#### PRACTICAL MANUAL

# **Processing of Horticultural Crops**

(Course No. HPH 317) Credits: 3(1+2)

[For B. Sc. (Hons.) Horticulture 6th Semester Students]

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College of Horticulture & Forestry
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#### Syllabus:

Equipments used in food processing units. Physico-chemical analysis of fruits and vegetables. Canning of fruits and vegetables, preparation of squash, RTS, cordial, syrup, jam, jelly, marmalade, candies, preserves, chutneys, sauces, pickles (hot and sweet). Dehydration of fruits and vegetables – tomato product dehydration, refrigeration and freezing, cut out analysis of processed foods. Processing of plantation crops. Visit to processing units.

Name of Student
Roll No
Batch
Session
Semester
Course Name :
Course No. :
Credit
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in the yearin the respective lab/field of College.
Date: Course Teacher

## **INDEX**

SI	Exercise	Page		
No.		No.	instructor	
	<del>-</del>		Signature	
	To understand the purpose of use of processing equipment			
	Determination of maturity on the basis of Total Soluble Solids (TSS) content			
3	To understand the method of total sugar estimation by Alcohol method			
4	To understand the method of reducing sugar estimation			
5	To understand the method of Titrable acidity estimation by AQAC method			
	To understand the method of ascorbic acid estimation by titration method			
7	To understand the method of protein estimation by Lowry's method			
8	To understand the method of starch estimation by titrimetric method			
9	Estimation of crude fibre			
	Estimation of chlorophylls			
	Estimation of lycopene			
12	Study the fruit canning			
13	Study the vegetable canning			
	Study the juice canning			
	Preparation of squash			
16	Preparation of lemon/lime cordial			
	Preparation of RTS (ready to serve) from lime/lemon/mango			
	Preparation of jam			
	Preparation of jelly from guava/apple/jackfruit			
20	Preparation of marmalade			
	Preparation of preserve			
22	Preparation of candy			
	Preparation of Tomato chutney			
	Preparation of tomato sauce/ketchup			
25	Preparation of tomato soup			
26	Preparation of tomato puree and paste			
27	Preparation of tomato cocktail			
28	Preparation of mixed vegetable pickle			
29	Preparation of syrup			
30	Preparation of sweet mango pickle			
31	Preparation of sweet mango chutney			
32	Drying and dehydration of fruits and vegetables			
33	Dehydration of fruits and vegetables			
34	Visit to processing unit			
35	Handling, grading and packaging of cut flowers			
36	Drying of flowers			

# Objective: To understand the purpose of use of processing equipment.

1. Pocket Refractometer:	
	©'ATAGO
	<b>26.9</b> %
	(9 - S3%)  START  (ERO)
	PROCECULAR PAL-1
	-
2. Hand Refractometer:	
	Daylight Plate — Main Prism Assembly
	Calibration Screw
	Rubber Grip-
	Focus Adjustment
3. Fruit Pressure Tester (Penetrometer):	
o. I full I lessure rester (i effetionieter).	
	The same of
	H
4. Spectrophotometer:	

5. Cabinet Dryer:	
	The same
6. Solar Dryer:	
7. Spray Dryer:	D.
	T \
8. Fluidized Bed Dryer:	
	CC.
	4
9. Crown corking machine:	
	12

10. Can Sealer:	
11. Polyethylene Sealer:	
	8
12. Grading Equipment:	
· · · · · · · · · · · · · · · · · · ·	
Advantages of Grading:	

13. Room Cooling:	
14. Forced Air Cooling:	
	Cold Wall Cooling Unit
	Fans
	Carra
15. Hydro Cooling:	
16. Ice Cooling:	
	SANGERT.
	ICE CHAMBER
	TO A CAN PROPERTY ASSETS
17. Vacuum Cooling:	Candener Evepouler o o o o
	Conspection: Vacuum chamber Vacuum pump
	Condensate

# Objective: Determination of maturity on the basis of Total Soluble Solids (TSS) content.

Principle:				
Materials required:				
Procedure:				
Observation:				
Crops	Upper position	Middle position	Lower position	Average

Draw a picture of Hand Refractometer:
Conclusion:

#### Temperature correlation for standard model of sugar Refractometer calibrated at 20 °C

Tamm (0C)	Percentage of dry substance													
Temp. (°C)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
	Subtract of dry substance													
15	0.29	0.31	0.33	0.34	0.34	0.35	0.36	0.37	0.37	0.38	0.39	0.39	0.40	0.40
16	0.24	0.25	0.26	0.27	0.28	0.28	0.29	0.30	0.30	0.30	0.31	0.31	0.32	0.32
17	0.18	0.19	0.20	0.21	0.21	0.21	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24
18	0.13	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16
19	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	80.0	0.08	0.08	0.08	0.08
						Add to t	he readin	g						
21	0.07	0.07	0.07	0.07	80.0	0.08	0.08	0.08	0.08	0.08	0.08	0.08	80.0	0.08
22	0.13	0.14	0.14	0.15	0.15	0.15	0.15	0.14	0.16	0.16	0.16	0.16	0.16	0.16
23	0.20	0.21	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24
24	0.27	0.28	0.29	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32
25	0.35	0.36	0.37	0.38	0.38	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
26	0.42	0.43.	0.44	0.45	0.46	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
27	0.50	0.52	0.53	0.54	0.55	0.55	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
28	0.57	0.60	0.61	0.62	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
29	0.66	0.68	0.69	0.71	0.72	0.72	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
30	0.74	0.77	0.78	0.79	0.80	0.80	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81

Source: Proceeding of the ninth session of the International Commission for Uniform Methods of sugar analysis, London, 1936.

