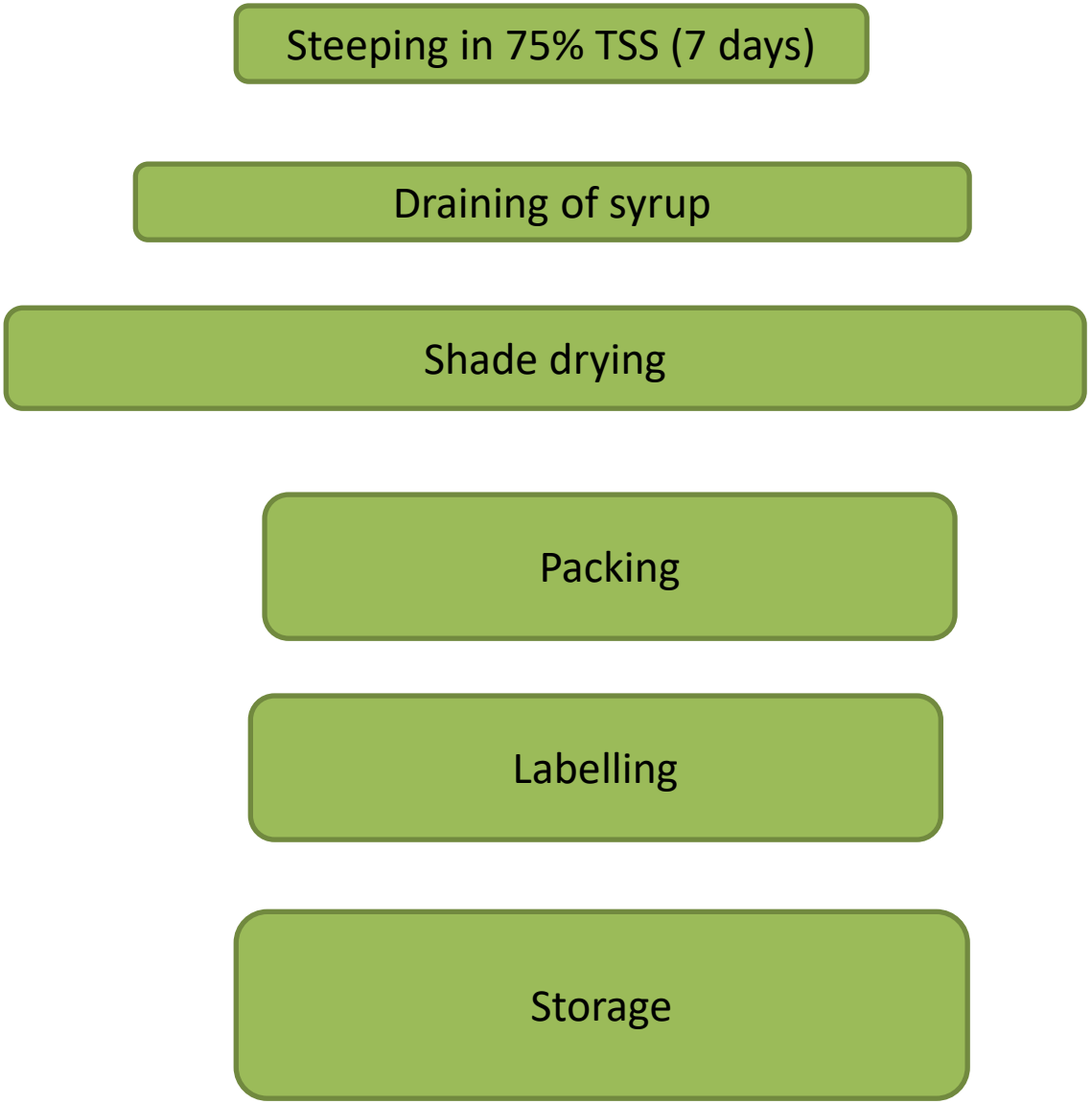
Removal of peel

Slicing (1 cm size)

Blanching in boiling water 5 minutes

Pricking of both the sides

Steeping in syrup solution each 40, 50, 60, 70% TSS (24 hours)


Steeping in 75% TSS (7 days)
Draining of syrup
Shade drying
Packing
Labelling
Storage

Factors affecting the dehydration

1. Temperature.
2. Velocity of air.
3. Surface area.
4. Size of product.
5. Tray load.
6. Relative humidity of air.

Changes during dehydration

- Shrinkage.
- Thermo plasticity.
- Maillard browning.
- Loss of volatile flavor constituents.
- Partial loss of some nutrients like vitamin -C.

