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PROCESS TECHNOLOGY FOR ROASTED GROUNDNUTS

AATMANIRBHAR BHARAT

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

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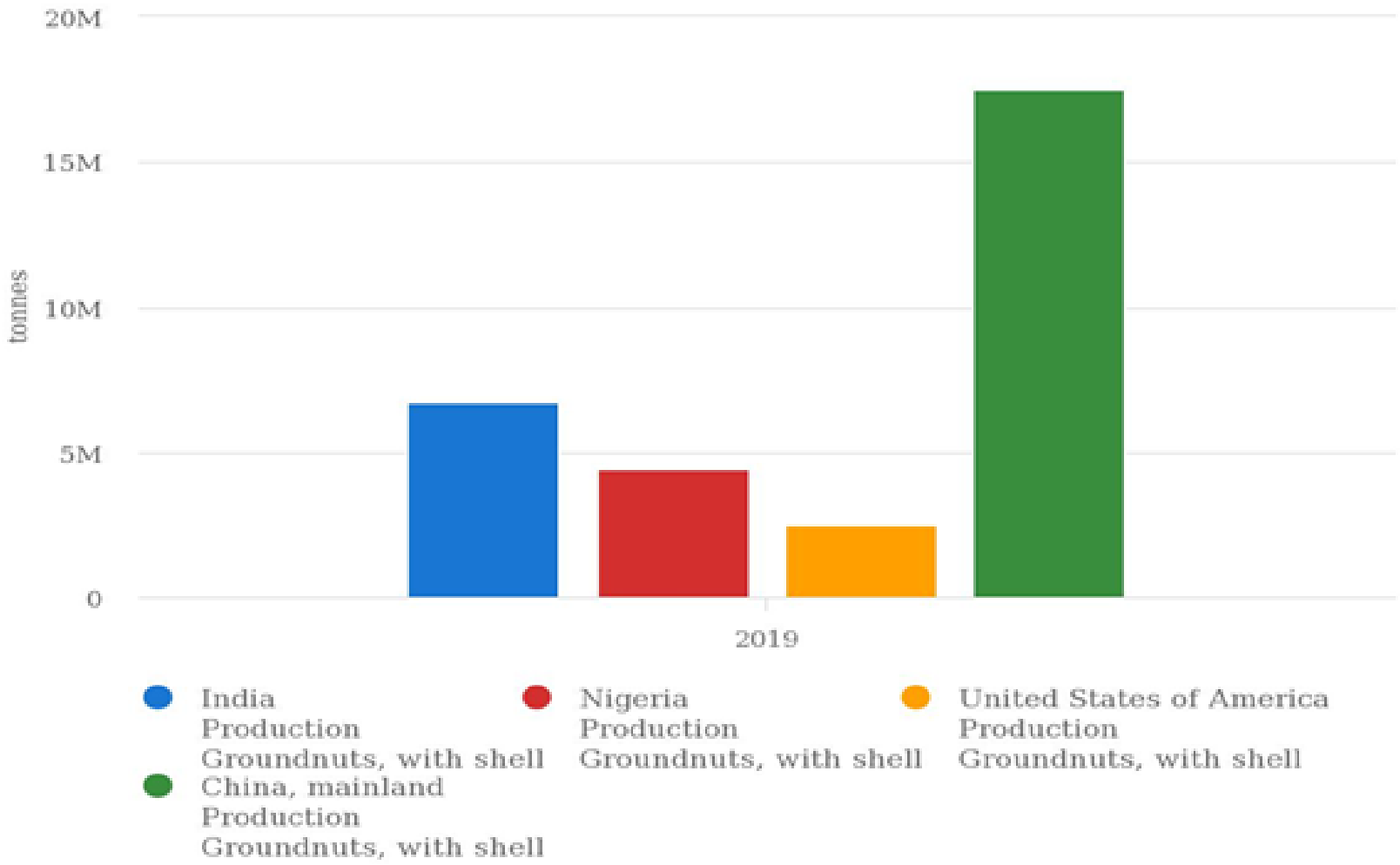
INTRODUCTION

- Ground nut (*Arachis hypogaea*) is one of the major with an annual production of 80 to 85 lakh MT.
- Major producing states are Gujarat (20.84 lakh tones), Andhra Pradesh (5.82 lakh tones), Rajasthan (11.26 lakh tones), Karnataka (2.87 lakh tones) and Maharashtra (2.66 lakh tones)
- Groundnuts are the fourth most source of edible oil
- It is a rich source of protein

GROUND NUT PRODUCTION IN MAJOR COUNTRIES IN 2019



(Source: FAOSTAT, 10 Feb 2021)

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MAJOR NUTRIENTS IN GROUNDNUTS

