



# Peanut Specification Manual

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*The bitterness of poor quality remains  
long after the sweetness of low price  
is forgotten.*

*- Aldo Gucci*

**The specification manual is for peanuts of Indian origin. The manual is confidential & proprietary.  
The specification limits used in this manual comply with Codex Alimentarius, GOST & USDA standards.**





# PREFACE

Peanut quality is defined by its specifications and it is subject to misinterpretation between quality experts, especially in the physical characteristics of the peanut. This manual defines all the specifications and captures various industrial standards along with Agrocrops' proprietary b2b trademark standard: **Pnutking**.

The manual focuses on defining quality parameters for raw shelled peanuts, roasted & blanched peanuts and inshell peanuts. The document also highlights various grades and types of Indian peanuts along with its suggested uses, based on individual characteristics.

The peanut specification manual is intended for purchasers, sellers, snack-brand manufacturers, food safety auditors, regulators, institutions, researchers, quality professionals and all other end-users of peanut as an ingredient.



## **Agrocrops' Quality Policy**

*“Relentlessly improve quality of our peanuts to improve business growth and thereby lower cost.”*





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**Raw Shelled Peanuts**



# PEANUT VARIETIES

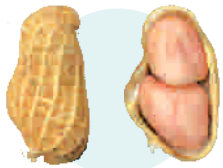
Peanut seed varieties are considerably diversified in the Indian peanut industry. Seed types vary in short (90 days) and long (130 days) harvest cycles. Farmer's choice of seed

varieties are based on soil type, yield expectation, water availability and market conditions. All the seed types are non-GMO.



Each peanut variety has a specific utility. Even though various seed types falls under the generic variety "java"; there are many types of java to choose from, in order to get an optimal result

of the end product. Microbiology, nutrition and shelf life may vary between different seed varieties of the same type.



**JAVA**  
(Fat 45%)

Kernels are spherical in shape, the skin (testa) is smooth and thin. The color is pale-light to pink-tan. Oil content is 35-45%, taste is sweet & buttery. Less oily flavor with a medium roast. Lowest aflatoxin risk and longer shelf life.



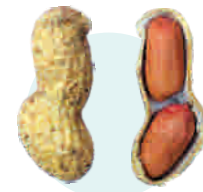
**JAVA LONG**  
(Fat 45%)

Kernels are oblong in shape, the skin (testa) is smooth and sometimes wrinkly. The color is pale-light to pink-tan. Oil content is 35-45%, taste is less sweet & buttery. Some JL varieties have lower shelf life.



**TJ**  
(Fat 50%)

Higher oil content of 45-50%, the testa is pale pink-dark to pink-tan. The testa is rough & thick. The kernels are inconsistently round. With high fat and lipid profile, the Tj variety is very low in aflatoxin. Less sweet & buttery, nutty flavor when roasted.



**BOLD G10**  
(Fat 40%)

Elongated shape with a lower diameter in the middle. Testa is thick & color is from dark pink to dark brown/red. High in oil content 45-52%, high in lipid profile and fats. Intense aromatic/roasted flavor with no sour or bitter taste. Lowest aflatoxin risk and longer shelf life.



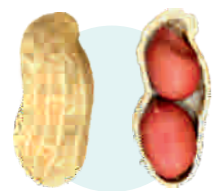
**BOLD G20**  
(Fat 50%)

Elongated shape with a higher diameter in the middle. Testa is thick & color is from dark pink to dark brown/red. High in oil content 45-52%, high in lipid profile and fats. Intense aromatic/roasted flavor with no sour or bitter taste.



**SPLITS**  
(Fat 45%)

Splits are derived from the Bold variety. Testa & the hearts are sometimes removed. Elongated in shape, oil content is 40-45%.



**RED SEED**  
(Fat 50%)

Kernels are spherical in shape and the testa is bright red to dark red. Oil content is 45-50% with high fat and lipids profile. Skin is smooth and oily. Mildly bitter and buttery.

## RECOMMENDED USES

- |  |   |  |   |   |  |  |
|--|---|--|---|---|--|--|
| <ul style="list-style-type: none"> <li>● Confectionery</li> <li>● Coated &amp; Flavored</li> <li>● Frying</li> <li>● Fresh use</li> <li>● Natural Peanut Butter</li> </ul> | <ul style="list-style-type: none"> <li>● Confectionery</li> <li>● Oil crushing/Chopped</li> <li>● Frying</li> <li>● Fresh use</li> <li>● Salted snacks</li> </ul> | <ul style="list-style-type: none"> <li>● Peanut butter</li> <li>● Oil crushing</li> <li>● Frying</li> <li>● Fresh use</li> <li>● Roasted in-shell</li> </ul> | <ul style="list-style-type: none"> <li>● Peanut butter</li> <li>● Roasting &amp; Blanching</li> <li>● Oil crushing/Chopped</li> <li>● Coating/Baking/Boiling</li> <li>● Roasted in-shell</li> </ul> | <ul style="list-style-type: none"> <li>● Peanut butter</li> <li>● Roasting &amp; Blanching</li> <li>● Oil crushing/Chopped</li> <li>● Coating/Baking/Boiling</li> <li>● Roasted in-shell</li> </ul> | <ul style="list-style-type: none"> <li>● Peanut butter</li> <li>● Baked snacks</li> <li>● Oil crushing</li> <li>● Flavored snacks</li> <li>● Chopped toppings</li> </ul> | <ul style="list-style-type: none"> <li>● Peanut butter</li> <li>● Baking/Boiling</li> <li>● Oil crushing</li> <li>● Salted snacks</li> <li>● Roasted in-shell</li> </ul> |
|--|---|--|---|---|--|--|

## AVAILABLE GRADES

40/50 up to 140/160 cpo\*    50/60 up to 140/160 cpo\*    40/50 up to 140/160 cpo\*    40/45 up to 70/80 cpo\*    30/35 up to 70/80 cpo\*    40/50 up to 60/70 cpo\*    60/70 up to 80/90 cpo\*

## HARVEST SEASON

Harvested several times in a crop year. Available throughout the year.

