



# Process technology for Nutmeg (*Myristica fragrans*)



**AATMANIRBHAR BHARAT**

PM Formalisation of Micro Food Processing  
Enterprises Scheme (PM FME Scheme)



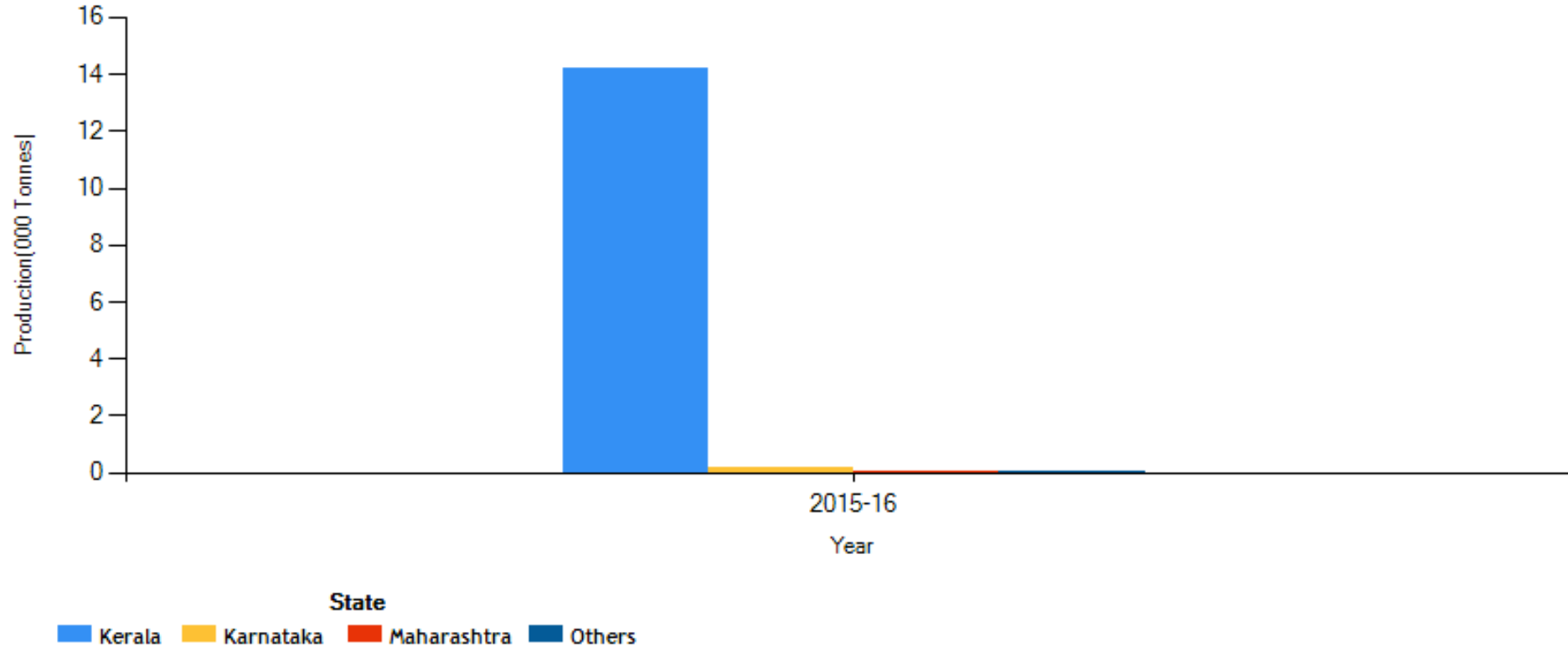
## NUTMEG (*Myristica fragrans*)



- A twin spice – seeds and mace are utilized as spice.
- Cultivated in 23 ('000 Hectares) in India with an annual production of 15 ('000 MT).
- Fleshy outer rind of nutmeg could also be used for value addition.
- Major varieties are **IISR Viswashree, konkan sugundhu and konkan swad.**
- Cultivated in sandy loam, clay and red laterite soils in warm, humid conditions with annual rainfall of 150 cm.