Objective	e: To understand	the method of total sugar estimati	ion by Alcohol method
Principle:			
•			
Reagents:			
Chomical	oronaration:		
Cileillicai	preparation		
Procedure	:		
Observation	on:		
SI. No.	Sample	Titrate value/Reading (ml.)	Total sugar (%)

<u> </u>		4.
		1atian
ua.	L	lation

% Sucrose = (% total invert sugars - % reducing sugars) x 0.95 % Total sugars = (% reducing sugars + % sucrose)		Total sugars as invert sugars (%) = -	Factor × Dilution	-v 100
% Total sugars = (% reducing sugars + % sucrose)		Total sugars as invert sugars (%) = -	Titre × Weight of sample taken	-^ 100
		% Sucrose = (% total invert sugars - % Total sugars = (% reducing sugars	% reducing sugars) x 0.95 s + % sucrose)	
Precaution:				
	Precaution: .			

**Exercise: 4** Objective: To understand the method of reducing sugar estimation. Chemical preparation: **Observations:** Titrate value/Reading (ml.) Sample Reducing sugar (%) SI. No.

Calculation:	For the supplication
Reducing sugars (%) = -	Factor × Dilution  Titre value × Weight of sample taken
	·
Precaution:	

.....

# Objective: To understand the method of Titrable acidity estimation by AOAC method.

Principle:
Reagents:
Chemical preparation:
Procedure:

#### Observation:

Comple No		Micro-burette reading		A a i ditu (0/)
Sample No.	Initial	Final	Average	Acidity (%)

### Calculation:

c= volume made v	Titrable Acidity (%) = ole.  Just taken for examination with distilled water.  Titrable Acidity (%) = 0.0000000000000000000000000000000000	OH solution is 0.1 <i>N</i> ) a X b	XC	x —	100	
Precautions:		 				 

Objective:	To understand method.	the r	method	of a	scorbio	acid	estimati	on by	titration
Principle:									
Reagents:									
Chemical pro	eparation:								
Procedure: .									

#### Observation:

Sample No.	DFV	Titrate value (ml)	Ascorbic acid content (mg/100g)

Calculation: [	D.F.V. (Dye Factor Value)	= 0.5/ Titrate Reading (ml)	
	Ascorbic Acid (mg/100g) =	D.F.V.× Titrate Value × Volume make up Aliquot taken × Weight of the sample	—X 100
Precautions:			

Objective: To understand the method of protein estimation by Lowry's method.  Methods of protein estimation:					
		owry's method:			
Procedure:					
Estimation:					
Observation:					
SI. No.	Sample	Reading at 750 nm	Protein content (mg / 100g)		
1					

Calculations: Express the amount of protein mg / 100g in sample.
Precautions:

Objective: To understand the method of starch estimation by titrimetric method.
Principle:
Descriptor
Reagents:
Chemical preparation:
Procedure:

### Observations:

SI. No.	Sample	Titrate value/Reading (ml.)	Amount of starch (g/100g of fresh weight)

Calculation:		
Amount of starch (g / 100 g of fre	esh weight) = A × B × C × 100 / T × D × 10	00
A- Titrate value D- Weight of the sample	B- Total volume of starch hydrolyze T- Titer value obtained	C- Factor used as constant (0.9)
Precaution:		

## Experiment: 9

Objective: Estimation of crude fibre.
Principle:
Reagents:
Chemical preparation:
Due and divina
Procedure:

#### Observation

Sample No.	W	Wt. of the sample	Crude fiber (%)