Chemical composition of Pineapple candy

S. No.	Characters		Value
1.	Total Soluble Solids (%)		75.0
2.	Acidity(%)		0.61
3.	Ascorbic Acid(mg/100g)		6.63
4.	Browning (OD)		0.11
5.	Organoleptic quality	➢ Score	8.00
		➢ Rating	LVM (Like Very Much)

Source- Singh (2000)

Physico-chemical composition of pineapple fruit

SN.	Characters	Average value
1	Juice content (%)	36.00
2	Total Soluble Solids (%)	8.48
3	Acidity(%)	0.39
4	Ascorbic acid (mg/100g)	15.19
5	Vitamin-A (IU)	189.22
6	Total mineral (%)	0.29

Changes in chemical composition during storage of Pineapple candy

Storage period (monthly)	T.S.S.	Acidity (%)	Ascorbic acid (mg/100g)	Browning (OD)	Organoleptic quality
					Score
0	75.00	0.61	6.63	0.11	8.0
1	75.00	0.61	6.15	0.13	7.8
2	75.00	0.62	5.78	0.15	7.7
3	76.50	0.63	5.26	0.17	7.5
4	77.0	0.65	5.12	0.18	7.4
5	78.00	0.67	5.07	0.19	7.3
6	78.50	0.68	4.96	0.20	7.2
7	79.00	0.70	4.81	0.22	7.1
8	79.50	0.73	4.55	2.25	7.0
9	80.50	0.75	4.26	2.31	6.8

- Score 7 and above acceptable

Process for dehydration of fruits

S. No.	Fruit	Preparation and pretreatment	Sulphuring time	Drying temperature
1.	Banana	Wash, peel , halve lengthwise or slice crosswise 12mm thick	30 min	55-60˚C or sun drying
2.	Date	Wash , dip in boiling o.5% caustic soda solution, then rinse		45-50˚C or sun drying
3.	Fig	Wash	1 hour	55-60˚C or sun drying
4.	Grape	Dip in boiling o.5% caustic soda solution, then rinse	1 hour	55-60˚C or sun drying
5.	Mango	Wash, peel, cut in to 12 mm thick slices	2 hour	45-50˚C or sun drying
6.	Papaya	Wash, peel, remove seeds and cut in to 6mm thick slices	2 hour	60-65˚C or sun drying
7.	Apple	Wash, peel, core trim and cut in to 5 mm thick slices	30 min	60-65˚C or sun drying

Ways To Drying Fruits

- Fruits can be dried in the sun, but often doesn’t work well in high humidity areas.
- Need several days of high temperature and low humidity.
- Dry in an oven.
- Dry in fruit dehydrators.

Quality of dehydrated Fruits

- Most fruit – should have 20% moisture content when dried.
- Cut several cooled pieces in half should be no visible moisture and should not be able to squeeze any moisture from fruit.
- Not be sticky.
- If piece folded in half, shouldn’t stick to itself.

Dehydrated Fruits

Mixed Dried Fruits

Advantage of dehydration

- The weight of the product is reduced ¼ to 1/9 its original or fresh weight.
- Due to reduction in bulk of the product , it require less space.
- Cost of processing is very low.
- No require any preservative for its preservation.
- Per unit weight of fruit nutrients concentration is very high.
- Easy to transport and marketing.

Conclusion

1. India is the second largest producer of fruits and vegetable but only 1-2 % of it, is processed.
2. It saves energy, money, and space in shipping, packaging, storage and transportation.
3. It is known as high value low volume food or high acid high sugar foods.
4. Adopt dehydration technology to reduce the post harvest losses.
5. Dehydrated product increase the availability of fruits in off season.
6. Dehydration is an important and oldest preservation method of food processing.
7. Dehydrated product provide remunerative return for his produce and the manufacturer to get reasonable profit.


THANKS