

REVISED SYLLABUS FOR
FRUIT & VEGETABLE
PROCESSER

UNDER CRAFTSMEN TRAINING SCHEME

AS APPROVED BY
THE TRADE COMMITTEE MEMBERS

GOVT. OF INDIA
MINISTRY OF LABOUR AND EMPLOYMENT
DIRECTORATE GENERAL EMPLOYMENT AND TRAINING
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN BLOCK, SECTOR – V, SALT LAKE CITY
KOLKATA-700091

GENERAL INFORMATION

- 1) Name of the trade : "Fruit & Vegetable Processing"
- 2) N.C.O. Code No. : 775.90
- 3) Duration of Craftsman : One Year
Training
- 4) Duration of Apprenticeship Training : 2 years including Basic
Training of one year.
- 5) Entry Qualification : Passed in 10th class exam
under 10+2 system of
education with Science as
one of the subjects or its
equivalent.
- 6) Rebate of Ex-craftsmen: One year (Fruit & Vegetable
Trainees Processing)
7. Ratio of Apprentice : 1 : 10
to workers

MEMBERS OF THE TRADE COMMITTEE FOR THE TRADE OF
FRUIT AND VEGETABLE PROCESSING

CHAIRMAN

Sri A.D. Jadhav : Director,
Vocational Education & Training,
Maharashtra State, Mumbai-400 001.

MEMBERS

- 1) Sri H.R. Gajare : Deputy Director,
Directorate of Apprenticeship Trg
Sion, Mumbai-22
- 2) Sri A. H. Modak : Deputy Director,
Vocational Education & Training,
Regional Office, Nasik.
- 3) Sri D.K. Tejani : Dy. Apprenticeship Advisor (Sr.),
Head office, Mumbai-400 001.
- 4) Sri H.H. Nikam : Part-Time Principal,
Basic Trg. & Related Instructions
Centre, Dadar, Mumbai-400 023
- 5) Sri B.V. Rampurkar : Junior Supervisor,
Head Office, Mumbai-1.
- 6) Miss. R.P. Dandekar : Trade Instructor (PFV),
I.T.I. (for Girls), Dadar, Mumbai-2
- 7) Sri S.A. Prajapati : Shanti Nagar, Mira Road, Thane.
- 8) Srimati Anagha Sapre : Subhash Road, Vile Parle(E), Mumbai
- 9) Dr. L.C. Govekar : Jiva Mahale Marg, Andheri, Mumbai
- 10) Sri P.B. Kanade : Deonar Sion Trombay Marg, Chembur,
Mumbai
- 11) Sri V. G. Pendase : Manager, (Project),
Maharashtra Agro Industries &
Development Corporation Ltd.,
Prabhadevi, Mumbai-400 005
- 12) Sri V.V. Gadgil : Assistant Apprenticeship Advisor,
(Technical), Head Office, Mumbai
- 13) Sri R.V. Wadikar : Assistant Apprenticeship Advisor
(Technical), Head Office,
Mumbai.

Trade Committee Members

- | | |
|--|--|
| 1. Mr. S. R. Majumder
Director | CSTARI, Calcutta (Chairman) |
| 2. Dr. H. N. Samaddar
Project Director | Deptt. of Food Processing
and Industrial Dept.
Govt. of West Bengal |
| 3. Mr. S. B. Dongre
Dy. Director | Ministry of Food Processing
Govt. of India |
| 4. Mrs. Pamela Appadurai
Dy. Technical Advisor | Food & Nutrition Board
Govt. of India |
| 5. Mr. S. Jaya Paul
Asstt. Technical Advisor | Food & Nutrition Board
Govt. of India |
| 6. Mr. A. K. Poddar
Dy. Director of Industries | Directorate of College &
Small Scale Industries
Govt. of West Bengal |
| 7. Mr. S. Chakraborti
Asstt. Director of Industries | -do- |
| 8. Dr. Sunit Mukherjee
Prof. (Retd.) Jadavpur
University | Dr Subhas Mukherjee Memori-
al Reproductive Biology
Research Centre |
| 9. Mr. Nirmal Dhar
Programmer | Ramkrishna Mission Ashram
Narendrapur |
| 10. Mr. Mukul Sarkar
HOD (Food Products) | Institute of Advanced
Management |
| 11. Mr. S. N. Mira | MIDA & Co. Pvt. Ltd. |
| 12. Mr. D. P. Ganguly
Joint Director | CSTARI, Calcutta |
| 13. Mr. R. M. Sinha
Joint Director | -do- |
| 14. Mr. K. P. Chattopadhyay
Joint Director | -do- |