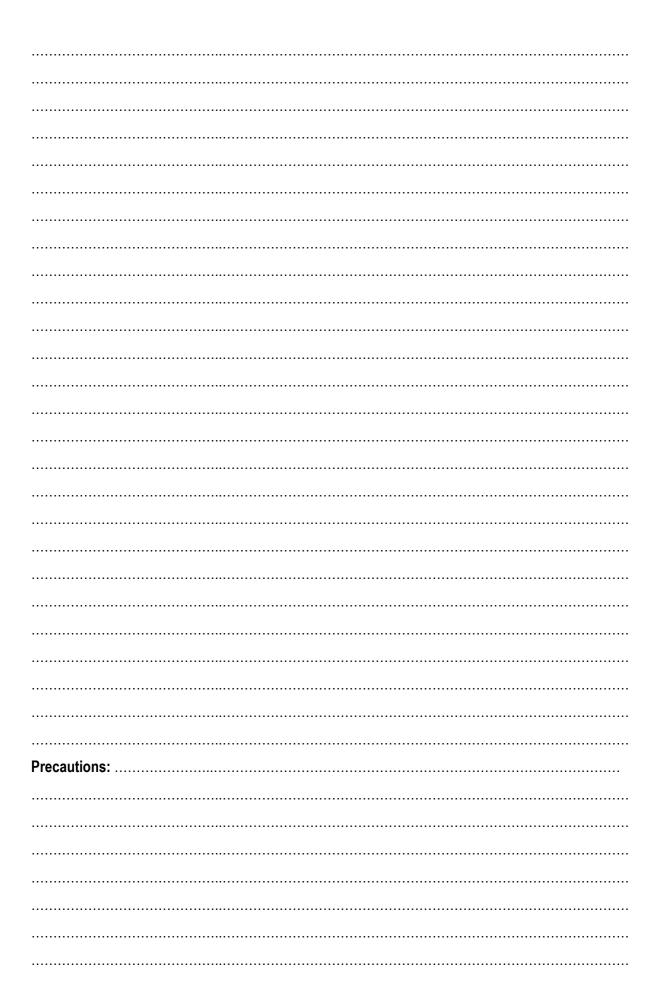
Calculation: Amount of Crude fiber (%) = W × 100 / Weight of the sample taken
Precaution:

Objective: Estimation of chlorophylls.
Principle:
Reagents:
Chemical preparation:
Dropodures
Procedure:

Observ	ration:					
Calculation: Calculate the amount of chlorophyll present in the extract mg chlorophyll per g tissue using the fallowing equation:						
	mg chlorophyll a / g tissue = 12.7 ( $A_{663}$ ) – 2.69 ( $A_{645}$ ) × V / 1000 × W mg chlorophyll b / g tissue = 22.9 ( $A_{645}$ ) – 4.68 ( $A_{663}$ ) × V / 1000 × W and mg total chlorophyll / g tissue = 20.2 ( $A_{645}$ ) – 8.02 ( $A_{663}$ ) × V/1000 × W					
Where,	A= absorbance at specific wavelengths, V= final volume of chlorophyll extract in 80 per cent acetone and W= fresh weight of tissue extracted.					
Precau	tion:					

Objective: Estimation of lycopene.
Describe Lycopene:
Reagents:
Procedure:

#### Calculation:



# **Objective: Study the fruit canning.**

Fruit canning:		
	Selection of commodity	Can fabrication
	Washing/ Sorting/ Grading	Flat cans
	*	Can Reforming
	Peeling/ Coring/ Cutting	Flanging
	Blanching	Double seaming (one side)
	Can Filling	Prepared Can
	*	egetables
	Tulis v	L
	Syruping	Brining
	*	_
	Exhausting	
	Can sealing	
	Heat Processing	
	*	
	Cooling	
	Labeling and Storage	
Draggutional		
Precautions:		

# **Objective: Study the vegetable canning.**

Vegetable canning:		
	Selection of commodity	Can fabrication
	Washing/ Sorting/ Grading	Flat cans
	₩	Can Reforming
	Peeling/ Coring/ Cutting	Flanging
	Blanching	Double seaming (one side)
	Can Filling	Prepared Can
	*	/egetables
		J
	Syruping	Brining
	*	<del>_</del>
	Exhausting	
	Can sealing	
	Heat Processing	
	Treat Processing	
	Cooling	
	Labeling and Storage	
Precautions:		

Objective: Study the juice canning.
Juice canning:
· · · · · · · · · · · · · · · · · · ·
PM PM VOC EMISSIONS EMISSIONS EMISSIONS
EMISSIONS EMISSIONS
RECEIVING HIJCE HIJCE FLASH
RECEIVING AND STORAGE WASH JUICE STRAINER TRAINER COOLER
PM D
PM EMISSIONS
RIED PEEL PRESS HAMMERMILL PEELS, SEEDS, AND PULP
RIED PEEL PRESS PAND PULP PRESS AND PULP
VOC EMISSIONS
CITRUS MOLASSES UJUICE EVAPORATOR STORAGE STORAGE LABELING AND CASING WATER COOLER COOLER FILLER
EVAPORATOR SEASON SEASO
JUICE CANNING
Precautions:

# Objective: Preparation of squash.

Squash:						
		Fruit	Ingredient for one litre pulp/juice			
	SI.		Sugar	Water	Citric acid	Preservative
	No.	110.10	(kg)	(ltr)	(g)	(g)
	1	Orange	1.75	1.0	20	2.5 KMS
		Mango	1.75	1.0	20	2.5 KMS
		Lime, lemon	2.00	1.0	-	2.5 KMS
		Bael	1.80	1.0	25	2.5 KMS
		Litchi	1.80	1.0	25	2.5 KMS
		Pineapple	1.75	1.0	20	1.9 KMS
		Guava	1.80	1.0	20	2.0 KMS
		Papaya	1.80	1.0	25	2.5 KMS
		Karonda	1.80	1.0	5	4.0 SB
		Phalsa	1.80	1.0	5	4.0 SB
		Jamun	1.80	1.0	15	3.0 SB
		Plum	1.90	1.0	10	4.0 SB
		Water melon		0.25	10	1.5 SB
		S- Potassium				
	- XIVIX	- Totalogiani		ouipinic	, ob oodie	iii bonzoato
	• • • • • • • • • • • • • • • • • • • •					
Recipes of squash:						
Elaborate Procedure:						
			Fruits	;		
			1			
		Wasi	v hing & ti	immino		
		vvasi	illig & ti	11111111111	J	
	_		. ♦			
	(	Cutting or grat	ing, and	l remov	al of seed	
			$\downarrow$			
		Ju	ice extra	action		
			1			
			Strainin	na		
			I	ig		
			<b>*</b>			
		Jui	ce mea	suring		
			+			
Prepara	tion of	syrup (sugar -	+ water	+ acid,	heating just	t to dissolve)
			1			
		Stra	aining of	svrup		
		0	J	٠,٠٠٦		
		Mis	dina with	iuiaa		
		IVII	king with	i juice		
			+			
Add	ition of	preservative	(0.6 g K	MS or	1.0 g SB/ltr	Squash)
			$\downarrow$			
			Bottlin	g		
			1	-		
			▼ Cappir	na		
			οαμμπ 	ij		
			, ♦			
			Storag	е		

Precaution:

Objecti	ve: Preparation o	of lemon/lime	cordial			
Cordial:.						
Recipe for	or lemon/lime cordi	al				
SI. No.	Ingredients	Quantity	SI. No.	Ingredients	Quantity	
1	Lime/lemon juice	1 ltr	3	Water	1 ltr	
2	Sugar	1.25 kg	4	KMS	2 g	
Elaborat	e Procedure:					
				Fruits		
			Washing	↓ (running tap water)		
				₩		
				Peeling		
			Cutting of	or slicing into halves		
			h	↓ iice extraction		
			00	UCC EXTRACTION		
Straining						
Addition of preservative (KMS 1g/ltr of juice)						
↓						
	Storing	g in glass container to	or 10-15 days	s for clarification (suspended ↓	materials settles down)	
		S	yphoning off	the supernatant clear juice		
			Straini	↓ ng and measuring		
				$\downarrow$		
			Prep	paration of syrup		
				Straining		
			Missing	of inice with our up		
			iviixing	of juice with syrup		
	Addition of preservative (0.6 g/ltr product)					
				↓ Bottling		
	······································			$\Downarrow$		
				Capping		

Storage in cool and dry place

.....

Precaution:

## Objective: Preparation of RTS (ready to serve) from lime/lemon/mango.

RTS (Ready to serve):							
	SI. No.	Fruit	Juice (Itr)	Sugar (kg)	Citric acid (g)		
		Bael	1.0	1.20	28	7.7	
	2	Lemon/lime	0.5	1.30		8.2	
		Guava	1.0	1.25	28	7.7	
		Mango	1.0	1.25	28	7.7	
		Ginger Aonla blend (aonla	0.25	1.30	30	8.4	
		juice: lime juice: ginger juice 10:2:1)	1.3	1.60	22	10.0	
	I	,					
Elaborate procedure:							
	Fruits L						
	Washing & trimming						
	↓ Cutting or grating, and removal of seed						
		<b>\</b>					
	Juice extraction						
	Straining						
	Juice measuring						
***	Mixing with strained syrup solution (sugar + water + acid, heating just to dissolve)						
Mixing with straine	ed syr	up solution (sugar + wa	ter + aci	d, heatin	g just to di	issolve)	
	Homogenization						
	<b>▼</b> Bottling						
		<b>↓</b>	_				
	Crown corking						
	Pasteurization (at about 90 °C) for 20 minutes						
	Cooling ↓ Storage						
		•					
	•••••						

Precaution:

Objective: Preparation of jam.					
Jam:					
	01	F '41			
	SI.	Fruit/		dients for one	
	1	Vegetable Aonla	0.75	Citric acid (g)	150
	2	Apple	0.75	2.0	100
		Apricot	0.60	1.0	100
	4	Carrot	0.75	2.5	200
	5	Grapes	0.70	1.0	50
	6	Guava	0.75	2.5	150
	7	Karonda	0.80	-	100
	8	Loquat	0.75	1.0	100
	9	Mango	0.75	1.5	50
	10	Musk melon	0.75	2.5	50
		Plum	0.80	-	150
		Peach	0.80	3.0	100
	13	Pear	0.75	1.5	100
Elaborate Procedure:					
Liaborate i roccaure.		Ripe fi	rm fruits		
		1	1		
		Wa	▼ shing		
			Ţ		
		Pe	▼ eling		
			↓		
		Pulping (remov	e seed and co	ore)	
			1	,	
	Addit	ion of sugar (a	dd water if ne	cessary)	
			<b>↓</b>		
		Boiling (with co	ntinuous stirri	ng)	
			<b>\</b>		
		Addition of	of citric acid		
			<b>\</b>		
Judging of end points	nt by fui	ther cooking up	pto 105 °C or	68-70% TSS or I	by Sheet test
			<b>\</b>		
		Filling hot into	sterilized bott	les	
			<b>₩</b>		
		Со	oling		
			<b>♦</b>		
		Wa	axing I		
		^	<b>★</b> .		
		Ca	pping I		