Harvested two times in a crop year in May & September.

Harvested one time in a crop year in September.

Harvested one time in a crop year in March.



# PHYSICAL STANDARDS



## Wrinkled Shrivelled

Peanut that has wrinkles on the skin (testa) regardless of its size. Wrinkles must cover at least 40% of the body part of the kernel. Immature kernels that has wrinkles are not counted.

## Immature

Kernels that are not fully developed, peanuts from Nubs (mono/nubs) and kernels that are soft even though they meet the size requirements are classified immature.

## Skin Damaged

Kernels that has (25% or lower) skin (testa) removed in processing or due to rubbing each other are classified skin damaged.

## Sprouty

Kernels that are germinated or in the initial stages of germination. Kernels that are partially or wholly rotten and with protruding hearts are counted.

## Insect Damaged

When showing any definite damage effects of insects, including an insect in the kernel, frass or web attached to the kernel, wormholes, or worm "cuts".

## Admixture

Mixtures of other variety of peanut or unwanted peanut fractions such as peanut heart, bits are classified as an admixture.

## Inshell Kernels

Peanut shells that are small, shrivelled, tough and contain small underdeveloped kernels. Appearance is like a raisin, contains a high concentration of moisture and mold.

### INDUSTRY STANDARDS

2%

2%

2%

0.50%

0.50%

1%

0.50%

### PNUTKING STANDARDS

0.20%

0.10%

0.50%

0%

0%

0%

0%

### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

- |  |  |   |  |   |   |   |
|--|--|---|--|---|---|---|
| <ul style="list-style-type: none"> <li>● Hard to blanch the skin</li> <li>● Poor crunchiness after processing</li> <li>● Higher risk of contamination</li> <li>● Poor appearance</li> <li>● Higher FFA/Rancid Flavor</li> <li>● Lower oil content</li> </ul> | <ul style="list-style-type: none"> <li>● Higher aflatoxin risk</li> <li>● Uneven roasting</li> <li>● Bitter taste / Unpleasant flavor due to early rancidity</li> <li>● When blanched, the kernels looks yellow</li> <li>● Poor coating finish</li> <li>● Higher FFA &amp; lower shelf life</li> </ul> | <ul style="list-style-type: none"> <li>● Risk of higher blanched peanuts</li> <li>● Risk of higher splits</li> <li>● Peanut dust</li> </ul> | <ul style="list-style-type: none"> <li>● Higher aflatoxin risk</li> <li>● Soft kernel, dark-black roast</li> <li>● Bitter taste / Unpleasant flavor</li> </ul> | <ul style="list-style-type: none"> <li>● Turns dark when roasted</li> <li>● Higher fungal activity</li> <li>● Powdery inside / peanut meal</li> </ul> | <ul style="list-style-type: none"> <li>● Peanut meal and dust</li> <li>● Unexpected result in the finished snack product</li> </ul> | <ul style="list-style-type: none"> <li>● Higher aflatoxin risk</li> <li>● Risk of mold spread</li> <li>● Health hazard</li> </ul> |
|--|--|---|--|---|---|---|

### TESTING METHOD

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation



# PHYSICAL STANDARDS



## Color

The outer skin (testa) color to be homogeneous from light pink to dark pink for JAVA & dark pink to red for BOLD. The cotyledon is to be white to light yellow.

## Purple

Kernels with purple or dark pink spots on the skin or on the flesh are classified as defects.

## Discoloured

Kernels that are stained, yellow, or blemished on the skin or surface inside the testa. Discoloration may be an early stage of rancidity or decay.

## Rancid

High unpleasant, repugnant, stale tasting peanut with oil odour are classified as rancid.

## Over & Under Size

Kernels that are larger or smaller in size other than the size it is graded for, when measured by its diameter in the middle of the peanut are classified as defects.

## Long Shape

Applicable to only JAVA peanuts. Kernels that are oval/long or elongated in shape are classified as defects.

## Moisture

The water content of kernel is measured in %.

### INDUSTRY STANDARDS

Fresh & light	1%	5%	5%	35%	10%	8%-9%
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### PNUTKING STANDARDS

Fresh & light	0.10%	0.10%	0%	5%	5%	7% & 8%*
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### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

- |  |   |  |   |  |  |  |
|--|---|--|---|--|--|--|
| <ul style="list-style-type: none"> <li>Poor shelf life</li> <li>Higher FFA &amp; peroxide value</li> <li>Rancid smell</li> </ul> | <ul style="list-style-type: none"> <li>Poor appearance</li> <li>Turns dark when deep fried</li> </ul> | <ul style="list-style-type: none"> <li>May contain higher FFA</li> <li>Lower shelf life</li> </ul> | <ul style="list-style-type: none"> <li>Poor shelf life</li> <li>Higher FFA &amp; peroxide value</li> <li>Unpleasant flavor</li> <li>Poor appearance when roasted</li> </ul> | <ul style="list-style-type: none"> <li>Uneven coating &amp; roasting</li> <li>Poor ingredients to peanut ratio in snack manufacturing</li> <li>Damage to the finished snack product</li> </ul> | <ul style="list-style-type: none"> <li>Poor coating effects</li> <li>Damage to the finished snack product</li> <li>Poor appearance</li> <li>Lower taste profile</li> </ul> | <ul style="list-style-type: none"> <li>Mold growth</li> <li>Shorter shelf life</li> <li>Higher aflatoxin risk</li> <li>Weight shortage</li> <li>Poor blanching/frying</li> </ul> |
|--|---|--|---|--|--|--|

### TESTING METHOD

Sensorial	Visual inspection and Physical separation	Visual inspection and Physical separation	Organoleptic test	Physical separation or Use the Sift procedure	Physical separation or Use the Sift procedure	AACC 14-15.02, 14-16.01 / Digital moisture meter: IS 3579:1966 MS-70 / MX-50 -Standard-HI -RS-232c
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# PHYSICAL STANDARDS



## Dirty

The surface of the kernel (split/broken/whole) is heavily smeared, thickly flecked or coated with dirt, seriously affecting its appearance.