Nutrients	Per 100 gram of groundnut
Protein	23.65
Carbohydrate	17.27
Total fat	39.63
Total fiber	10.38
Total folates	90.89 (µg)
Calcium	54 mg
Iron	3.44 mg
Sodium	12.21 mg
Potassium	679 mg
Zinc	3.18 mg

Source: Nutritive value of Indian Foods, NIN

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HEALTH BENEFITS OF GROUNDNUTS

Parameter	Benefits
Antioxidant activity	p-coumaric acid an antioxidant metabolite in groundnut has antioxidant activity
Anti-cancer activity	There is an inverse negative correlation in peanut consumption and risk of colon cancer
Heart healthy	Groundnuts contain more mono unsaturated fatty acids (50%) and only 14% saturated fatty acids
Diabetes	Magnesium and dietary fiber in peanuts makes it anti-diabetic

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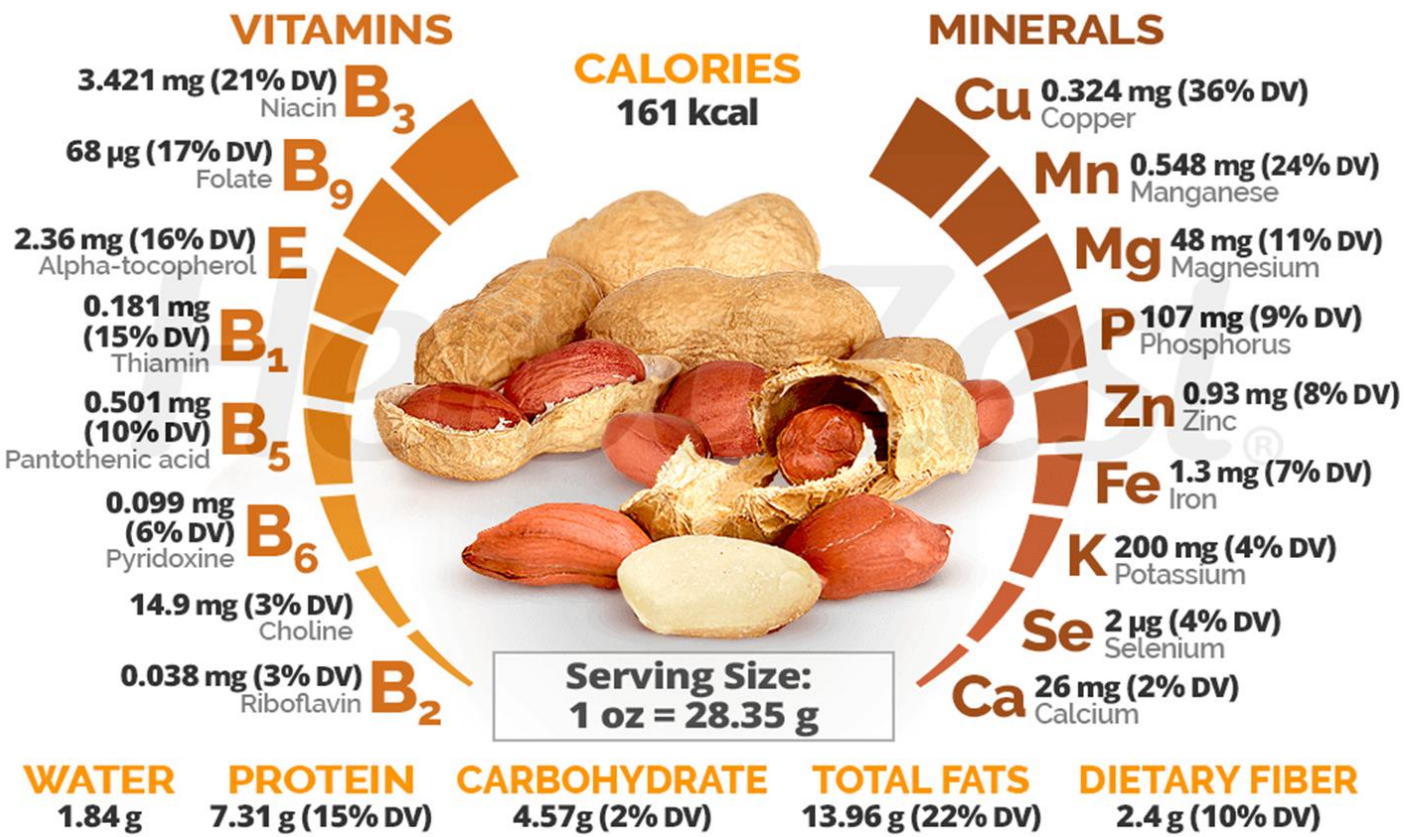
NUTRIENTS IN ONE SERVING OF PEANUTS



(source: www.herbazest.com)

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CULTIVATION OF GROUNDNUTS

- Groundnut belongs to the legume family which grows up to 30 – 50 cm tall.
- Widely cultivated in tropical, sub-tropical and warm temperate zones.
- The plant grows well at 24 to 27 degree Celsius
- Well drained sandy, sandy loam soils are suitable soils for groundnut cultivation.
- Good quality bold seeds should be utilized for efficient germination.
- In India ground nut is cultivated in all the four seasons while 85% of it is done in kharif season, where 50 – 125 cm well distributed rains are received.