SYLLABUS FOR THE TRADE OF FRUIT AND VEGETABLE PROCESSING
UNDER CRAFTSMEN TRAINING SCHEME

Period of Training : 1 Year

Duration of Training : 12 months (About 2000 Hours)

A. RELATED INSTRUCTIONS

600 Hours

1. History and development of food preservation industry with special reference to India.
2. Principles and methods of food preservation both temporary and permanent with suitable examples of each. Different types of spoilages and their control by low temperature, freezing and cold storage.
3. Fruits and vegetables as available in different parts of the country, their preservation, causes of spoilage :
of
4. Selection of quality/raw materials including fruits and vegetables for preparation of various products, preserving media, mode of action in preservation. Spices and other constituents their flavouring properties condiments and other natural additives and ingredients, and their flavouring and preservative properties.
5. Study of various types of equipment - care and precautions, usage.
6. Food grades and standards F.P.O., I.S.I. and mark.P.F.A
7. Tomato products : Importance of tomatoes selection, preparation of common products such as juice, sauce, puree, paste ketchup etc.
8. Fruit beverages: Preparation, preservation, dilution ratio of squash, crush, cordial, syrup, nectar etc.
9. Jams, jellies and marmalades - selection, preparation, regulations in production and preservation.
10. Definition of preserves, candied fruits, fruit bars glazed fruits, crystallised fruits - simple methods of preparation of these *and fruit butters*
11. Study of various types of containers - merits and demerits of each
- scope for new types of containers/packing materials such as pouches, packaging and packing materials, such as fruit grade plastic pouches, aseptic brick packs, tetra-pack, cartons etc.
12. Canning of fruits and vegetables - principle, procedure and steps involved - care in handling of common available fruits and vegetables in the region.

13. Scheme and layout of canning industry in India. 2
14. A general outline of canning and preservation of animal products Meat, Fish and Poultry. 6
15. Canning procedure for Indian dishes and sweets, curried, vegetables Cubes and rasgollas. 7
16. Pickles, chutneys and sauces, types methods of preparation, curing techniques, defects and remedies. 8.
17. Sun drying & dehydration - merits & demerits -principles involved in drying and preservation. 9.
18. Constituents of food, importance of fruits & vegetables in the diet. 10
19. Methods of storing of perishables, surface coating controlled atmosphere etc. 11
20. Acids, Alkalies and salts, their properties & uses etc. 12
21. Study of Brewed Vinegars such as cider, grape & malt etc. 13.
22. Importance of personal Hygiene, Sanitary standards in Fruits and vegetable preservation. 14.
23. Definition of preservatives - types of preservatives commonly used in food industry - limitations of use of preservatives. 5.
24. Types of spoilages in preserved foods, Their causes and control. 6.
25. Food, colours & additives. 7.
26. Use of waste for production of bi-product. 8.
27. Spices, oil, Oleoresin powder, paste out of common spices 9.
28. T Q M 2 9.
29. Formulation of a project report for self employment 10.
30. Market survey of fruits product. 11.

B. PRACTICALS

- 1 Pulp & juices - Extraction & Preparation .
- Preparation of common fruit beverages available in the region such as squashes, crushes, cordial, cocktails, syrups, nectars, R.T.S. beverages etc. . 1
2. Study of common food processing equipment, such as seamers, juice extracting machines, auto-claves, corking machines, etc. piler, crushers, grinders, slicer etc. . 1
3. Canning of Meat, Fish and Poultry products.
4. Canning of commercially important fruits and vegetables.

