Developments in Packaging of Soya Products

Dr. Madhab Chakraborty

Joint Director & Regional Head

Indian Institute of Packaging, Delhi

SOYABEAN

- The soybean is one of the richest and cheapest sources of protein and oil content which accounts for about 60 % of dry soybeans by weight .
- The remainder consists of 35 % carbohydrates and about 5 % ash.
- Many valuable vitamins, flavonoids, and poly-saccharides also exist within soybeans.
- Because soybeans contain no starch, they are a good source of protein for diabetics.
- Soy contains two types of fatty acids namely omega-3 and omega-6 fatty acids.

Beneficial effects

- Soya beans contain antioxidants. These compounds protect cells from damage that is caused by free radicals. These free radicals are believed to be responsible for many cancers and premature aging.
- Soya beans have cholesterol- lowering properties. They lower LDL (Low-density lipoprotein) and raise HDL (High-density lipoprotein).
- Soya beans can increase bone mineral density and decrease calcium loss in aging women.

- The total annual production of soybean contributes to 55–58% of the total oilseed output which is about 210–230 million tonnes.
- The major producers in the soy market are India, US, Brazil, China and Argentina.
- Major exporters of soybeans are US, Brazil and Argentina. China is a major importer of soybean.

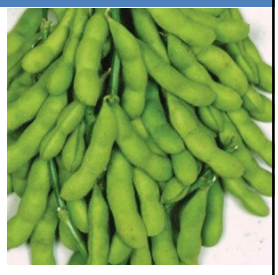
Soyabean production worldwide (Million Metric Tons)

Year	US	Brazil	Argentina	China	India	Paraguay	Canada
2021-2022	119.884	144.000	52.000	19.000	11.200	10.500	6.400
2020-2021	112.549	137.000	47.000	19.600	10.450	9.900	6.350
2019-2020	96.667	128.500	48.800	18.100	9.300	10.100	6.145
2018-2019	120.515	119.700	55.300	15.967	10.930	8.520	7.417
2017-2018	120.065	123.400	37.800	15.283	8.350	11.046	7.717

Source : The Soybean Processors Association of India databank

India is the 5th largest producer in the World

Soybean production in India (Lakh MT)



	Estimated Production
Rajasthan	8.585
Madhya Pradesh	41.774
Maharashtra	45.446
Andhra Pradesh	1.644
Chhattisgarh	0.686
Gujarat	1.450
Karnataka	3.732
Others	1.242
Grand Total	**104.559**

Source : The Soybean Processors Association of India databank

MP is the second largest producer in India

With the increasing health consciousness among the general people, the use of Soyabean processed products is getting acceptance.

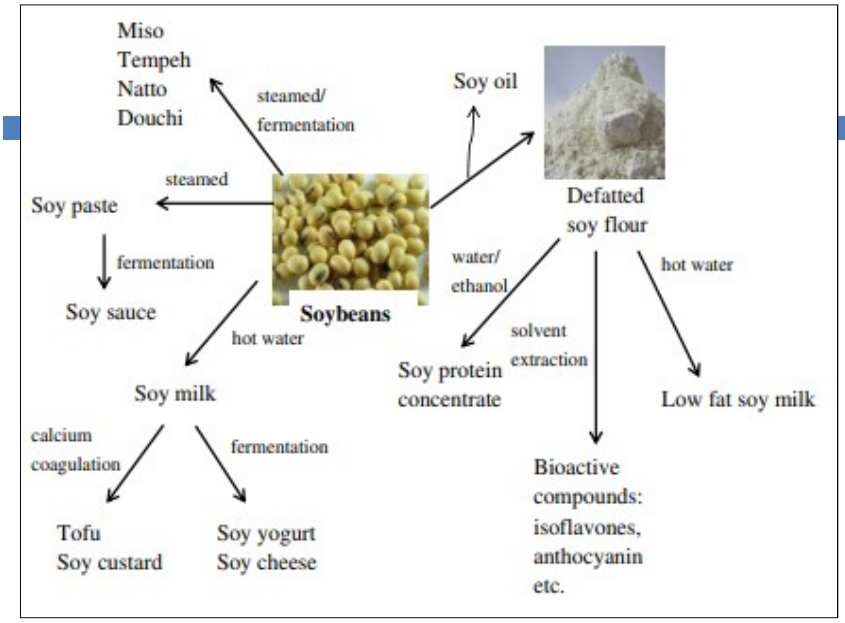
Being mainly the country of vegetarians, India has indeed a very great potential for Soya products.

SOYFOODS or SOY PRODUCTS

- Soy products are made out of soybean.
- They are a substitute for milk and milk products such as cheese, flavoured milk, yoghurts and spreads among others.
- Soy products also act as a substitute for meat products, and are best suited for vegan diets.
- Soybeans are rich in protein content and provide amino acids that are essential for the body. Soybean was first cultivated in China from where it spread to other parts of Asia.

