

Salient technologies developed by ICAR-CIPHET, Ludhiana

Visible light insect trap

Visible light insect trap **is designed to effectively trap infesting/spoilage insects during storage of food items irrespective of the type of item.** Overcomes limitations of conventional light traps. Efficient against *Rhizopertha dominica*, *Lasioderma sericorne*, *Cadra cautella*, *Cytotroga cerelella*, *Tribolium castaneum*, and *Lemophloeus* spp. Dual insect attraction capability through light and color and can be easily installed on the floor or wall. Comprises of PCB with SMDs emitting light at 450 ± 10 nm.

Patent application no.: 202311072493



Licensing fee: 4.0 lakh

Buckwheat dehuller

It is a mechanized and power operated machine for dehulling buckwheat, a gluten-free and protein-rich pseudocereal often consumed during fasting in India. The machine consists of an abrasive dehulling unit and a separation unit that sorts the output into dehulled grains, unhulled grains, and broken parts. This facilitates the production of value-added items like flour, noodles, and biscuits.

Capacity: 40 kg/h

Efficiency: $67 \pm 2\%$

Licensing fee: 0.50 lakh



Refractive window drying machine for manufacturing of fruit bars

This is used for drying fruit pulps into bars using a low temperature. It is a continuous system and uses a Mylar film over a hot water bath (90–95 °C) to gently heat and dry pulp spread on its surface. As the belt moves, it continuously dries the pulp from 80% to 20–25% moisture (w.b.) in under 3 hours. Ideal for producing high-quality mango, guava, and jamun bars, the RW dryer ensures good colour, flavour, and minimal nutritional loss.

Capacity (10 h of operation): 14 kg fruit pulp/day = approx. 5 kg bar/day



Drying efficiency (10 h of operation): 12.33%

Fish dressing cum waste collection system

The Fish Dressing and Waste Collection System (FDACS) channels solid and liquid waste separately, with continuous cleaning of the blade, fish, and tabletop using a controlled spray of clean water. Solid wastes like intestines, gills, scales, and fins are collected in a covered bin, while liquid waste such as blood and slime is funnelled into a separate bin. The system reduces drudgery, saves time, and minimizes water usage. It also enhances cleanliness, hygiene, and waste segregation, and includes a transparent fly protector for visibility and customer safety during processing.



Autoclavable microencapsulation system with multistage break up two fluid nozzles for clean production of microcapsules

This is used for producing microencapsulated ingredients, which enhance the value of functional foods by masking undesirable flavours and preventing chemical reactions. The microencapsulation process uses two-fluid glass nozzle atomizers, where pressurized air or inert gas breaks up the matrix fluid jet. This process yields microcapsules through ionotropic gelification, producing particles as small as 50 μm . The system is specifically designed for the encapsulation of bacteriocins, enzymes, probiotics, and prebiotics, making it ideal for the growing market of processed and functional foods. The microencapsulator ensures controlled release properties, enhancing the functionality of food ingredients.

Capacity: 3 kg of wet alginate microcapsules per batch

Patent no.: 324943

Licensing fee: 1.0 lakh



Table-top vacuum fryer

- Oil Capacity: 8-12 litres
- Main Components: Frying vessel, condenser, vacuum pump, and control panel
- Compact & Easy-to-Use: Designed for frying various snack foods.
- Low Maintenance: Simple to clean and operate.
- Healthier Output: Produces fried products with reduced oil content.
- Quality Preservation: Maintains nutrients, color, and flavor.
- Better Texture: Enhances crispiness of fried products.
- Oil Efficiency: Minimizes degradation of the frying medium.
- Patent application no.: 202411038348



BIO THERMOCOL: Mycelium based packaging material from crop residue:

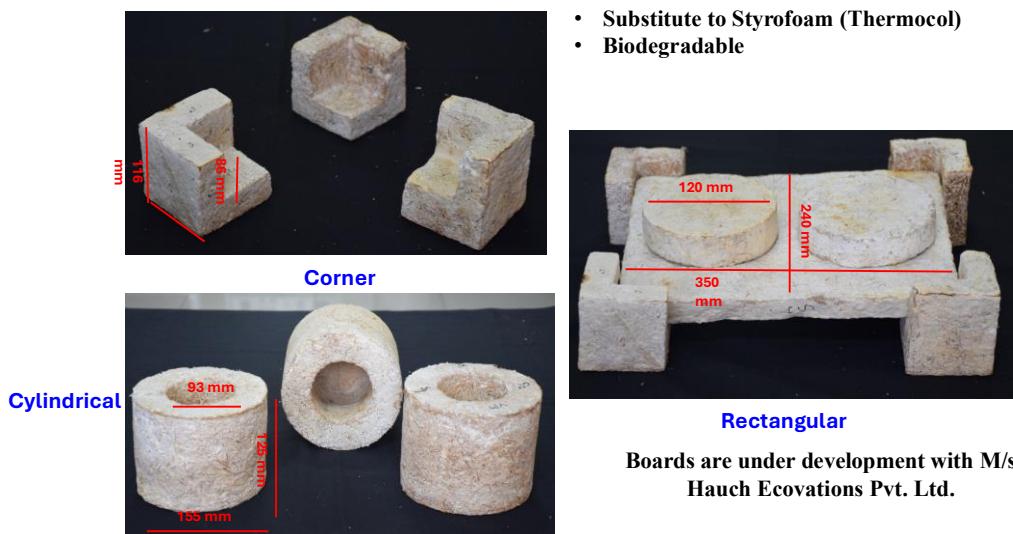
With so many items being distributed in packaged form and our global population rising, the usage of polystyrene packing is increasing dramatically. Expanded polystyrene (EPS) or Styrofoam, is a petroleum-based non-recyclable and non-biodegradable foam. Production of polystyrene creates the worst impact on the environment, in terms of energy consumption and greenhouse gas emissions. After harvesting of various agricultural crops, a large quantity of residues; around 500 million tonnes are generated (both on and off farm). After being used in various applications such as cattle feed, animal bedding, cooking fuel, organic manure etc., about 234 million tonnes of residues generated in India is available as surplus every year and major portion of this unused crops residues is burnt in the irrigated areas, where multiple crops are grown annually. Recently researcher have started focussing on an

emerging green and sustainable class; mycelium-based packaging material as a substitute to polystyrene (EPS) or styrofoam to reduce unbearable environmental issues. Hence an attempt was made to convert agricultural residue into mycelium-based packaging material.

Agricultural residues (rice straw and wheat straw) obtained locally were processed for size reduction by chopping to obtain desired sizes. The substrate was sterilized in autoclave for required time and inoculated with spawn of desired mushroom. After incubating at desired temperature for 7 days the material was shattered, and then filled into the moulds, and incubated further for 6-7 days under the required conditions. After growth the material was dried at 65-75 °C for 12-18 hours. The products prepared using this technology are biobased, environmentally friendly, biodegradable, fire retardant and hydrophobic in nature, and an excellent replacement to styrofoam/ thermocol.

Licensing fee: 5.0 lakh

Development of mycelium-based packaging material using rice and wheat straw



Makhana seed collection system

- Main Components: Float, Collection Chute, Hydraulic System, Screening Assembly, Centrifugal Pump, Outboard Motor Propeller, Control System (Hydraulic pump and operator controls)
- Reduces labor, collection time, and cost, minimizes seed damage, and operates in varied pond depths.
- Patent application no.: 202411071081



Hand operated cocoa pod breaker

Main Components: Cutting Knives Assembly, Spring-Loaded Platform, Ergonomically designed Handle, Main Frame & Base Frame, Hydraulic System

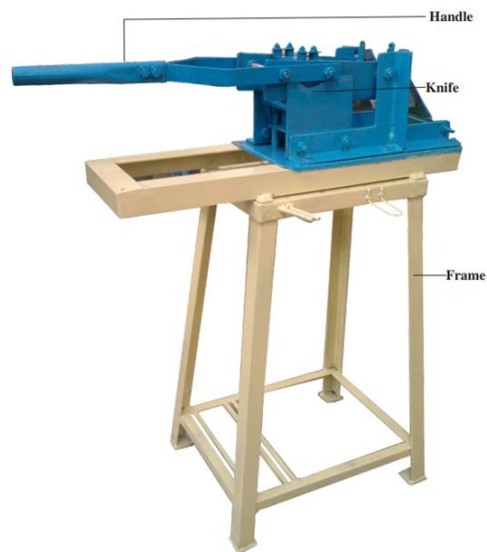
Capacity: 290 kg of pods per hour, compared to 155 kg per hour in the manual method.

Efficiency: 86%

Reduces bean damage to less than 1%,

Reduces labor, increases speed, and provides high-quality wet beans for further processing.