5. Preparation of tomato products such as juices, puree, sauces, ketchups, soup etc.
6. Preparation and preservation of pickles, chutneys, sauces etc.
7. Selection, preparation of fruits for jams, jellies, marmalades available in the region.
8. Preparation of preserves, candies, crystallised and glazed fruits.
9. Preparation of fruit toffees, cheese and fruit bars.
10. Preparation of Brewed vinegars, synthetic vinegars.
11. Study of seam technology, Adjustment and setting of double seamer.
12. Identification of different lacquers, defective cans, Precautions while consuming the canned foods.
13. Study and use of common instruments such as refractometer, Hydrometers, Jelmeter, thermometer, vacuum gauge, pressure gauge, seam checking gauge common balance etc.
14. Preparation of standard solution of salts, acids and alkalies used in food industries.
15. Estimation of acid in food products such as Jams, Jellies, cordials canned fruits and vegetables, tomato products etc.
16. Estimation of sodium chloride in food products.
17. Estimation of Benzoic acid in terms of ppm present in fruits and vegetable products.
18. Estimation of sugars in fruits and vegetable products.
19. Study of compound Microscope
20. Identification of Bacteria, Yeast and mould under microscope
21. Microbial Examination of canned foods.
22. Detailed cut out analysis of Fruit and Vegetable products.
23. Estimation of sulphurdioxide in terms of ppm present in fruit and vegetable products.
24. Estimation of metal content in the canned food, fruit & vegetable.
25. A market survey
26. Development of innovative (new) product.

Tools and Equipment for the Trade of Preservation of Fruits & Vegetables

(For a class of 16 trainees)

Sl.No.	Name of Articles(Specification if any)	Quantity
1.	Vacuum Gauge	1
2.	Pressure gauge	1
3.	Seam Checking gauge of screw gauge	1
4.	Refractometers (Pocket) 0.32 28-62 58-92 B Sugar Scale	2 each
5.	Brinometer-(salinometer)	2 each
6.	Hydrometer of different ranges 0-30, 30-60, 60-90 Brixhydrometer	1 each
7.	PH Meter	1
8.	Working table with 6-3 X 21/2 Aluminium tops	2+2
9.	Fruit trays	6+2
10.	Enamel mugs	8
11.	Enamel bowls	8
12.	Pulper Electric 1/4 Tonne capacity per 8 hrs with 1 HP Motor and two S.S.Sieves (1/16 mesh 1/32 mesh)	1 1
13.	Thermometer 150°C & 260°C	3 + 3 = 6
14.	Cooker Pressure	2
15.	Sealing Machine for A 10 A 21/2 type cans	1
16.	Vegetable grader	1
17.	Tongs	1 each
18.	perforated spoons S.S.12" length 4" dia	6
19.	Slicing machine	1
20.	Coring Knives	6
21.	Pitting Knives	6
22.	Cutting Knives	6

23. Juice Extractor (Screw type) 1 HP Motor	1
24. Lime Juice Extractor & Orange Juice halving & Burring	1
25. Bottle filling machine electrically operated with 1 HP Motor	1
26. Crown corking machine handoperated	1
27. Pilfer proof capping machine	1
28. Weighing balance ordinary (Grocer's) with set of weight	3
29. Chemical balance	2
30. Beaker of assorted sizes	24
31. Conical flask of assorted sizes	24
32. Measuring cylinder 100 ml 200 ml 500 ml 1 lit	12
33. Measuring flask 250 ml	12 nos.
34. Burette with stands 50 cc	12
35. Pipette 25 cc 10 cc 5 cc	12 each
36. Stainless steel knives	6 pcs
37. Spoon of assorted size	16 pcs
38. Stainless steel degches	6 pcs
39. Gan and Cork opener	1 each
40. Thermo motor (0 c to 100 c)	16 pcs
41. Jelmeters	6
42. Jelly Filter bags	4
43. Drier 12 tray capacity with blower & heating coils	1
44. Glass Funnels of assorted size	12
45. Enamelled trays of assorted size	16
46. Enamelled buckets or stainless buckets	6
47. Gas burner with cylinder	16 Nos.
48. Aluminium container 50 gallons capacity	2 + 2
49. 2 Industrial burner with	2 cylinder