## Splits

Kernels that are split into two halves with or without the heart. Kernels that are split with and without skin are included. Kernels that are mechanically damaged are not included.

## Broken Damaged

Damaged kernels with more than 1/2, but less than 3/4 of the original kernel. Small pieces consisting of less than 1/2 of a kernel are also classified as broken.

## Blanched

Kernels that does not have the skin (testa) cover wholly or partially (25% and above) are classified as defects.

## Internal Mold

Peanuts that look intact on the outside but when split, contains an inner mold that is brown, black or yellow in color.

## Moldy Rotten

Kernels that has an external mold with visible damages on the outer surface (testa). Kernels that are decomposed, fermented and has a fungal infections are included.

## Frosted

The flesh of the kernel is brownish, pale, translucent & chewy. Flesh appears pale and glassy.

### INDUSTRY STANDARDS

2%

5%

2%

2%

0.50%

1%

1.50%

### PNUTKING STANDARDS

0%

1%

0%

0.50%

0%

0%

0%

### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

- Higher aflatoxin risk
- Lower shelf life
- Inedible

- Higher aflatoxin risk
- Lower shelf life
- Easier to get contaminated/soiled

- Oil stained kernel
- Higher aflatoxin risk
- Peanut meal & dust
- Easier to get contaminated/soiled

- Poor coating
- Lower aflatoxin risk
- Higher splits during product handling
- Peanut meal & dust

- Higher aflatoxin risk
- Higher FFA & peroxide value
- Bitter taste
- Dark-black roast

- Higher aflatoxin risk
- Higher FFA & peroxide value
- Rapid rise in mold growth among good peanuts
- Dark-black roast

- Higher FFA & peroxide value
- Bitterness / Foul / Rancid taste
- Not crunchy
- Hardens after roasting / frying

### TESTING METHOD

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection after splitting the nuts

Visual inspection and Physical separation

Organoleptic test

## Raw Shelled Peanuts



### SMELL

Smell to be fresh, without mustiness, rancidity, oily or any other foreign smell. Any distinctive smell which may denote some form of deterioration is considered defective.

# IMPURITY STANDARDS



## Peanut Dust

Fine dust particles that are made up of peanut skin (testa) or a whole peanut skin, peanut meal or residual powder caused by insects, are identified as defects.



## Foreign Material

Mixtures other than peanut and its fractions are classified as foreign material. Sticks, pieces of hay, farm wastes/dust, bone pieces and other seeds such as corn are included.



## Mono/Nubs

Peanut shells containing a single peanut kernel inside. Nubs are empty shells.



## Metal Pieces

Physical metal fragments of any dimensions and kind are classified as defects.



## Stones

Stones that are large & small of any size, weight & dimensions are not allowed.



## Soil, Sand & Mud Balls

Loose soil, sand and mud balls which may become loose sand, very tiny mud balls and sand lumps are all classified as defects.



## Plastic & Glass Pieces

Glass and plastic particles are classified as defects.

### INDUSTRY STANDARDS

None

0.20%

1.0%

0%

0%

0%

0%

### PNUTKING STANDARDS

0%

0%

0%

0%

0%

0%

0%

### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

- Affects good quality peanuts by sticking onto them
- May interfere with machine sanitation

- Foul smell
- Risk of toxins
- May interfere with machine operations
- Health hazards

- Higher aflatoxin risk
- Higher peroxide value
- Immature kernels
- Wrinkle kernels

- Health hazards

- Health hazards

- Health hazards

- Health hazards

### TESTING METHOD

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Metal detector conveyor

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation





# Roasted & Blanched Peanuts

# PHYSICAL STANDARDS



## Appearance

Uniform white to light cream, without any stains/blemish.

## Brown Spots

Spots of over roasting effects (brown or black) as a result of uneven roasting temperature or roast stains due to rough surface of the kernel. Kernels that are fully dark roasted are not counted.

## Damaged

Kernels with more than 1/2, but less than 3/4 of the original kernel. Small pieces consisting of less than 1/2 of a kernel are also classified as damaged. Insect damaged are not counted.

## Dirty

The surface of the kernel is smeared, thickly flecked or coated with dirt (light-medium - heavy) caused by handling.

## Dark Roasted

Kernels (whole or halves) that are burnt and or dark roasted are included. Peanut hearts that are dark roasted are not included.

## Discolor

Kernels that are stained, yellow, blemished or dark roasted on the inner surface.

### INDUSTRY STANDARDS

Homogeneous

None

3%

3%

1%

3%

### PNUTKING STANDARDS

Homogeneous

0%

0.50%

0%

0%

1%

### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

- Varying taste & texture profile
- Poor appearance
- Off flavors

- Varying sensory profile
- Lower shelf life
- Inedible

- Peanut meal & dust
- May get contaminated with dirt
- Uneven processing

- Inedible
- Damage to the finished snack
- Poor sensory profile

- Poor sensory profile
- Bitter taste
- Very poor appearance
- Higher FFA & peroxide value
- Lower shelf life

- Varying sensory profile
- Lower shelf life
- Inedible

### TESTING METHOD

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation



# PHYSICAL STANDARDS



## Insect Damaged

Showing any definite damage effects due to insects, including an insect in the kernel, frass or web attached to the kernel, worm holes, or worm "cuts".

## Moldy

Kernels that has external mold with visible fungi fractions. Kernels that are decomposed, fermented and has fungal infection.

## Peanut Meal

Fine dust particles that are made up of peanut flesh without the skin. Peanut meal or residual powder as a result of deterioration of the kernel are identified as defects.

## Skin Residue Unblanched

Kernels that has red noses and or with some skin on their surfaces. Skin covering more than 10% of the kernels are counted.

## Splits Halves

Split of any size is counted. Percentage of split is relative to the moisture specification. The splits may or may not be attached with the hearts.

## Spotted

Kernels with white or pale yellow spots covering 1/4 of the peanut surface area (inner or outer). Kernels that are purple in color are not considered.