Soybeans are used to prepare a variety of food products such as

- Soy Oil
- Soymilk
- Soy nuggets or chunks
- Tofu or soy paneer
- Soya sauce or tamari
- Miso or soybean paste
- Soy flour
- Soy yogurt
- Soy custard



Soya processing

PACKAGING

- COMBINATION OF ARTS, SCIENCE AND TECHNOLOGY
- ENSURES SAFE DELIVERY OF THE PRODUCT
- INTEGRAL PART OF THE PRODUCTION AND PHYSICAL DISTRIBUTION
- PACKAGING SALES WHAT IT PROTECTS PACKAGING PROTECTS WHAT IT SALES
- TOOL FOR MARKETING

WORLDWIDE PACKAGING TRENDS RELATES

- LIFE STYLE
- CONVENIENCE
- EATING HABITS
- PURCHASE POWER
- SUSTAINIBILITY

PACKAGING FUNCTIONS

- CONTAIN
- PROTECT
- PRESERVE
- PRESENT
- MARKETING ATTRIBUTES

MAJOR CRITICAL FACTORS

- OXYGEN
- MOISTURE
- FLAVOUR
- COMPATIBILITY
- SHELF LIFE
- CONVINIENCE

Factors affecting shelf life of soy products

- Temperature
- Humidity
- Oxygen
- Moisture

CHANGES IN PACKAGING OVER THE PERIOD OF TIME

TYPE OF PACKAGING

- CONSUMER PACK
- TRANSPORT PACK

How packaging has complemented the change

DEVELOPMENTS IN PACKAGING

- METAL CONTAINER
- PLASTIC JERRICANS EBM
- PLASTIC SBM BOTTLE
- TETRA PACK
- FLEXIBLE POUCH
- BAG IN BOX

Packaging of Soya Oil

Testing Parameters for Flexible Packaging Materials for Packaging of Edible Oils.

Material,
Thickness,
Overall Migration Test,
Gelbo Flex Crack Test,
WVTR,
OTR,
Heat Seal Strength
Tensile Strength and Elongation

IS 14636 : 1998 (Reaffirmed Year : 2018)

Testing Parameters Blow Moulded HDPE Containers for Packaging of Edible Oils

Dimension (Tolerance +/- 1%)

Thickness (Min: 0.3 mm upto 5 lit, 0.5 mm upto 10 lit, 0.7 mm upto 15 lit)

Weight (Tolerance +/- 4% upto 2 lit and 7% upto 15 lit)

Closure Leakage Test (Vertically upside down 10 min)

Drop impact Test - IS 2798 (Drop Height- 1.2 m upto 5 lit, 1.0 m upto 10 lit, 0.5 m upto 15 lit) (Base and side)

Stack Load Test- IS 2798 (3 m stack height 24 hours)

Handle Pull- 10 min

Ink Adhesion

Overall Migration Test- n heptane 38 deg C for 30 min

ESCR- IS 8747- 60 deg C - 48 hours

Stoarge Test (38 deg C and 90% RH)(3 times of duration exposed)

IS 15473 : 2004 (Reaffirmed Year : 2020)

Testing Parameters of Polyethylene Terephthalate (PET) Bottles for Packaging of Edible Oils

Capacity (Brimful capacity 2% greater than nominal capacity)

Thickness (Min: 0.25 mm)

Weight (Tolerance +/- 5%)

Closure Leakage Test (Vertically upside down on vibration table for 1 hour)

Drop impact Test (Drop Height- 1.2 m) (Base and side)

Stack Load Test- (400 N for 1 lit and 600 N for 2 lit for 24 hours)

Stoarge Test)(Moisture Content, Free Fatty Acid and Peroxide limit)

(38 deg C and 90% RH)(3 times of duration exposed

IS 12887 : 1989 (Reaffirmed Year : 2018)

Testing Parameters of Flexible Pouches for Packing of Refined Edible Oils 5 Litre

Thickness (10% Tolerance)

Vibration Leakage Test (30 minutes)

Dart Impact (Ht: 152.4 cm, Min Load: 200 gf)

Drop impact Test (Drop Height- 1.2 m) (Repeat on 5 pouches)

Stack Load Test- (400 N for 1 lit for 24 hours- keeping 4 pouches together)

Overall Migration Test- n heptane 38 deg C for 30 min

WVTR

OTR

Stoarge Test)(Moisture Content, Free Fatty Acid and Peroxide limit)

(38 deg C and 90% RH)(3 times of duration exposed

IS 12724 : 2004 (Reaffirmed Year : 2020)