# NUTMEG PRODUCTION ACROSS INDIA



Major share of nutmeg production was in Kerala (98.13%), followed by Karnataka (1.38%) data as on 2015-2016

Source: National Horticultural Board



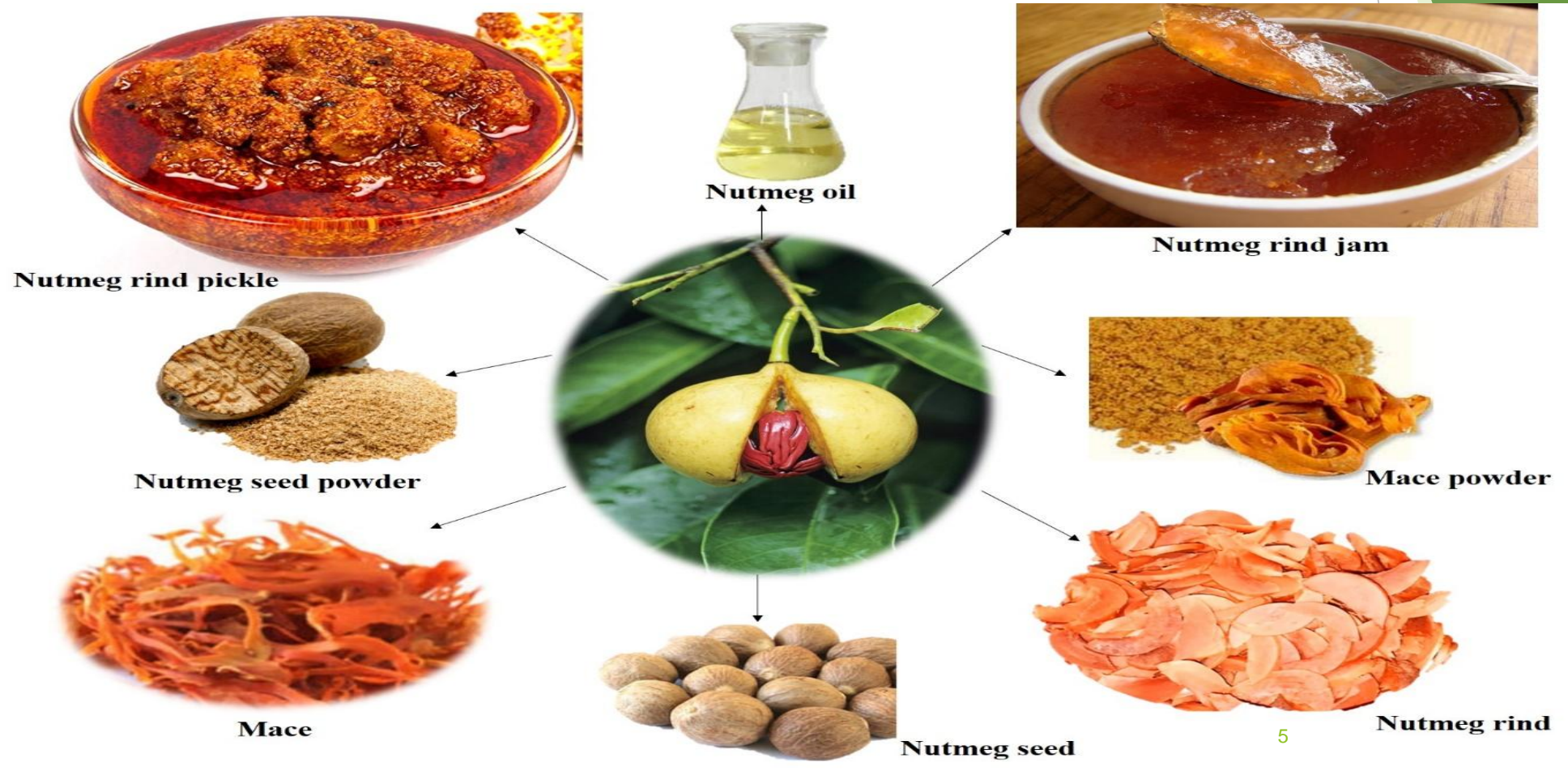
## NUTRIENT COMPOSITION OF NUTMEG



	Nutrients (per 100 g)					
	Carbohydrate	Protein	Fat	Calcium	Iron	Phosphorus
Nutmeg rind	11.2 g	1.0 g	0.4 g	40.0 mg	2.0 mg	10.0 mg
Nutmeg seeds	27.64 g	6.30 g	36.52 g	148.0 mg	2.33 mg	207.0 mg
Mace	47.8 g	6.50 g	24.4 g	180 mg	12.3 mg	100 mg