### INDUSTRY STANDARDS

1%

1%

1%

5%

25%-35%

3%

### PNUTKING STANDARDS

0%

0%

0.50%

0.50%

15%-30%

1%

### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

- Peanut meal
- Damage to the kernel
- Lower shelf life

- Higher aflatoxin
- Higher FFA & peroxide value
- Rapid rise in mold growth among good peanuts
- Poor sensory profile
- Poor shelf life

- May interfere with snack manufacturing
- Affects good quality peanuts by sticking onto them
- May interfere with machine sanitation

- Peanut dust
- Poor appearance
- May interfere with machine sanitation

- Increase in peanut meal & admixture
- Lower yield in finished snack product
- Uneven processing

- Peanut meal & dust
- Poor shelf life
- Varying sensory profile (chunky texture/oily smell)

### TESTING METHOD

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

Visual inspection and Physical separation

# PHYSICAL STANDARDS



## Flavor & Taste

Characteristic of peanut flavor, aromatic, free from rancidity, taints and unwholesome flavor.



## Color Value

Color value is measured by HunterLab color scale.



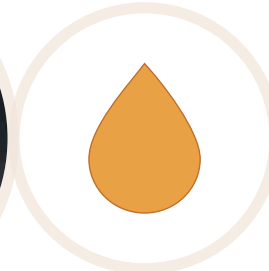
## Texture

Firm, crisp texture, free from oily, rubbery, soft or spongy kernels.



## Counts Ounce

Counts per ounce: 31/41, 41/51, 51/61, 61/71 & 71/81.



## Moisture

Water content of peanut is measured in %. Moisture level can be specified between 2 & 6%.

### INDUSTRY STANDARDS

**Nutty and aromatic**

**Pale white to beige**

**Firm to bite**

**25/29, 41/51, 51/61, 61/71**

**6%-7%**

### PNUTKING STANDARDS

**Nutty, aromatic, fresh, not rancid, no foreign taste**

**Color range between L50 to L70  
a: -10 to 10  
b: 40 to 60**

**Firm to bite, crunchy/crispy, not tough & not brittle**

**5 count difference, i.e. 31/36, 41/46 & 51/56 are available**

**2%-6%**

### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

- Varying sensory profile
- Poor appearance
- Off flavors
- Shelf life
- Inedible

- Varying sensory profile
- Poor appearance
- Off flavors

- Varying sensory profile
- Poor appearance
- Off flavors
- Shelf life
- Inedible

- Uneven processing
- Poor ingredient to peanut ratio
- Damages to the finished snacks
- Varying sensory profile
- Poor appearance

- Shelf life
- Lower yield in finished snack product
- Weight shortage
- May cause higher splits if very dry
- Varying sensory profile

### TESTING METHOD

Organoleptic

Dual-beam non-contact Reflectance spectrophotometer

Organoleptic

Physical separation or Use the Sift procedure

AACC 14-15.02, 14-16.01 / Digital moisture meter: IS 3579:1966 MS-70 / MX-50 -Standard-HI -RS-232c





**Peanuts Inshell**



# PEANUTS INSHELL VARIETIES



**INSHELL 17**



**INSHELL 20**



**INSHELL 23**



**INSHELL 26**



**INSHELL 29**



**INSHELL 32**



**ROASTED INSHELL**

## PNUTKING STANDARDS

Shell to Nut Content	Spotted Shells	Moisture	Admixture	Cracked/Broken Shells	Discolored/Stained Shells	Dirty Shells
% of kernels, wholes or splits from a specific quantity of shells.	Shells with dark spots on the outer surface, as a result of insect damages or water/weather damages.	Moisture is measured on the kernels and not on the shells.	Part of peanut plant, any material other than the shells.	When the shells have openings (large or small) exposing the kernel inside.	Light discoloration than the normal color due to soil stains or mildew.	Surface of the shell is stained or accumulated with farm dirt.
<b>70%</b>	<b>1%</b>	<b>8%</b>	<b>0.50%</b>	<b>1%</b>	<b>2%</b>	<b>3%*</b>
Foreign Materials	LSK (Loose Shelled Kernels)	Pops	Nubs	Insect Damaged	Dust	Roasting Degree
Bones, farm materials not related to peanut & stones.	Kernels in whole or splits that are out of a broken shell, fresh or dirty are classified as LSK.	Pops are shells with immature kernels and are lighter in weight. Sometimes the shells are empty.	Shells that are not fully developed, (mono shells). Kernels of this type meet the size requirements but are classified as immaturated.	Shells that has hollow/ holes on the surface, with any trace of insect presence.	Dust that are fine granules accumulated from the shell/husk.	Applicable to only roasted shells.
<b>0%</b>	<b>1%</b>	<b>0%</b>	<b>as per count</b>	<b>0.10%</b>	<b>0.5%</b>	<b>100°C-150°C</b>

**TYPES: Cleaned • Graded • Sorted • Roasted**





**Microbiology, Chemical  
& Toxin Standards**



# MICROBIOLOGICAL STANDARDS



E.Coli	Salmonella	Staphylococcus	Aflatoxin	Total Viable Count	Total Fungi	Yeast
Escherichia coli also known as E. coli, is a Gram-negative, facultative anaerobic, rod-shaped, coliform bacterium of the genus Escherichia that is commonly found in the lower intestine of warm-blooded organisms.	Salmonella is a group of bacteria that commonly causes a food borne illness called salmonellosis.	Staphylococcus is a genus of Gram-positive bacteria in the family Staphylococcaceae in the order Bacillales. Staphylococcus species are facultative anaerobic organisms (capable of growth both aerobically and anaerobically).	Aflatoxins are a family of toxins produced by certain fungi that are found on agricultural crops such as maize (corn), peanuts, cottonseed, and tree nuts. The fungi that produce aflatoxins are Aspergillus flavus and Aspergillus parasiticus, which are abundant in warm and humid regions of the world.	Total viable count (TVC), gives a quantitative estimate of the concentration of micro organisms such as bacteria, yeast or Mold spores in a sample. The count represents the number of colony forming units (cfu) per g (or per ml) of the sample.	Total fungal count.	Yeasts are eukaryotic single-celled micro organisms classified as members of the fungus kingdom.