1	2	3
50.	4 Double burners with	2 cylinder
51.	Electric Mixer	1
52.	Spoons, Wooden Ladle	16
53.	Cooking range electric	1
54.	Rubber Gloves	12 pairs (for each trainees)
55.	Aprons	1 for each trainee
56.	Electric Kettle	2
57.	Cement jars for confectionery	16
58.	Cup Board (large)	4
59.	Bottle stand for 1 gross bottle	1
60.	Laboratory table with rack (8'X2'-6"-6") provide with sinks	4
61.	Water tank with tap 4' X 1' X 3'	1
62.	Stools (high)	16
63.	Instructor's table and chairs	1 set
64.	Racks for keeping books etc.	1 set
65.	Deep Freezer	1
66.	Rotary flat can body reformer with change parts	1
67.	Hand die flanger with change parts	1
68.	Flange rectified with change parts	1
69.	Auto Claves 20 lit capacity	2
70.	Wooden show case for keeping the samples & display of the products	2
71.	Stainless S.S. Vessels with lids 20 lit cap	10
72.	S.S. Vessels with lids 6 lit cap	6

1	2	3
73.	S.S. Vessels with lids 10 lit cap	6
74.	Incubator with thermostetic control	1
75.	Wooden Basket press 10 kgs capacity (for pineapple juice extraction)	1
76.	Gas Lighter	1
77.	Hand Washing basin with tripod stands	3
78.	Kipps Apparatus	3
79.	Separating Funnels 500 ml & 100 ml	12
80.	Test tube	25
81.	Micrometer seam checking gauge	1
82.	Portable boiler	1
83.	Fire fighting Equipment	1

Syllabus for the Trade of Fruit and Vegetable Processing
under Apprenticeship Training Scheme

Shop floor Training - 1 year

- Note: 1. All freshers should undergo one year Basic Training followed by one year training on the shop floor. The apprentices should have more practice on the shop floor on those operations/skills which have been already learnt during Basic Training.
2. The content of one year training in the Industrial Training Institute in this trade is exactly the same as mentioned in (1) above. The trainees of Industrial Training Institutes who may be engaged for one year of Shop Floor Training after one year training in Industrial Training Institute should follow the same course for apprenticeship as in (1) above.
3. The Ex-Industrial Training Institute Trainees, i.e., those who, after completion of one year training in ITI would be engaged for undergoing apprenticeship training for the remaining period of one year in this trade, should learn the remaining operations/skills of any of the Shop Floor during apprenticeship developed his method of work speed accuracy and finish in jobs which would normally consists of operations/skills already learnt by him earlier.

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SYLLABUS FOR THE TRADE OF F.V.P. UNDER APPRENTICESHIP TRAINING
SCHEME
RELATED INSTRUCTIONS

TRADE: Preservation of Fruit and Vegetables.

Related Instruction should be imparted to all the apprentices during the entire period of training including Basic training. The syllabus given for related Instruction should be considered as a guide.

The subject to be taught to the apprentices in related Instructions:-

- 1) Trade Theory
- 2) Social Studies

Trade Theory

First Year:

The content of syllabus for the apprentices during first year training should be the same as the content of the course for the ITI trainees in this trade.

Second Year: (3 Hrs/week or 150 Hrs/year approx.)

- 1) Safety Precautions while using equipments and working in laboratory.
- 2) Sanitarian standards and hygiene in food industry.
- 3) Principles and Methods used in food preservation.
- 4) Definition of quality control: Functions of quality control in food industry.
- 5) Rules regarding quality control in food industry.
- 6) In plant quality control technology: objective and subjective analysis of food and packaging material.
- 7) Types of packaging materials used in food industry and its use according to the product.
- 8) Definition of preservatives; its standards and limits used for food products.
- 9) Management systems used for store and production department in food industry.
- 10) Microbial control of food in food industry. Methods of examination of microbes in food products.
- 11) Methods of sensory evaluation of food quality including the triangular test, flavour profile, consumer acceptance etc.