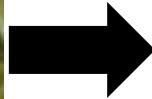
# MAJOR PRODUCTS & BY-PRODUCTS OF NUTMEG



# PROCESSING OF NUTMEG SEEDS & MACE



Fully ripened fruits (in about 6-8 months)



Nutmeg seed with mace

Blanch in hot water at 75 °C for 2-5 minutes



Dry in oven at 55-60 °C for about three to four hours



Dried for 4 to 8 weeks under sun / mechanical dryers at 40-50 °C for 5-6 hrs



# GRADING & CRACKING OF NUTMEG SEEDS



- Nutmeg seeds are graded using the meshes and outer shell is cracked using commercial seed cracker 7



## POINTS TO BE CONSIDERED WHILE HARVESTING & DRYING

- Always prefer freshly harvested nutmeg fruits than fallen fruits from the orchards.
- Blanching of nutmeg seeds with mace in hot water containing 100 ppm of chlorine or 1000 ppm of alum is recommended to avoid mould growth on mace.
- After harvesting, **immediate drying** of mace are recommended to avoid microbial contamination.
- Drying temperature should be maintained at **40-50 °C** in seeds to avoid lose of essential oil and oleoresin content.







## FSSAI STANDARDS OF NUTMEG SEED, MACE AND ITS POWDERS

Quality parameters	Nutmeg seed (Jaiphal)	Nutmeg seed powder	Mace (Jaipatri)	Mace powder
<b>Extraneous matter</b>	Absent	----	Not > 0.5 % by wt.	----
<b>Moisture</b>	Not > 10 % by wt.	Not > 8% by wt.	Not > 10 % by wt.	Not > 10 % by wt.
<b>Total ash on dry basis</b>	Not > 3.0% by wt.	Not > 3.0 % by wt.	Not > 4.0% by wt.	Not > 3.0% by wt.
<b>Ash insoluble in dilute HCl on dry basis</b>	Not > 0.5 % by wt.	Not > 0.5 % by wt.	Not > 0.5 % by wt.	Not > 0.5 % by wt.



Quality parameters	Nutmeg seed (Jaiphal)	Nutmeg seed powder	Mace (Jaipatri)	Mace powder
<b>Volatile oil content on dry basis</b>	Not < 6.5 % by v/w	Not < 6.0 % by v/w	Not < 7.5 % by v/w	Not < 5.0 % by v/w
<b>Insect damaged matter</b>	----		Not > 1.0 % by wt.	----
<b>Nutmeg in mace</b>	----		Not > 1.0 % by wt.	----
<b>Crude fibre</b>	----	Not > 10% by wt	----	Not > 10% by wt
<b>Non-volatile ether extract</b>	----	Not < 25.0 % by wt.	----	Not < 20 & not > 30 % by wt
<b>Calcium content expressed as calcium oxide on dry basis</b>	Not > 0.35 % by wt.	----	----	----

## NUTMEG RIND CANDY

- A traditional recipe of Indonesian islands where they call it as 'manisan pala'

### Ingredients required

<b>Peeled nutmeg rind</b>	1 kg
<b>Sugar syrup</b>	enough quantity to completely immerse the rind slices at 40% concentration (40 g of sugar in 100 ml water)
<b>Potassium metabisulphite</b>	150 ppm



# FLOWCHART FOR MAKING NUTMEG RIND CANDY

Peel the nutmeg and steam blanch for 10 minutes

Cut the nutmeg rind into longitudinal slices

Make sugar syrup (proportionally to the quantity of rind slices at 40 % concentration)

Put sliced nutmegs into sugar solution

Add preservative KMS at 0.15 g per kg of fruit

Keep this mixture of nutmeg slices and sugar syrup overnight

Boil this mixture daily to increase the concentration of syrup by 5 °brix until it reaches 70 °brix

Dip the nutmeg slices in luke warm water to drain off the excess syrup and dry it in cabinet dryer at 60 °C for 6-8 hrs.