## PNUTKING STANDARDS

0 MPN/g	0 CFU/25g	0.05 CFU/25g	B1B2G1G2:4PPB/B1: 2PPB	10,000 CFU/g	100 CFU/g	100 CFU/g
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### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

<ul style="list-style-type: none"> <li>• Destroys red blood cells</li> <li>• Kidney injury</li> <li>• Depressed platelet counts</li> <li>• Lack of urine formation, swelling &amp; acute renal failure</li> </ul>	<ul style="list-style-type: none"> <li>• Lipid oxidation</li> <li>• Influence nutritional quality of carbohydrate and protein content</li> <li>• Causes food poisoning, diarrhea, abdominal cramps and fever</li> </ul>	<ul style="list-style-type: none"> <li>• Deterioration of products</li> <li>• Nausea, vomiting, and stomach cramps</li> <li>• Other symptoms include hypersalivation, nausea, vomiting, and abdominal cramping</li> </ul>	<ul style="list-style-type: none"> <li>• Discoloration, rotting &amp; shrinking of kernels</li> <li>• Seed necrosis</li> <li>• Loss in germination capacity</li> <li>• Inflammation that affects the heart</li> <li>• Damage to the digestive organs including liver and kidney</li> </ul>	<ul style="list-style-type: none"> <li>• Rise in aflatoxin</li> <li>• Poor germination rate</li> </ul>	<ul style="list-style-type: none"> <li>• Discoloration &amp; rotting of kernels</li> <li>• Reduces the germination rate</li> <li>• Loss in the quantum of carbohydrate, protein and total oil content</li> <li>• Induces increased moisture content &amp; free fatty acid</li> </ul>	<ul style="list-style-type: none"> <li>• May cause infection in individuals with compromised immune system</li> <li>• Results in heating of silages followed by growth of additional mold</li> <li>• Causes various degrees of deterioration and decomposition of foods</li> </ul>
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### TESTING METHOD

ISO 16649-3:2015	ISO 6579-1:2017	IS 5887(Part 8/Sec1) 2002Amnd I REAFF 2018	RAL/CHE-FOOD/2A	IS 5402: 2012 REAFF 2018	IS 5403: 1999 REAFF 2018	IS 5403: 1999 REAFF 2018
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# MICROBIOLOGICAL STANDARDS



Coliforms	Enterobacteriaceae	Total Plate Counts	Bacillus Cereus	Staphylococcus Aureus	Clostridium Perfringens	Patulin
Coliforms are bacteria that are always present in the digestive tracts of animals, including humans and are found in their wastes. They are also found in plant and soil material.	Enterobacteriaceae includes, along with many harmless symbionts, many of the more familiar pathogens, such as Salmonella, Escherichia coli, Yersinia pestis, Klebsiella and Shigella. Other disease-causing bacteria in this family include Proteus, Enterobacter, Serratia and Citrobacter.	The total plate count is the enumeration of aerobic, mesophilic organisms that grow in aerobic conditions under moderate temperatures of 20-45°C. This includes all aerobic bacteria, yeast, molds and fungi that grow in the specific agar.	Bacillus cereus is a toxin-producing bacterium that causes food poisoning.	Staphylococcus aureus is a major human pathogen that causes a wide range of clinical infections. It is a leading cause of bacteremia and infective endocarditis as well as osteoarticular, skin and soft tissue, pleuropulmonary and device-related infections.	Clostridium perfringens (C. perfringens) is a spore-forming gram-positive bacterium that is found in many environmental sources as well as in the intestines of humans and animals.	Patulin is an organic compound that is classified as a polyketide. It is a white powder that is soluble in acidic water as well as in organic solvents. It is a lactone that is heat-stable, so it is not destroyed by pasteurization or thermal denaturation.

## PNUTKING STANDARDS

10 CFU/g	0 CFU/g	1,300 CFU/g	10,000 CFU/g	0.05 CFU/g	100 CFU/g	50 µg/kg
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### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

<ul style="list-style-type: none"> <li>May cause severe abdominal cramps, bloody diarrhea and vomiting</li> </ul>	<ul style="list-style-type: none"> <li>Enterobacteria are bacteria from the family Enterobacteriaceae</li> <li>Enterobacteria are responsible for a variety of human illnesses, including urinary tract infections, intestinal upset, wound infections, gastroenteritis, meningitis, septicemia and pneumonia</li> </ul>	<ul style="list-style-type: none"> <li>Total Plate Count (TPC) is the enumeration of the total aerobic bacterial population. It is a useful indicator to verify the freshness of a product, also regarding shelf life in food</li> <li>Unusually high TPCs may reasonably be assumed to be potential health hazards, pending pathogen screening results</li> </ul>	<ul style="list-style-type: none"> <li>Bacillus cereus is a type of bacteria commonly found in soil and food that produces toxins</li> <li>These toxins may cause two types of illness- one type characterized by diarrhea and the other, called emetic toxin, by nausea and vomiting</li> </ul>	<ul style="list-style-type: none"> <li>Staphylococcus aureus is one of the most common bacterial infection in humans</li> <li>Being a common cause of skin infections including abscesses, respiratory infections such as sinusitis and food poisoning</li> </ul>	<ul style="list-style-type: none"> <li>C. perfringens is a bacteria that causes food poisoning</li> <li>Leads to food poisoning, illness usually begins suddenly and lasts for less than 24 hours, including dehydration</li> </ul>	<ul style="list-style-type: none"> <li>This mycotoxin exerts nephrotoxic (kidney) and immunotoxic effects</li> <li>Patulin produces gastrointestinal symptoms like gastric ulcers, intestinal haemorrhages, lesions in the duodenum and alteration of intestinal barrier function</li> </ul>
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### TESTING METHOD

IS 5401(Part 1):2012	ISO 21528-2-2004	ISO 4833:2013 Part I	ISO 7932-2004	ISO 6888-1-1999	ISO 7937 -2004	AOAC 995.10
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# MICROBIOLOGICAL & CHEMICAL STANDARDS



Listeria	Enterobacter Sakazakii	Carbamatos	Organophosphate	Hexachlorocyclohexane	DDT and its metabolites	Organochlorine
Listeria is a genus of bacteria. Until 1992, 10 species were known, each containing two subspecies.	Cronobacter sakazakii, which before 2007 was named Enterobacter sakazakii, is an opportunistic Gram-negative, rod-shaped, pathogenic bacterium that can live in very dry places.	Carbamates is common insecticide that inhibit cholinesterase activity.	Organophosphates is common insecticide that inhibit cholinesterase activity.	Hexachlorocyclohexane, one of the most commonly used chlorinated insecticides.	Dichlorodiphenyltrichloroethane (DDT) is an insecticide used in agriculture.	Organochlorine pesticides are synthetic pesticides widely used all over the world.