SHOP - FLOOR TRAINING
BASIC TRAINING - ONE YEAR

- Sl.No. Skills/operations to be learnt during Apprenticeship Training
1. Instructions in Safety Precaution as applicable to the trade
 2. Use of tools & equipments
 1. All types of dryers
 2. All types of freezers
 3. Volumetric and Vaccumetric filling machines
 4. Bottle Washers
 5. Tetra packer and filler
 6. Canning Unit
 7. Refractometer of all types
 8. Salinometer
 9. Hydrometer
 10. PH meter
 11. Viscosity meter
 12. Tintometer
 13. Calorimeter
 14. Distillation Unit
 15. Micrometer screw gauge
 16. Electronic chemical balance
 17. Muffle furnace
 18. Microscope (simple electronic & compound)
 3. Preparation of Fruit Beverage -all types.
 4. Canning of Fruits and Vegetables.
 5. Preparation of tomato products e.g. Sauce, Ketchup, puree etc.
 6. Preparation of pickles e.g. Sweet pickles, Spicy pickles etc.
 7. Preparation of standard solution of salt, acids and alkalies.
 8. Estimations of acids, preservatives, salt, sugar.
 9. Identification of bacteria, yeast and molds under microscope.
 10. Preparation and transfer of culture media.
 11. Preparation of slides and use of stains.
 12. Detailed cut out analysis of Fruit and Vegetable products.

SHOP FLOOR TRAINING
(SECOND YEAR)

Sl.No. Skills/operation to be learnt during Appr. Trg.-second yr.

1. Instruction in safety precautions. (1 week)
2. On lin Quality Control
 - a) Hygiene in production department (3 weeks)
 - i) Personnel Hygiene
 - ii) Hygiene inside the factory
 - iii) Control of insects and rodents.
 - b) Sanitization Standards & Records (4 weeks)
 - i) Periodical Cleaning
 - ii) Food contact part; made of stainless steel.
 - iii) Operation and capacity
 - iv) Checklist
 - c) Methods used for preparation (10 weeks)
 - i) Carbonated beverages
 - purified- syrup- cooling - mixing ingredients
 - cut out analysis - packaging
 - ii) Non Carbonated beverages.
 - fresh fruit/pulp/juice - quality test
 - mixing = cooling -syrup
 - ingredients
 - packaging -cut out analysis.
 - iii) Jams, Jellies or Marmalade
 - fresh fruits/pulp/juice - quality tests -sugar+pulp/juice
 - packaging & mixing ingredients - cooking till end point
 - cut out analysis.
 - iv) Ketchup/Sauces
 - fresh vegetables/pulp/juice/paste -quality test
 - addition of vinegar- cooking till - mixing ingredients
 - and preservatives end point
 - packaging - cut out analysis.
 - v) Pickles
 - a) fresh fruits/vegetables - curing- quality test
 - packaging - addition of salt / - preparation of
 - oil/vinegar spices mixture
 - cut out analysis.

- b) fresh fruits/vegetables -preparation of spices mixture
cut out - packaging - addition of oil/salt/vinegar
analysis.

vi) Canning

product preparation - filling in reformed can according
to the product

exhausting

sealing

checking - cooling - processing

vii) Freezing

fresh fruits/vegetables - washing - sorting - balancing &
preparing

Frozen store - Freezing - packaging
40 ° to 12 °c

viii) Drying

fresh fruits/vegetables - Sorting - cleaning - blanching
packaging - drying - osmosis/strips/slice/juice/pulp
(nitrogen or vacuum)

Storage condition (control of temp. relative humidity)

2

ON LINE . PRODUCT TESTING

(10 weeks)

i) Carbonated beverages

- 1) Brix of syrup
- 2) Objective test for colour
- 3) Volume test
- 4) Sealing test
- 5) Foreign matter test
- 6) Clarity

ii) Non- Carbonated beverages

- 1) Brix of fruit pulp/ juice
- 2) Brix of syrup
- 3) Colour objective test
- 4) Volume test
- 5) Sealing test
- 6) Foreign matter test

iii) Jams/Jellies/Marmalades

- 1) Brix while filling & setting test
- 2) Objective test
- 3) Volume test
- 4) Sealing test
- 5) Foreign matter test

iv) Ketchup / Sauces

- 1) Brix of juice / pulp/ paste
- 2) Brix while filling
- 3) Volume test
- 4) Sealing test
- 5) Foreign matter test

v) Pickles

- 1) Salinometer test
- 2) Foreign matter test
- 3) Micro organism test
- 4) Minimum oil content test

vi) Canning

- 1) Checking of Can (type)
- 2) Brix of sugar syrup
- 3) Salinometer test for brine
- 4) Time, Pressure & Temperature Control during exhausting and processing
- 5) Cooling time and temperature

vii) Freezing

- 1) Enzyme test
- 2) Temp. of freezing
- 3) Temp. of frozen storage

viii) Drying

- 1) Moisture Content test (objective)
- 2) Enzyme test

3. QUALITY CONTROL FOR PACKAGING MATERIAL

a) Quality of Packaging Material

(2 weeks)