Pack the dried nutmeg candies in sealed air tight polythene bags and store up to 6 months

# NUTMEG RIND JAM



## Ingredients required

<b>Peeled nutmeg rind pulp</b>	: 1 kg
<b>Sugar</b>	: 2 kg
<b>Citric acid</b>	: 1 g per kg of pulp
<b>Potassium metabisulphite</b>	: 40 ppm

- Jam and jellies have a wide market in India with a market share of around \$ 211 million in 2016

# FLOWCHART FOR PREPARATION OF NUTMEG JAM



Take nutmeg rind and wash it thoroughly under running water

Peel the rind and blanch it in steam for 5 minutes

Pulp the rind and strain the pulp through strainer

Add sugar double the quantity of pulp

Add preservatives like citric acid (1g/kg) and KMS (0.04g/kg)

Heat the mixture on medium flame until the TSS reaches 68 •brix

Checking end point by sheet test / refractometer

Once done it needs to be filled in hot to sterilized bottles

Cooled, capped and stored at ambient temperature



## FSSAI STANDARDS FOR FRUIT JAM



Parameters	Permissible limits
Total soluble solids	Not < 65 %
Fruit content	Not < 45 %
Preservatives	Sulphur dioxide – 40 ppm Benzoic acid – 200 ppm Sorbic acid – 500 ppm
Microbial contamination	Mold count: not > 40 % of the field examined Yeast and spores: not > 125 per 1 /60 c.m.m



# NUTMEG RIND SYRUP



<b>Unpeeled nutmeg rind pulp</b>	1 kg
<b>Sugar</b>	0.6 kg per liter of extract
<b>Water</b>	2 liters
<b>Potassium metabisulphite</b>	0.35 g per kg of syrup





# FLOWCHART FOR PREPARATION OF NUTMEG RIND SYRUP

Nutmeg rind is collected and washed thoroughly to remove the dirt adhering to the surface



The rind is boiled in water (double the quantity of rind) for 30 minutes



Further the extract is decanted and mixed with sugar



Boil the mixture till the TSS is 65 •brix



Add preservative KMS (0.35 g per kg of syrup)