	Storage (at ambient temperature)
Donastian	
Precaution:	
Sheet	or Flake
test:	

blems in jam production:
Crystallization:
Sticky or gummy jam:
Premature setting:
Surface gaining and shrinkage:
Microbial
spoilage:

.....

				Exercise: 1
Objective: Preparation of jelly from		le/jackfrui	t.	LACICISC.
elly:	CI.	Fruit	Ingredients for Sugar (kg)	r one litre extract
	1	Guava	0.75	3.0
	2	Sour apple	0.75-1.00	2.0
	3	Gooseberry	0.80	-
	4	Karonda	0.75	_
	5	Jamun	0.75	1.0
	6	Wood apple	1.00	-
	7	Plum	0.75	2.5
	8	Loquat	0.80	2.0
	9	Papaya	0.75	3.0
Poiling		Washing  utting into thin s	lices of fruit for about 2	0.30 min )
Boiling v	•	<b>↓</b>		,
	Addition of citric	acid during boi	ling (2 g/kg of fruit	t)
		<b>♦</b> Straining of extr	act	
	Pectin	↓ test (for additior	n of sugar)	
		Addition of sug		
		. ↓	u.	
		Boiling ↓		
	Judging of end p	oint (Sheet/Dro	p/Temperature tes	st)
Remova	l of scum or foam	(one teaspoon	ful oil added for 45	5 kg sugar)
	Colour an	d remaining citri	c acid added	
	Filling ho	↓ t into clean steri	lized bottles	
		<b>↓</b> Waxing		

		↓ Capping	
		Storage at ambient temperature	
Def	etermination of pectin conten		
i)			
ii)	Jelmeter test:		
Juc	udging of end point:		
i)			
ii)	Drop test:		
iii)	) Temperature test:		
Pro	roblems	in	jelly
	making:		

			Exe	ercise: 20
Objective: Prepara	ation of marmalade.			
•				
		Marmalade recipe:		
		Sweet orange (malta) Khatta or lime	-	1 kg 0.5 kg
		After pectin extraction		0.0 Kg
		Pectin extract	_	1ltr
		Sugar	-	750 g
		Shredded peel	-	62 g
Elaborate Procedure:		u a fanita		
	KI	pe fruits		
	W	/ashing		
	Peeling outer yello	w portion (flavedo) thinly		
	Cutting yellow portion into fine shred	▼ s (1.9-2.5 cm long and 0.08-0	).12 cm th	nick)
	Cutting of 0.3-0.45 cm thick slices of p	↓           peeled fruit or crushing into pu	ılo in a gr	eater
	outung or one or re on amon once or p	↓ was a substant of the subst	w g.	
	Boiling (in 2-3 times its v	veight of water for 40-60 min.	)	
	Strainir	ng the extract		
	Testing for pesting	tontent (Alcohol test)		
	resung for pecui	Content (Alcohol test)		
	Addition of s	ugar (as required)		
	Cooking to 103-10			
	_	<b>↓</b>		
	Addition of prepared shreds (shredded pee for softening and removing bitterne			
		<b>\</b>		•
	Boiling till jellying p	oint (continuous stirring)		
	Testing for end point	(Sheet/Drop/Temperature)		
	Cooling (to 82-88 °C	★ C with continuous stirring)		

	Flavoring (Orange oil) L
	Filling into sterilized bottles
	▼ Sealing
	▼ Storage at ambient temperature
Drahlama in marmalada makinar	
Problems in marmalade making:	

Objective: Preparation Preserve:	•	
Elaborate Procedure:		
	Mature	fruits
		r da a
	Wasi _	ning -
	Preparation for s	sugar treatment
		,
	Keeping fruit and sugar in alternate layers syrup of 40 %	
	3,000	,
	Remova	l of fruit
	Increasing consistency of sy	run to 60 % TSS by hoiling
	moreasing consistency or ey	7
	Steeping of from	uit (for a day)
	Repeating the process and raising the street	r nath of syrup by 5 % TSS to 70 % TSS on
	alternat	
	Steening in 70 %	TSS for a week
	Steeping in 70 %	155 for a week
	Prese	erve
	Paris	, in a
	Drair	ling L
	Filling in Jar	or Container
		(CO 0/ TOO
	Covering fruit with freshly prepare	ared sugar syrup of 68 % 155
	Sealing (	▼ Airtight)
	0.	Į.
	Stora	age

Duchlama in myanayatian of myanaya	
Problems in preparation of preserve	
Floating of fruits in Jar:	
3 · · · · · · · · · · · · · · · · · · ·	
Stickiness:	
Toughness of fruit skin or peel:	
Fermentation:	

.....