## PNUTKING STANDARDS

ABSENT/25g	ABSENT/25g	BDL	BDL	0.5mg/kg	0.15mg/kg	BDL
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### MAJOR EFFECTS OF FAILURE IN SPECIFICATION

<ul style="list-style-type: none"> <li>Fever and other flu-like symptoms, such as fatigue and muscle aches. Infections during pregnancy can lead to miscarriage, stillbirth, premature delivery or life-threatening infection of the newborn</li> </ul>	<ul style="list-style-type: none"> <li>Causes necrotizing enterocolitis, sepsis, and meningitis in low-birth-weight &amp; preterm neonatal infants</li> </ul>	<ul style="list-style-type: none"> <li>Causes acute muscarinic manifestations (eg: salivation, lacrimation, urination, diarrhea, emesis, bronchorrhea, emesis, bronchospasm, bradycardia, miosis) and some nicotinic symptoms, including muscle fasciculations and weakness</li> </ul>	<ul style="list-style-type: none"> <li>Causes acute muscarinic manifestations (eg: salivation, lacrimation, urination, diarrhea, emesis, bronchorrhea, emesis, bronchospasm, bradycardia, miosis) and some nicotinic symptoms, including muscle fasciculations and weakness</li> </ul>	<ul style="list-style-type: none"> <li>Leads to a probable human carcinogen, have been reported to cause adverse reproductive outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Effects on the liver and reproduction. DDT is considered a possible human carcinogen</li> </ul>	<ul style="list-style-type: none"> <li>Causes hypertension, cardiovascular disorders and other health related problems in humans</li> <li>Increases the risk of hormone-related cancers including breast, prostate, stomach and lung cancer</li> </ul>
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### TESTING METHOD

ISO 11290-1-1996 Amendment-1-2004	ISO 22964, 2006	RAL/CHE-PR/30	RAL/CHE-PR/30	RAL/CHE-PR/30	RAL/CHE-PR/30	RAL/CHE-PR/30
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# CHEMICAL & RADIONUCLIDES STANDARDS



Organonitrogen	Peroxide Value	FFA % as Oleic acid	Oil Content	Lipids	Fat	Caesium-137	Strontium-90
Organonitrogen is an insecticide on the enzyme cholinesterase.	The peroxide value is determined by measuring the amount of iodine which is formed by the reaction of peroxides (formed in fat or oil) with iodide ion.	It is the most common fatty acid in nature. Salts of oleic acid are called oleates.	Oil content of the peanut when crushed for first time.	Lipids include fats (solid at room temperature) and oils (liquid at room temperature). Lipids are an important part of a healthy diet. The body uses lipids as an energy store, as insulation and to make cell membranes.	The Fat content ranges from 44%–56% and mainly consists of mono- and polyunsaturated fat, most of which is made up of oleic and linoleic acids.	Radioactive Caesium has a half-life of 30 years and will therefore remain in the environment for a significant period of time and in plants grown in the exposed area.	Strontium is a trace element found in seawater, soil and is similar to calcium. Occurs due to farming in contaminated soil or water quality.

## PNUTKING STANDARDS

BDL	1 meq O <sub>2</sub> /kg	0.5%	45%-52%	40-50g/100g	44%-48%	60 Bq/kg	11 Bq/kg
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## MAJOR EFFECTS OF FAILURE IN SPECIFICATION

<ul style="list-style-type: none"> <li>Causes weakness, blurred vision, headache, nausea, tearing, sweating, and tremors in humans. Very high doses can be fatal because it can paralyze the respiratory system</li> </ul>	<ul style="list-style-type: none"> <li>Contributes significantly to dietary contamination and development of gastrointestinal tract (GIT) cancers</li> </ul>	<ul style="list-style-type: none"> <li>Contribute significantly to dietary contamination. Associated with increased risk of breast cancer</li> <li>May cause glucose intolerance and diabetes</li> </ul>	<ul style="list-style-type: none"> <li>Absence of nutty flavor</li> <li>Oregano smell (Unpleasant odour)</li> <li>Instability of peanut kernel during storage</li> <li>Affect textural quality of peanut butter</li> </ul>	<ul style="list-style-type: none"> <li>Peanut nutritional value (energy) may decline</li> <li>Oleic to linoleic acid ratio varies</li> <li>Peanuts turn rancid</li> <li>Absence of freshness</li> <li>Increased cardiovascular disease risk</li> </ul>	<ul style="list-style-type: none"> <li>Lower nutritional quality</li> <li>Less than optimum flavor</li> <li>Peanut oil stability</li> <li>High amounts of omega-6 to omega-3 fatty acids may increase inflammation</li> <li>Contribute to obesity, heart disease, arthritis and chronic health problems</li> </ul>	<ul style="list-style-type: none"> <li>Leads to damaged cells and may also cause cancer</li> </ul>	<ul style="list-style-type: none"> <li>Strontium can damage bone marrow, cause anemia and prevent the blood from clotting properly</li> </ul>
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## TESTING METHOD

RAL/CHE-PR/30	IS: 548 (Part-1)-1964-RA 2015	IS: 3579:1966-RA 2015	IS: 3579:1966-RA 2015	RAL/CHE-FOOD/299	IS: 3579:1966-RA 2015	Gamma spectrometry with germanium semiconductor detector	RAL/CHE-FOOD/215-A
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# INFESTATION & MYCOTOXIN STANDARDS