Patent application no.: 202411079887



AICRP on PHET:

1. Multi-Crop Processing (5-in-1) Machine



The Multi-Crop Processing Machine (5-in-1 machine) has been developed to process groundnut, sunflower, maize, and castor, thereby increasing the availability of raw materials for both domestic and export processing industries. This machine is particularly beneficial for small to medium-scale farmers, processors, startup entrepreneurs, seed processing industries, hotels, restaurants, and cottage industries, as it can help double their income. The 5-in-1 machine operates with a 0.5-1 HP single-phase electric motor. In one hour, it can separate 50 kg of pods

from groundnut crops, extract seeds from 120 kg of groundnut pods with less than 2% breakage, process seeds from 250 ear heads of sunflower, and separate seeds from 250 maize cobs, all without causing visual damage to the groundnut pods, maize seeds, and sunflower seeds.

Additionally, it is capable of castor decortication with an efficiency of 99% and a capacity of 100 kg per hour. The overall efficiency of the machine for all crops is 98%, and the germination rate of all seeds obtained from the machine exceeds 95%. The machine is compact, portable, and easy to operate, with a cost of Rs. 50,000. This price is 3-4 times less than the total cost of four separate machines required to process groundnut, sunflower, maize, and castor.

Grain Amaranthus thresher (2hp)

The grain amaranthus thresher consists of a threshing unit, sieve walker, blower, mainframe, shafts with bearings, a V-belt, and a pulley for power transmission, all powered by a single-phase 2 HP electric motor. The overall dimensions of the thresher are 650 mm (length) x 1020 mm (width) x 1225 mm (height). The machine operates with a power requirement of 2 HP and has a processing capacity of 13 kg/h. The patent for this machine has been granted (No. 91530). Grain amaranthus cobs are fed through the feed hopper, where they enter the threshing drum and undergo the threshing operation. The threshed grains then pass through the oscillating sieve mechanism, where empty cobs are separated. Finally, the threshed grains are collected at the seed outlet of the thresher. The cost of the machine is Rs 30,000.



Buckwheat-cum-Sunflower Dehuller: A new prototype of a buckwheat dehuller has been developed. This powered machine operates with a 1 HP single-phase motor and has overall dimensions of 82 cm (length) x 55 cm (width) x 116 cm (height), with an approximate weight of 82 kg. The main components of the machine include a hopper, a dehulling unit featuring a rough-surfaced dehulling drum with a perforated concave, a blower, and outlets. The machine has a processing capacity of 12-18 kg/h and achieves a dehulling efficiency of over 90%. It requires one person to operate and is priced at Rs 40,000.



Nannari root slicer and core removal machine

The developed nannari root cutting and core separator unit consists of a hopper, rollers, a cutting blade, and a core separator. The machine is equipped with a 1 HP 3-phase motor and an attached differential gearbox (1:12), featuring a grooved pulley connected to the main shaft. Nannari roots are cut into 25 mm pieces by a sharp knife connected to an eccentric unit. The cut roots are then moved to the core separator unit, where a needle pushes the core of the nannari root through a reciprocating action. The separated core and roots are collected at the discharge outlet. The machine has a capacity of 50 kg/h, which can be scaled up to a higher capacity, and is priced at Rs 1,50,000.



The Renewable Energy-Based Fodder Dryer and Winter Protection Shelter for goats

The Renewable Energy-Based Fodder Dryer and Winter Protection Shelter for goats was developed by ICAR-CIRG in Makhdoom. This structure, designed for goat kid housing and fodder drying, measures 22 x 11 feet and accommodates 40 goat kids aged 6-9 months. It features plastic panels for thermal insulation during winter, providing a cost-effective solution for sheltering goats while efficiently drying fodder. A trial was conducted to evaluate the drying of green biomass (*Cenchrus* spp.), which initially had a moisture content of 83.46% and a dry matter content of 16.54% (wet basis). The drying performance of a polyhouse solar dryer (S1) was compared to open sun drying (S2) and shade drying (S3). The polyhouse solar dryer achieved a maximum air temperature increase of 17°C above ambient levels. After 59 hours of drying, the moisture content of the biomass was reduced to 9% in the polyhouse solar dryer (S1), while open sun drying (S2) and shade drying (S3) resulted in moisture contents of 26.5% and 24%, respectively.