Cool the syrup and bottle it and store at ambient temperature



# NUTMEG RIND POWDER

Wash the nutmeg rind and cut it into thin slices



Keep the slices under sun dry at atmospheric temperature 32.4 °C for 72 hrs



Stir the slices occasionally while kept for drying



Once dried completely, powder the slices using a pulverizer



Store the powder in air tight PET containers

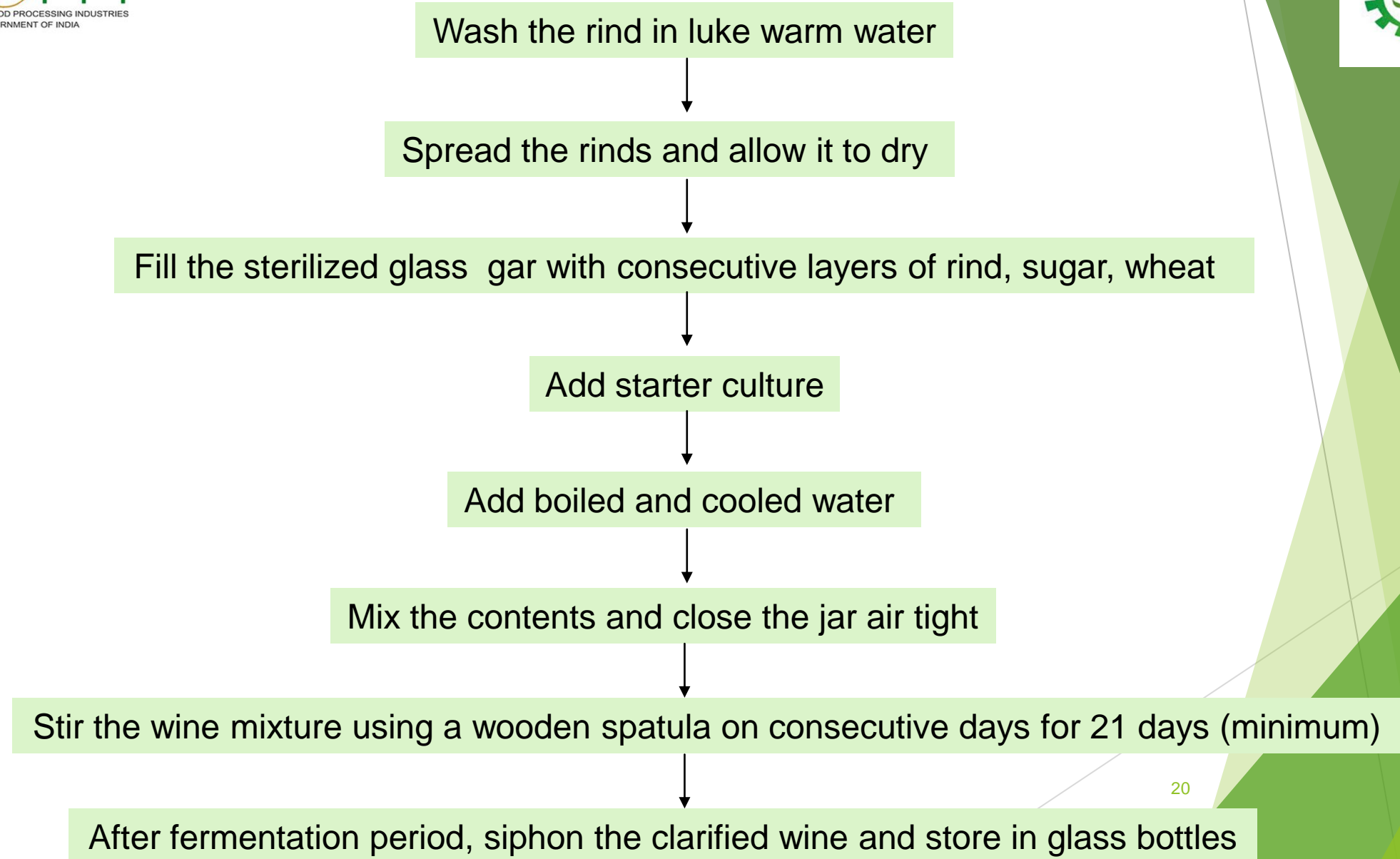




## NUTMEG RIND WINE

<b>Nutmeg rind</b>	: 1 kg
<b>Sugar</b>	: 1 kg
<b>Water</b>	: 1 liter
<b>Whole wheat</b>	: 10 g
<b>Starter culture</b>	: yeast (5g) + sugar (1 table spoon) mixed in luke warm water (20 ml)

# FLOWCHART FOR PREPARATION OF NUTMEG RIND WINE





## FSSAI STANDARDS FOR FRUIT SYRUP

Parameters	Permissible limits
Total soluble solids min (%)	65 %
Min (%) of puree in the final product	25 %
Acidity expressed as citric acid max (%)	3.5 %
Preservatives	Sulphur dioxide – 350 ppm Benzoic acid – 600 ppm Sorbic acid – 1000 ppm

## Nutmeg rind pickle



<b>Sliced Nutmeg rind</b>	: 2 cups
<b>Water (boiled &amp; cooled)</b>	: ½ cup
<b>Spice mix:</b>	
<b>Red chilly powder</b>	: 2 tsp.
<b>Asafoetida</b>	: ¼ tsp.
<b>Gingelly/sesame oil</b>	: 3 tsp
<b>Fenugreek powder</b>	: ¼ tsp.
<b>Mustard seeds</b>	: ½ tsp.
<b>Red dried chilly</b>	: 5 numbers
<b>Curry leaves</b>	: 10 leaves



# FLOWCHART FOR PREPARATION OF NUTMEG RIND PICKLE

Heat the oil in a deep bottom pan and splutter mustard seeds



Add red chilly, curry leaves, fenugreek powder and asafoetida



Turn down the flame and add nutmeg rind pieces



Add vinegar and mix



Store the mixture in sterilized glass bottles



## REFERENCES



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