Testing Parameters of Square Tins - 15 kg/litre For Ghee, Vanaspati, Edible Oils and Bakery Shortenings

Air Pressure Test (8 kPa for 15 sec)

Handle Pull Testing (vertical pull of 40kgf for 2 min)

Hydraulic Pressure Test (30kPa for 3 min)

Drop Test ((Drop Height- 0.5 m upto 15 lit)

(Base , side and corner)

IS 10325 : 2000 (Reaffirmed Year : 2016)

Polymeric Structure of Multilayer Plastic Films for Edible Oil Packaging (for 500 ml and 1 lit pouch)

5 layer structure:

First layer (32.5 micron): LDPE (non Slip) 20%and LLDPE Octene (non Slip) 80%

Second Layer(5 micron) : Tie Layer EAA

Middle Layer (15 micron): Nylon

Fourth Layer(5 micron) : Tie Layer EAA

Fifth Layer(32.5 micron): Sealant layer LDPE(Slip)20% and Metalosine (Slip) 80%

PHYSICAL CHARECTERISTICS

Blow up Ratio: 2.4 to 2.5

GSM: 86

Substrate: Total 90 micron

Ink: 2 GSM surface printing + Top Coat

Odour: Free from objectional odour

Seal strength: 4 kgf/ 25 mm

COF: Poly to Poly/ Poly to metal: 0.3

MVTR: 4 g/sq.m for 24 hours at 38deg C 90% RH

OTR: 40 cc/ sq.m for 24 hours at 25deg C

Alternative Polymeric Structure of Plastic Laminate for Edible Oil Packaging (1 lit pouch)

Outer layer (12micron): BOPA both side corona treated

Reverse Printing 0.7 GSM PU based Ink

Adhesive (Solvent based Lamination) 2GSM

Inner layer: White Poly: 65 micron

Total GSM: 74

Benefits:

Per pack cost reduction

Sustainability: Source Reduction

Zero Percent failure

PHYSICAL CHARECTERISTICS

Blow up Ratio: 2.5 to 2.6

LDPE Structure: 3 layer Co-Ex with specialized structure

Solvent Retention test

Bond Strength: 250 gf/25 mm

Seal strength: 4 kgf/ 25 mm

Drop Test: 4 feet 6 drop

COF: Poly to Poly/ Poly to metal: 0.3

MVTR: 2 g/sq.m for 24 hours at 38deg C 90% RH

OTR: 35 cc/ sq.m for 24 hours at 25deg C

Packaging of Soya Chunks

Packaging of Soy Milk latest

LDPE Pouches

HDPE bottles

6-layered carton

Metal can

Glass bottles

PET bottles with PP/HDPE lid

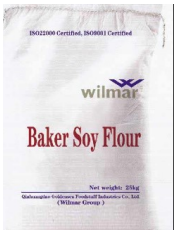
Soymilk is prepared after soaking soybeans in water.

Packaging of Tofu or Soya Paneer

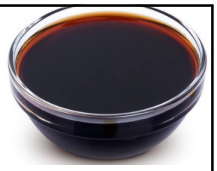
Tofu is a cheese-like food made after curdling the soymilk and is an excellent substitute for cheese for lactose intolerant people

Packaging of Soya Nuggets

Packaging of Soya Flour



Packaging of Soy Sauce



Soy sauce is made by fermenting soybeans and is used as flavouring agent.

Packaging of Miso

Miso is a fermented paste that's made by inoculating a mixture of soybeans with a mold *Aspergillus oryzae*

Package Labeling- General Requirements as per **FSSAI, Govt. of India**

- Labelling of pre-packaged foods
- Nutritional information
- Declaration regarding Veg or Non-veg
- Declaration regarding food additives
- Name and complete address of the manufacturer
- Net quantity
- Lot / Code / Batch information
- Date of manufacturing or packing
- Best Before and Use By Date
- Country of origin for imported food
- Instructions for use

TRANSPORT PACKAGING

- **CFB BOXES PARAMETRES**
- **COMPRESSION STRENTH**
- **SUBSTANCE OF EACH PLY AND NO. OF PLIES**
- **TYPES OF FLUTES, JOINTS, STYLE OF BOX,**
- **ADHESIVE, MOISTURE CONTENT, WATER PROOFNESS**

PERFORMANCE TESTS
IS:7028

- **DROP TEST**
- **VIBRATION TEST**
- **INCLINED IMPACT TEST**
- **STACK LOAD**

- **VALIDATION**

- PACKAGING IS THE FIRST INTERFACE TO THE CUSTOMER, MATTERS A LOT TO IMPROVE THE MARKET IMPRESSION

Thanks!!!

iiphyd.madhab@gmail.com,
M-9581000064