Modular water harvesting structure using plastic waste

The modular water harvesting structure utilizing plastic waste technology was developed by JAU, Junagadh. This innovative project features modular plastic blocks made from HDPE plastic waste, which are integral to the water harvesting system. The structure successfully harvested approximately 700 m³ of rainwater, which was recharged around five times during the season, resulting in a total recharge of 3,500 m³. Economic analysis indicates that the cost of constructing this water harvesting structure with modular plastic blocks is about Rs. 1.1 lakh, compared to Rs. 1.4 lakh for a structure built with UCR masonry. Additionally, using modular plastic blocks significantly reduces carbon emissions by 87%. The total estimated carbon emission from the construction of this water harvesting structure is 167.15 kg CO₂ equivalent per year.



Process Protocol/ Value added product developed:

ICAR-CIPHET

Process for preparation of ‘Makhana puffs’

The mechanized system of makhana processing produces fully popped makhana along with some by-products such as flattened makhana, over-popped makhana, semi-popped and unpopped makhana. These fetch lower market value as it is considered to be lower grade and size but have equivalent nutritional value to popped makhana. Therefore, it can be used in preparation of various value-added products like composite expanded snacks. Unpopped/ Semi-popped/flattened popped makhana, maize, potato flour, dehulled black gram dhal and rice were taken for development of “Makhana Puffs”. In the very first step, Unpopped/semi-popped/flattened makhana ground to get flour using a pulverizer (20-30 mesh size sieve). Maize, dehulled black gram dhal and rice coarsely ground before extrusion (18-20 mesh size). Potato flakes ground to 30- mesh size and this formulation was properly blended. Moisture content of feed was set to 15-16% and fed to extruder for puffing. The extruder parameters were 10.5 kg/h feed rate, 325 rpm screw speed, 60-80 °C barrel temperature and 110 ± 2 °C die

head temperature, the cutter speed was about 15 rpm. The puffs were dried to 3-4% moisture content (w.b.). Makhana puffs are highly nutritious and prepared using semi-popped/ flattened/ unpopped (thurri) makhana with fruit and cereal flour. This makhana based product is protein, minerals, antioxidants and dietary fiber rich ready to eat snack. This product is generally consumed by children group who require nutritious and healthy foods for their growth and development.

Licensing fee: 0.50 lakh



AICRP on PHET

Development of process technology for preparation of texturized mushroom protein from oyster mushroom.

The process of Mushroom-fortified texturized vegetable protein(TVP) was standardized. the optimized machine parameters were 300 rpm screw speed and 70 to 90°C barrel temperature. The 10% oyster mushroom powder with soy protein isolate and 35% feed moisture content of feed found optimal. Nutritional analysis revealed that, developed product has fiber and ascorbic acid content around 8.2% and 8.11 mg/100 g, respectively which were higher than the control sample. Mushroom fortified TVP also showed higher calorific value (19.3261 MJ/kg) than control sample (11.458 MJ/kg).



Process technology for making car polish from Karanj oil

Metal polish based on Karanj oil was developed by BAU Ranchi AICRP on PHET centre. It can be used for polishing metal surface to increase shine and making attractive. The materials used for development of polish are *karanj oil (3 gm)*, *Span-20 (3 gm)*, *abrasive powder (0.5 gm)*, *Alphox-200 (3 gm)* and *distilled water (40.5 gm)*. To prepare the car polish, start by properly mixing distilled water and Alphox-200 for 5 to 7 minutes to form Solution (1). In a separate container, mix Karanj oil and Span-20 for 5 to 7 minutes to create Solution (2). Next, combine Solution (1) and Solution (2), ensuring thorough mixing for 10 minutes. Once well-mixed, add the abrasive powder to the mixture. Continue to mix all ingredients together for an additional 10 to 15 minutes until a homogeneous blend is achieved. Finally, pour the finished mixture into a suitable container for storage. The value of pH of developed polish was 6.5. Gloss was measured using gloss meter on unpolished metal surface and polished surface and it was observed that the gloss value was found to be 6.3 GU for unpolished surface and 41.51GU for polish surface.