Fragments of Insects	Hair Contamination	Excreta	Deoxynivalenol (Don)	Ochratoxin A	Zearalenone	Fumonisin
Parts of insects & eggs of insects.	Rodent, Bird, Cat or Human hair or hair particles.	Rodent excreta or bird faeces.	Deoxynivalenol (DON) is a trichothecene mycotoxin mainly produced by Fusarium fungi (Fusarium molds). Major producing fungi includes Fusarium species Fgraminearum and Fculmorum, one of plant pathogens.	Ochratoxin A (OTA) is a mycotoxin produced by several fungal species including Aspergillus ochraceus, A. carbonarius.	Zearalenone, also known as RAL and F-2 mycotoxin, is a potent estrogenic metabolite produced by some Fusarium and Gibberella species. Particularly is produced by Fusarium graminearum, Fusarium culmorum, Fusarium cerealis, Fusarium equiseti, Fusarium eritricillioides, and Fusarium incarnatum.	The fumonisins are a group of mycotoxins derived from Fusarium and their Liseola section. They have strong structural similarity to sphinganine, the backbone precursor of sphingolipids.

## PNUTKING STANDARDS

0%	0%	0%	1,000 mg/kg	5 µg/kg	5 µg/kg	1 PPM
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## MAJOR EFFECTS OF FAILURE IN SPECIFICATION

<ul style="list-style-type: none"> <li>May cause allergic responses</li> <li>Inhalation of insect fragments may cause hospitalizations, individuals are still susceptible to hazardous diseases carried by these insects such as Salmonella</li> </ul>	<ul style="list-style-type: none"> <li>Rodents and their droppings may spread diseases and viruses, including hantavirus, salmonellosis and rat-bite fever. They also trigger asthma and allergies</li> </ul>	<ul style="list-style-type: none"> <li>Rodents and their droppings may spread diseases and viruses, including hantavirus, salmonellosis and rat-bite fever. They also trigger asthma and allergies</li> </ul>	<ul style="list-style-type: none"> <li>Acute or chronic toxicity in human</li> </ul>	<ul style="list-style-type: none"> <li>Ochratoxin A, is a potent toxin that cause kidney damage in rats, dogs and swine</li> <li>Human health effects are less well-characterized, may cause kidney diseases</li> </ul>	<ul style="list-style-type: none"> <li>Effects are estrogenic and mostly affect the urogenital system</li> </ul>	<ul style="list-style-type: none"> <li>Consumption of fumonisin lead to oesophageal cancer in human. Fumonisin B1 (Fb1) is the most toxic and has been shown to promote tumor in rats and cause equine leukoencephalomalacia and porcine pulmonary edema</li> </ul>
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## TESTING METHOD

AOAC 975 15th 1990	AOAC 975 15th 1990	AOAC 975 15th 1990	Elisa Kit	AOAC 2008.02	Elisa Kit	Ridascreen Elisa Kit
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# TOXIN STANDARDS



Lead	Arsenic	Cadmium	Mercury	Tebuconazole	Terbufos	Antimony
Lead content in peanut is caused by contaminated soil or water quality.	Arsenic is naturally present at high levels in the groundwater of a number of countries. Arsenic is highly toxic in its inorganic form.	Cadmium in peanut caused by farming in contaminated soil or water quality.	Mercury in peanut caused by farming in contaminated soil or water quality.	Tebuconazole is a triazole fungicide used agriculturally to treat plant pathogenic fungi.	Terbufos is a chemical compound used in insecticides and nematicides. Terbufos is part of the chemical family of organophosphates.	Antimony is a chemical element with the symbol Sb and atomic number 51. A lustrous grey metalloid, it is found in nature mainly as the sulfide mineral stibnite.

## PNUTKING STANDARDS

1 mg/kg	0.3 mg/kg	0.05 mg/kg	0.05 mg/kg	0.05 mg/kg	0.05 mg/kg	1 PPM
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## MAJOR EFFECTS OF FAILURE IN SPECIFICATION

<ul style="list-style-type: none"> <li>Leads to accumulation in the liver and kidneys, particularly the renal cortex, resulting in kidney damage</li> </ul>	<ul style="list-style-type: none"> <li>Causes gastrointestinal distress to death. Effects predominate, with vomiting &amp; abdominal pain</li> </ul>	<ul style="list-style-type: none"> <li>Accumulates in the kidney and liver of mammals, including humans; over time it can cause kidney dysfunction. Severe bone pain and numerous bone fractures</li> </ul>	<ul style="list-style-type: none"> <li>Leads to nervousness or anxiety, irritability or mood changes, numbness, memory problems, depression and physical tremors</li> </ul>	<ul style="list-style-type: none"> <li>The primary targets are the liver, spleen and the adrenal glands. It can cause harm to the eyes, digestive, and reproductive systems</li> </ul>	<ul style="list-style-type: none"> <li>Result in diaphoresis, vomiting, miosis, salivation, pallor and muscle weakness with respiratory failure and headache, dizziness, altered level of consciousness</li> </ul>	<ul style="list-style-type: none"> <li>Antimony can potentiate pneumoconiosis, altered electrocardiograms stomach pain, diarrhea, vomiting and stomach ulcer</li> <li>Other effects are increased blood pressure, altered EKG readings, heart muscle damage and gastrointestinal disorders</li> </ul>
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## TESTING METHOD