COMMONLY CULTIVATED GROUNDNUT VARIETIES

Zone	State	Varieties
1.Northern Zone	Punjab Haryana Uttar Pradesh	M-13, M-37, M-145, MA-10, T-64, T-99, TE-1, ICCV-86564, Punjab-1, C-501, T-28, M-197, PC-1, ICCS-1, ICCS-5, DRC-17, M-1, M-2, Chitra Amber, Amber mikta
2.Western Zone	Gujarat Rajasthan	ICCS-44, CC-11, CAUC-10, ICCS-37, RSB-87, Punjab-1, CC-20, Somnath, M-13, RS-1, CC-7, BAU-13, CC-5, SB-11, TC-10, ICCS-479, ICCS-86564, TAC-24
3.Central Zone	Maharashtra Madhya Pradesh	Phale-Pragati, Copergoan-1, Faizapur-5, Prakash, Koynavikram, TAG-24, J(E)3, AK-12, AK-24, TG-17, ICGS-37, M-13, SG-84, HNG-10, AK-22, ICGS-11, TE-1, TAG-24, Jyoti
4.Eastern Zone	Orissa, Bihar West Bengal	BG-1, BG-2, B-30, M-13, B-31, BAU-13, BG-3, BP-1, BP-2, Birsa Bold, GG-2, Kisan, Jawan
5.Southern Zone	Andhra Pradesh Tamil Nadu Karnataka	ICGS-11, TMV-2, S-206, Pondicherry-8, JL-24, TMV-1, TMV-4, Kadiri-2, Kadiri-3, TMV-10, IEGV-87160, ICGV-86143, TMV-6, DRE-1, ICGV-86564, DH-8, DH-3-30, K134, VRI-2, HG-10, TMV-8, TMV-9, TMV-12, TMV-12, KRG-1, CO-3, CP-4

(Source: https://agritech.tnau.ac.in/agriculture/oilseeds_groundnut.html)

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HARVESTING OF GROUND NUT

- Pods harvested before attaining maturity will results in low yield and shrunken seeds.
- Delayed harvest leads to seed germination.
- Indication for proper harvest is yellowing of the foliage and fall of old leaves.
- In bunch varieties of ground nuts the pods are harvest by pulling.
- in spread type it is harvested by ploughing.

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STEPS IN HARVESTING

STRIPPING	Can be done either manually or using drum or comb type strippers.
THRESHING	Is done with the help of mechanical threshers to remove the pods from the plant.
WINNOWING	Is done to remove the chaff from the pods.
CURING	Is the drying process to reduce the water content of pods to 10 – 15 %.
SHELLING	Pods will be shelled to fetch more value to the product.
CLEANING	To remove the foreign materials in the final product.

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GROUNDNUT POD STRIPPER

Dimensions (lxwxh),m	1.4x1.0x0.6
Weight, kg	115
Cylinder size, mm	270 dia x 1250
Beater size	60 mm height, 120 Nos.
Type, of blower	Throwing type, One No.
Power source	2 hp electric motor
Cylinder speed, rev./min	330
Output capacity, Kg/h	120
Stripping efficiency, per cent	100
Cleaning efficiency, per cent	98 (total grain losses nil)
Power consumption, kW	1.2
Labour requt., man-h/q	3

(Source: https://dmi.gov.in/ComProfiles.aspx)

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GROUNDNUT POD THRESHER

Power Required	35 HP
Capacity	1000-1500 kg / hr
Usage/Application	Multi crop threshing
Material	Mild Steel
Price	3.00 lakh

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GROUNDNUT THRESHER

Power required	35 hp
Material	M.S. IRON & CAST IRON
Working	THRESHING GROUNDNUT
Application	Threshing of Groundnut & Gram
Threshing Capacity	1000 - 1500 kg/hr

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MECHANICAL STRIPPER CUM DECORTICATOR

- Low cost, sturdy, portable machine that strips pods from plant as well as decorticates kernel from pod
- Ensures maximum financial return to the producer since decorticated groundnut has greater market value than groundnut pods
- Production efficiency of this manually operated machine is 0.34 hectare per day (stripping) and 75 Kg per hour (decortications)
- Seed quality decortications is possible with this

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CURING OF GROUNDNUTS

- Curing is done to the pods to reduce the water content of groundnut pods to 10 – 15 %.
- Efficient drying process avoids contamination and spoilage of pods during storage.
- Curing is done through sun drying, windrowing, forming heaps (proposed by Directorate of Oilseeds Research, Hyderabad), tripod structures (proposed by National Research Centre for Groundnut).
- Exposure of pods to direct sunlight is not advisable.
- Use of artificial dryers are found to be effective.