Objective: Prepa	aration of candy.
Candy:	
•	
Elaborate Procedu	re:
	Mature fruits
	₩ashing
	vvasining L
	Preparation for sugar treatment
	↓
	Keeping fruit and sugar in alternate layers (1 kg fruit: 1 kg sugar) or steeping fruit in syrup of 40 % TSS for a day
	↓
	Removal of fruit
	Increasing consistency of syrup to 60 % TSS by boiling
	Ota prime of facilities and and
	Steeping of fruit (for a day) $oxedsymbol{\mathbb{L}}$
	Repeating the process and raising the strength of syrup by 5 % TSS to 70 % TSS on alternate
•••••	days
	↓ Steeping in 75 % TSS for a week
	Uteeping iii 73 % 133 ioi a week
	Draining I
	★ Shade drying (prior to drying, fruits dipped in boiling water to remove adhering syrup)
	↓ Packing
	Storage

Problems in preparation of can	dy:	

Objective: Preparation of Tomato chutney. Chutney:						
Recipe Sl. No.	e for tomato chutney  Ingredients	Quantity	SI. No.	Ingradiants	Quantity	
		Quantity			Quantity	
<u>1</u>	Tomato pulp	1 kg 0.5 kg	8	Cinnamon	10 g 10 g	
3	Sugar Salt	25 g	10	Black pepper Large cardamom	10 g	
4	Onion chopped	100 g	11	Aniseed	10 g	
5	Ginger chopped	10 g	12	Cumin powder	10 g	
6	Garlic chopped	5 g	13	Vinegar	100 ml	
7	Red chilli powder	10 g	14	Sodium benzoate	0.5 g per kg of final product	
Process:  Tomato (fully ripe, red)  Washing  Sorting  Blanching for 2 minutes  Putting quickly in cold water (for crack skin)  Peeling  Crushing  Addition of ingredients except salt and vinegar and cooking for 5 minutes  Addition of preservatives  Filling hot into sterilized bottles  Sealing						
Elabor	Storage at ambient temperature (in cool and dry place)  Elaborate procedure:					

Precautions:

#### Exercise: 24 Objective: Preparation of tomato sauce/ketchup. Sauce/ketchup:.... Recipe for tomato sauce/ketchup SI. Quantity Ingredients Quantity Ingredients Ingredients Quantity No. No. No. Tomato pulp 6 Garlic chopped 10 g 1 kg 5 g 11 Aniseed 0.75 g 7 Red chilli powder 12 Cumin powder 10 g Sugar 5 g 3 Salt 10 g 8 Cinnamon 10 g 13 Clove headless 5 No. 4 Onion chopped 50 g 9 Black pepper 10 g 14 25 ml. Vinegar 10 g 10 Large cardamom 15 Sodium benzoate 0.25 g per kg of final product 5 Ginger chopped 10 g **Process:** Tomato (fully ripe, red) Washing Sorting and trimming Cutting and chopping Heating at 70-90 °C for 3-5 minutes (to soften) Pulping or extraction of juice/pulp (mechanically or by sieving) Straining tomato pulp/juice Cooking pulp with one third quantity of sugar Putting spice bag in pulp and pressing occasionally Cooking to one third of original volume of pulp/juice Removal of spice bag (after squeezing in pulp) Addition of remaining sugar and salt Cooking Judging of end point (tomato solids by hand Refractometer/volume by measuring stick, i.e., one third of its original volume Addition of vinegar/acetic acid and preservative Filling hot into bottles at about 88 °C Crown corking Pasteurization (at 85-90 °C for 30 minutes) Cooling

Storage at ambient temperature (in cool and dry place)

Elaborate procedure:

Precautions:	

#### **Objective: Preparation of tomato soup** Recipe for tomato soup Ingredients SI. No. Ingredients Quantity SI. No. Quantity 1 kg 5 No Tomato pulp Cloves 2 Salt 10 g 8 Cumin 1 g 3 Butter/Cream 20 g 9 Large cardamom 1 g 10 4 Flour/starch Black pepper 10 g 1 g 5 Onion (chopped) 20 g 11 Cinnamon 1 g 6 Garlic (chopped) 12 Water 350 ml 5 g **Process:** Tomato pulp/juice (strained) Boiling to concentrate Putting spice bag in cooking pan Preparing paste of butter and flour/starch Addition to concentrated juice Cooking to desired consistency with continuous stirring (to prevent coagulation of starch) Addition of sugar and salt and cooking for 2 minutes Removal of spice bag (after squeezing) Filling into cans (plain cans) Sterilization (115 °C for 40-45 min.) Cooling Storage at ambient temperature (in cool and dry place) Elaborate procedure:

Precautions:

Objective: Preparation of tomato puree and paste
Introduction:
Process:
Tomato juice
↓↓ Cooking to desired consistency (open cooker/vacuum pan)
Judging of end point for puree or paste (tomato solids by hand Refractometer or volume by measuring stick)
$\Downarrow$
Filling hot into bottles or cans (82-88 °C)
Sterilization in boiling water for 20 minutes
Cooling
↓↓ Storage at ambient temperature (in cool and dry place)
Elaborate procedure:

Precautions:			

## Objective: Preparation of tomato cocktail.

It is prepared just before serving or served from stock.

#### Recipe:

SI. No.	Ingredients	Quantity	SI. No.	Ingredients	Quantity
1	Tomato juice	5.0 ltr	7	Black pepper	1.5 g
2	Salt	45 g	8	Coriander seed	1.5 g
3	Lime juice	60 ml	9	Large cardamom	1.5 g
4	Red chilli powder	0.25 g	10	Cinnamon powder	1.5 g
5	Clove (headless)	5 No.		Vinegar (10% acetic acid)	300 ml
6	Cumin	1.5 g			

**Process:** 

Tomato juice (strained)

↓

Putting spice bag in juice and cooking gently for 20 min in covered vessel

↓

Addition of strained lime juice, vinegar and salt (if desired a little sugar may also be added)

↓

Heating at 82-88 °C

↓

Filling hot into bottles

↓

Crown corking

↓

Sterilization (at 100 °C) for 30 minutes

↓

Cooling

↓

Storage at ambient temperature (in cool and dry place)

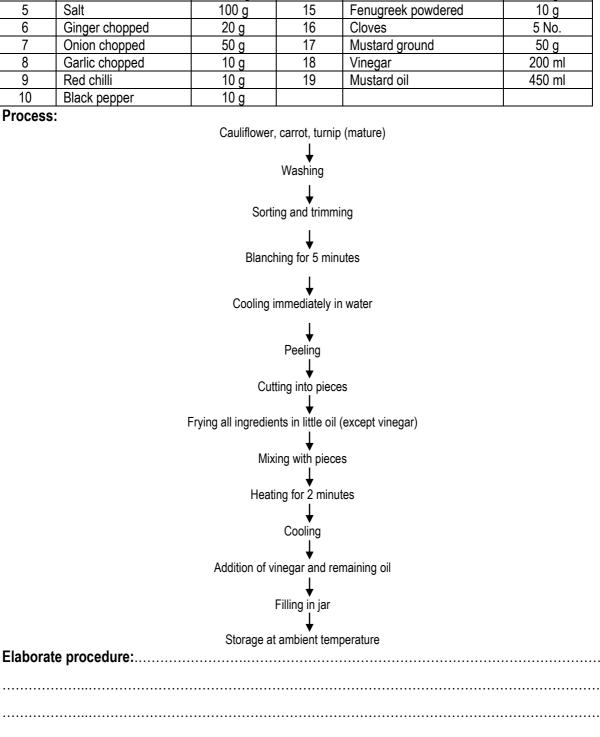
Elaborate procedure:	
Precautions:	•••

## Objective: Preparation of mixed vegetable pickle.

## Recipe for mixed vegetable pickle

SI. No.	Ingredients	Quantity	SI. No.	Ingredients	Quantity
1	Cauliflower pieces	1.0 Kg	11	Turmeric	10 g
2	Diced carrot	1.0 Kg	12	Large cardamom	10 g
3	Turnip slices	1.0 Kg	13	Aniseed	10 g
4	Peas	1.0 Kg	14	Cumin	10 g
5	Salt	100 g	15	Fenugreek powdered	10 g
6	Ginger chopped	20 g	16	Cloves	5 No.
7	Onion chopped	50 g	17	Mustard ground	50 g
8	Garlic chopped	10 g	18	Vinegar	200 ml
9	Red chilli	10 g	19	Mustard oil	450 ml
10	Black pepper	10 g			

Process:



Precautions:	

Objective: Preparation of syrup.
Recipe:
Dwaaaa.
Process: Selection of fruits (ripe)
Working (suppling top water)
Washing (running tap water) ↓
Crushing of fruit pieces
Fruit juice / pulp extract
Staining (with muslin cloth)  ↓
Mixing with strained syrup solution (sugar + water + acid, heating just to dissolve)
Bottling (sterilized)
Sealing (with crown cork or P.P. Cap)
Storing (cool and dry place)
<b>Note:</b> Fruit based syrups do not need preservatives, but for longer shelf-life 350 ppm KMS or 600 ppm sodiun benzoate may be added before bottling. In case of synthetic syrup, the syrup is strained before adding essence and colour.
Elaborate procedure:
Liaborate procedure

Precautions:	 	

## Objective: Preparation of sweet mango pickle.

**Introduction:** Pickling is the most ancient method of preservation of fruits or vegetables. Pickles are good appetizer and add to the palatability of a meal. Pickles of mango, lime, cauliflower, cabbage etc. are available. This is a suitable product for home scale preservation. There are three types of pickles viz. oil pickle, salt pickle and vinegar pickle.