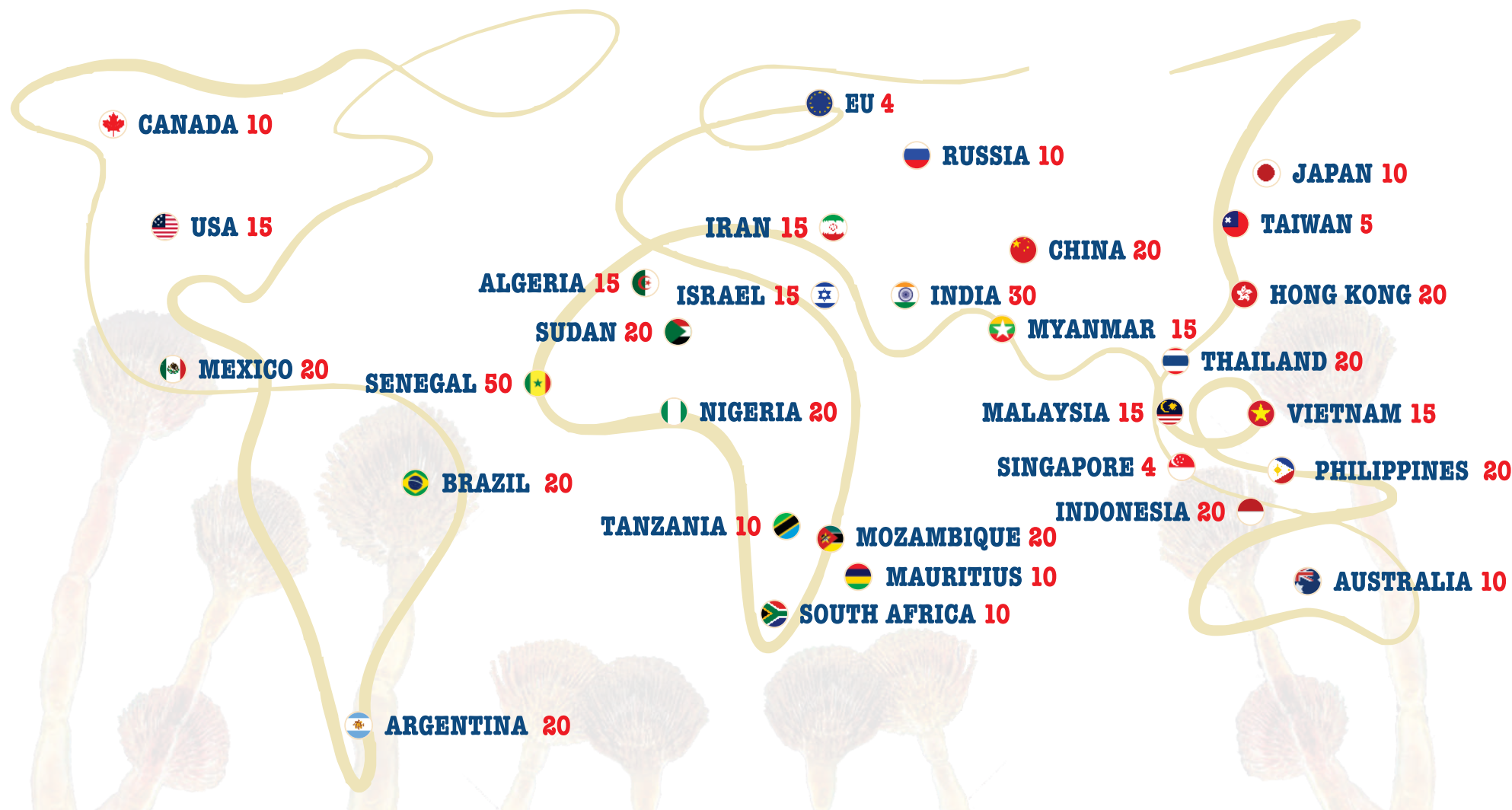
In House SOP method by ICPMS	In House SOP method by ICPMS	In House SOP method by ICPMS	In House SOP method by ICPMS	SO-IN-MUL-TE-085 by LC-MS/SM/GC-MS/MS	SO-IN-MUL-TE-085 by LC-MS/SM/GC-MS/MS	SO-IN-MUL-TE-063 by ICP-MS/ICPOES
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**Peanut Butter (in 2020)**



# AFLATOXIN LIMITS IN PPB OF MAJOR IMPORT & EXPORT COUNTRIES



## INFORMATION

Aflatoxin limits shown are for peanuts, human feed and constitutes a total of B1,B2,G1,G2.

The limits are in parts per billion and are subject to change as per the country's policies. Testing methods may vary across different countries.

# GLOSSARY

## A

**AACC** - American Association of Cereal Chemists

**AOAC** - Association of Official Agricultural Chemists

## B

**B** - Blue

**B2B** - Business to Business

**BDL** - Below Detection Limit

**Bq** - Becquerel

## C

°**C** - Celsius Degree

**CAC** - Codex Alimentarius Commission

**CFU** - Colony Forming Unit

**CPO** - Counts Per Ounce

## D

**DDT** - Dichlorodiphenyltrichloroethane

**DON** - Deoxynivalenol

## E

**EKG** - Electrocardiogram

**EU** - European Union

## F

**FFA** - Free Fatty Acids

**FM** - Foreign Material

## G

**g** - Gram

**G** - Green

**G10** - Gujarat 10

**G20** - Gujarat 20

**GIT** - Gastro Intestinal Tract

**GMO** - Genetically Modified

Organisms

**GOST** - Gosudarstvennye

Standarty State Standard

## I

**ICP** - Inductively Coupled Plasma

**ICPMS** - Inductively Coupled Plasma

Mass Spectrometry

**ICPOES** - Inductively Coupled

Plasma Optical Emission

Spectrophotometers

**ISO** - International Organization for

Standardization

## J

**JL** - Java Long

## K

**kg** - Kilo Gram

## L

**L** - Lightness

**LSK** - Loose Shelled Kernels

## M

**µg** - Micro Gram

**meq** - Milliequivalents

**mg** - Milligram

**MPN** - Most Probable Number

## O

**O** - Oxygen

**OTA** - Ochratoxin A

## P

**%** - Percent

**PPB** - Parts Per Billion

**PPM** - Parts Per Million

**PV** - Peroxide Value

## R

**RAL** - Reichs-Ausschuss für Lieferbedingungen

## S

**SOP** - Standard Operating Procedure

**sp** - Species

## T

**TJ** - Trombay Java

**TPC** - Total Plate Count

**TVC** - Total Viable Count

## U

**USDA** - United States Department of Agriculture





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