- i) Hygienic condition of storage
- ii) Durability of material (stability)
- iii) Quality of glass/ plastic /metal
- iv) Layers used in pouches and grammage
- v) Machinery tension test
- vi) Material according to the product

b) Product Packaging Condition

(1 week)

- i) Hygiene of package (finished)
- ii) Amount of material filled as per
- iii) Label specification (PFA FPO) / packaged commodities act
- iv) Damage during production
- v) Package used according to the product standards of package & specification

4. QUALITY CONTROL IN LABORATORY

a) Quality of Raw Material

(8 weeks)

i) Carbonated Beverages:

- Analysis of water
- Analysis of carbondioxide
- Analysis of sucrose
- Analysis of colour/flavour/acids

ii) Non Carbonated Beverages

- Analysis of water
- Analysis of fruit juice/pulp
- Organoleptic tests for fresh fruits
- Analysis of sucrose & KHS
- Analysis of colour/flavour/acids

iii) Jams/Jellies/Marmalade

- Analysis of fruit juice/pulp
- Organoleptic tests for fresh fruits
- Analysis of sucrose
- Analysis of colour/flavour/acids/pectin
- Analysis of sodium benzoate

iv) Ketchup/Sauces

- Organoleptic tests for fresh veg./juice/pulp/paste
- Organoleptic test for spices
- Analysis of salt
- Analysis of Vinegar/Acetic acid
- Analysis of sodium benzoate

v) Pickles

- Organoleptic test for fresh fruits/veg.
- Organoleptic test for spices
- Analysis of spices
- Analysis of vinegar/acetic acid
- Analysis of oils used
- Analysis of salt

vi) Canning/Freezing/Drying

- Analysis done according to the product processed

b. FINISHED PRODUCT QUALITY TEST ACCORDING TO PFA & FPC ACT SPECIFICATION:

i) Carbonated Beverages

Estimation of carbondioxide
Estimation of acid
Colour and flavour tests
Organoleptic tests

ii) Non carbonated Beverages

Organoleptic tests
Estimation of total soluble solids
Estimation of fruit content
Estimation of acid/PH
Estimation of Sulpherdioxide
Microbial tests of products

iii) Jams/Jellies/Marmalades

iv) Organoleptic tests
Estimation of total soluble solids
Estimation of acid/PH
Estimation of fruit contents
Estimation of Benzioc acid
Microbial tests of products

iv) Ketchup/Sauces

Organoleptic tests
Estimation of total Soluble solids
Estimation of acid
Estimation of salt
Estimation of Benzoic acid
Microbial tests of products

v) Pickles

Ogganoleptic tests
Drain weight
Veg/Fruit content
Estimation of salt
Estimation of oil
Estimation of acid
Microbial tests of product

vi) Canning

Cans testing
Organoleptic tests
Drained weight
Estimations according to the product
Microbial tests of product

vii) Freezing

Thawing period
Organoleptic tests
Estimations according to the product
Microbial tests of product

viii) Drying

Rehydration of product
Moisture content of dry product
Organoleptic tests

- ix a) Shelf-life tests at elevated temp. of 37° C & 43° C
b) Periodical Analysis Schedule for the finished products like
 i) Weekly
 ii) Monthly
 iii) Quarterly

5. STATUTORY & VOLUNTARY STANDARDS FOR FOOD PRODUCTS (4 weeks)

- a) FPO Standards
b) BIS standards
c) PFA Act
d) Agmark
e) Weights & Measures Act
h) Package Commodity Act

6. RAW MATERIAL & FINISHED PRODUCT STORAGE (4 weeks)

- i) Hygiene in store & control of insects
ii) Systematic order form of raw material and finished products
iii) Despatch of finished products

7. SUBSTITUTION/REVISION

8. ALL INDIA TRADE TEST