Aim: To learn the preparation of sweet mango pickle.
Recipe:
Process:
Selection of fruits (fully mature green)
↓ \
Washing (running tap water)
↓ Peeling
T cening ↓
Cutting or slicing
<b>5</b>
Putting slices in jar (sterilized)
Add the salt in jar
$\downarrow$
Putting in sun (for 1 week shake the jar at least twice a day to mix the salt)
↓ Mixing the spices
Wilking the spices  ↓
Add the sugar or jiggery in the jar
Seal the jar (with P.P. Cap)
$\downarrow$
Storage at ambient temperature (cool and dry place)
Elaborate procedure:

Precautions:	

## Objective: Preparation of sweet mango chutney

Introduction: The preparation of chutney is similar to that of jam except that spices, vinegar and salt are added in chutney. Mango chutney is an important fruit product exported from India to many countries. Chutney and sauces can be prepared both in home and commercially. They are good appetizer. Fruit such as mango, apple, plum, apricot and vegetable like tomato, cauliflower, turnip or carrot etc. are generally used.

Aim: To learn the process of chutney preparation from mango fruit.
Recipe:
Process:
Selection of fruits (fully mature mango)
Washing (running tap water) ↓
Peeling ↓
Cutting or slicing with stone or without stone
Cook the cut pieces with little water to make it highly soft   ↓  ↓
Mixing with sugar and salt and leaving for 1 hour   ↓  ↓
Keeping all ingredients (except vinegar) in cloth bag, tied loosely, putting in mixture and cooking on low flame
During cooking spice bag pressed occasionally   ↓
Cooking upto temperature (105 °C temperature) slirring occationally
Removal of spice bag after squeezing
Addition of vinegar ↓
Cooking for 2-3 minutes
Filling hot into hot sterilized jar
Sealing (airtight) P.P. Cap
Storage at ambient temperature (cool and dry place)
Elaborate procedure:

Precautions:	

Objective: Drying and dehydration of fruits and	l vegetables
Drying:	
, 3	
Dehydration:	
Draw a neat sketch of dryer:	
•	

## Objective: Dehydration of fruits and vegetables

**Introduction:** In dehydration process a single layer of fruit or vegetables, whole, sliced or cut into pieces are spread on trays which are placed inside the dehydrator.

#### Schedule for drying and dehydration of fruits:

Fruits	Preparation and pretreatment	Sulphuring time	Drying temperature	Drying ratio (%)
	Wash, peel, cut in to slices length wise or cross wise, 12 mm thick	30 minutes	55-60 °C or sun drying	15-20
Mango	Wash, peel, cut into 12 mm thick slices	2 hours	45-50 °C or sun drying	8-10

## Schedule for drying and dehydration of vegetables:

Fruits	Preparation and pretreatment	Sulphuring time	Drying temperature	Drying ratio
	Wash, remove stalks, covering	Blanch 4-5 min. immerse for 1 hour in 1%		35:1
	leaves and stems, break flowers apart into pieces of suitable size	KMS sol. and drain	sun drying	
Cabbage	Wash, remove outer leaves and	Blanch 5-6 min. immerse for 10 min in	55-60 °C or	18:1
	core, cut into fine shreds	0.5% KMS sol. and drain	sundry	
Green peas	Wash, remove shell and collect the	Blanch or steam for 3-4 min. immerse in	60-65 °C or	7:1
	grain	0.5% KMS sol. and drain	sundry	
Potato	Wash, peel and cut into 10 mm	<b>J</b>	60-65 °C	7:1
	thick slices	min. and immerse in 0.5% KMS solution	sundry	

Precautions:

Objective: Visit to processing unit.
<b>Exercise:</b> Write a brief report on the visit to the processing unit with full details of the unit.

## Objective: Handling, grading and packaging of cut flowers.

**Introduction:** The handling, grading and packaging of cut flowers are most important factors for the purpose of local marketing as well as export point of view.

Aim: To study the proper handling, grading and packaging of cut flowers.

How to handle the cut flowers:	
a)	
b)	
c)	
d)	
How to grading the cut flowers: a)	
b)	
c)	
d)	
How to pack the cut flowers by the help of packaging materials.	
b)	
c)	
d)	
e)	
What do you mean by post-harvest management of cut flowers?	

# **Objective: Drying of flowers**

Introduction:	its original shape a in domestic as well	nd colour and	look very atti	ractive. Dried			
Requirements	s:						
	Type of dryer	Drying condition		Effect of drying			
Type of flower		Temp (°C)	Time (min.)		Retention of colour	Remarks	
	Cabinet dryer						
	Microwave oven						

## Student's Notes