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BATCH DRYERS

- Pods are dried at 54 •C with air flow of 110 cu. ft. per minute.
- This enhanced the drying of pods in 16 hours with a moisture reduction from 48 % to 8%.

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MECHANICAL GROUNDNUT DECORTICATOR

Automation Grade	Automatic
Material	MS Sheets
Frequency	50 Hz
Phase	Single
Voltage	220 V

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MANUAL GROUNDNUT DECORTICATOR

TNAU groundnut decorticator

Dimensions (lxwxh),m	1.27x0.87x0.52
Size of oscillatior	520 mm arc length, 270 mm radius
Weight, kg	13
Power source	1 person
Shelling efficiency, percent	98
Shelling capacity, Kg/h	100 (graded pods)
Broken kernels, percent	1-2
Total kernels losses, percent	1-2
Labour requt., man-h/q	1

CLEANING OF GROUNDNUTS

- Machine is fully automatic type
- Use brusher rollers for cleaning
- Low crashing ratio, convenient sewage discharge,
- High output

- **Presence of foreign materials should be less than 5%.**

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EXPORT VALUE OF GROUND NUT PRODUCTS IN 2018

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ROASTED PEANUTS

- Roasting the kernel produce around 300 flavour compounds.
- Pyrazine compounds namely hexanal, hexanol methylpyrrole and benzene acetaldehyde.
- Roasting groundnuts found to increase the coumaric acid levels up to 22%.
- Roasting is done via many ways like dark roasting, deep frying and blister frying.

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TYPES OF ROASTING

DARK ROASTING	Is done at 350° F for fifteen to twenty minutes in a shallow frying pan
BLISTER FRYING	Blanched skinned peanuts are boiled in water for 10 minutes and drained. The drained nuts are fried using oil still it is wet, resulting in blisters on its surface
DEEP FRYING	Oil roasting is done using an electric skillet or deep fryer. If 2 cups of raw or blanched peanuts are taken, 1 ½ cup of oil is taken to roast the same.

FRYING EQUIPMENT

Electric skillet

Deep fat fryer

Power	3.2 kW
Surface Finish	Mat Polish
Temperature	200 Degree C
Price	6500 – 11,200/-

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MICROWAVE ROASTING

Material	Stainless Steel
Shape	Rectangular
Capacity	25 L
Features	BIS Approved

- Done using 700 watt microwave, in which the peanuts are dampened and sprinkled with salt, further it was kept in microwave for 1 – 2 ½ minutes with intermittent stirring in 30 seconds interval.

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FLOWCHART FOR SALTED PEANUTS

Sort & clean de-shelled raw nuts

↓

Soak the raw nuts in 4% salt solution for 12 hrs.

↓

Dry the salted nuts

↓

Roast the salted nuts

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EQUIPMENT FOR SALTED/ MASALA PEANUTS

Pan roaster

Automatic seasoning system

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HACCP PLAN FOR GROUND PROCESSING

Critical control point (CCP)	Potential hazard	Corrective measures
Raw material reception	Contaminated, immature pods, high pest infestation, dead insect remnants	The firm should not accept raw groundnuts of inferior quality. Quality check in terms of sorting, microbial analysis and eradication of insect remnants should be done.
Pre-processing storage	Mould growth and rodents attack, moisture absorption	Immediately process the received raw materials. While storing stack the gunny bags on wooden planks. Continuously monitor the moisture in the storage facility

Cont.

Critical control point (CCP)	Potential hazard	Corrective measures
Processing line	Cross contamination	Workers should wash hands before handling production line at different stages and all the equipment used in processing should be cleaned well ahead of processing.
Packaging	Moisture influx to final product, cross contamination	Packaging material should be oxygen barrier to avoid moisture absorption by final products. It should be tamer resistance to withstand conveyance. Avoid condensation of cold stored groundnuts while unloading as part of transit.
Storage of final produce	High water activity in produce, improper storing conditions	The aw activity of final product should be low (< 0.7). Vacuum packaging or nitrogen flushing could be used. The relative humidity of the storage environment should be 55-65%.

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