Photographs of car polish

1. Microbial method for production of protein isolate/ concentrate from oilseed cakes/ meals

1. Unique by eliminating the need for Hydrochloric acid (HCl).
2. Delivers higher yield, extended shelf-life, and better digestibility.
3. Reduces membrane fouling, maintains an environmentally friendly approach, and enhances appearance, taste, and functional properties.
4. Boasts probiotic and anti-obesity properties

Developed by:

Dr. D.N. Yadav, *et al.*

ICAR-CIPHET Ludhiana

Licensing fee: 5.0 lakh for MSME and 6.0 lakh for others

Patent no.: IN 407257 (International: US 12,285,029)



2. Taro peeling machine

1. The developed machine completely eliminates hand operation thereby reducing drudgery.
2. It peels taro with 95% efficiency without damage to the taro's fleshy portion, thereby minimizing wastage.
3. The capacity of the machine is estimated to be 100 kg/h.

Developed by:

Dr. Sandeep Mann

ICAR-CIPHET Ludhiana



Licensing fee: 0.50 lakh

3. Wadi making machine

1. The capacity of the machine is approx. 150-300 kg/h.
2. It reduces labor and ensures a hygienic, touch-free product.
3. It offers nine distinct wadi shapes, enhancing consumer appeal.

Developed by:

Dr. Sandeep Mann, *et al.*

ICAR-CIPHET Ludhiana

Licensing fee: 0.50 lakh



4. Mechanized system for primary roasting of makhana

1. The Makhana primary roaster efficiently handles 10 kg batches, ensuring precise roasting.
2. It's a cost-effective system with high throughput capacity, making it economically viable.
3. Capable of roasting all makhana grades, it operates with a 1kW energy requirement and uses 8 kg of LPG gas per 100 kg of makhana for heating, with key components including the Roasting Pan, Heating System, Power Transmission, Agitation System, and Discharge Mechanism.

Developed by:

Dr. R.K. Vishwakarma, *et al.*

ICAR-CIPHET Ludhiana

Licensing fee: 0.50 lakh

Patent application no.: 202011037651



5. Live Fish Carrier System (LFCS)

1. This system enables farmers to sell fish alive, increasing their revenue compared to selling dead fish, which fetch about 50% less.
2. With a 100 kg fish capacity per trip and 200 litres of water, it boosts income and reduces post-harvest loss by allowing unsold fish to return to the pond.
3. This automated system replaces manual labour and uses <50% less water than traditional methods, operated by just one worker.
4. LFCS extends the shelf life of harvested fish from ponds and rivers.



Developed by:

Dr. Armaan U. Muzaddadi, *et al.*
ICAR-CIPHET Ludhiana

Patent no.: 398167

Licensing fee: 1.0 lakh

6. Fish Dressing system

1. This machine speeds up fish dressing and maintains a clean processing area
2. It cuts fish into steak and helps collect solid and liquid wastes separately in closed container.

A transparent fly protector keeps flies at bay, while a continuous shower ensures cleanliness for the cutter, fish steaks, and the processing table, ensuring food safety

Developed by:

Dr. Armaan U. Muzaddadi, *et al.*
ICAR-CIPHET Ludhiana



7. Popped makhana grading machine

1. This compact grading machine efficiently categorizes popped makhana into different sizes and separates flattened makhana.
2. It's user-friendly, operated by a 1 hp electric motor with just two unskilled workers needed for operation, ensuring ease of use.
3. Constructed with high-grade stainless steel surfaces, it maintains excellent product quality and hygiene.
4. The machine can process 150 kg of popped makhana per hour with an overall grading efficiency of 87%.



Developed by:

Dr. R.K. Vishwakarma, *et al.*
ICAR-CIPHET Ludhiana

Licensing fee: 1.0 lakh

Patent application no.: 202511077426

8. Process technology for preparation of rice bran protein

1. The developed process help in achieving a protein purity of 75-78%, with bland flavour and possesses functional characteristics similar to brown rice protein.
2. This technology eliminates the need for pre-processing de-oiled rice bran residue, saving time, energy, and costs
3. It enhances the in vitro digestibility of rice bran protein.



De-oiled rice bran



Rice bran protein

Developed by:

Ms. Surya, *et al.*
ICAR-CIPHET Ludhiana

Licensing fee: 1.0 lakh

9. Mechanized system for popping and decortications of makhana seeds

1. The developed makhana popping machine efficiently roasts, pops, and produces a significant quantity of grade popped I kernels.
2. With a capacity of 12-15 kg/h for roasted seeds, the machine achieves a decortication efficiency of 95% and a popping efficiency of 90-94%.
3. This mechanized process not only reduces processing time but also minimizes labor drudgery and conserves energy.

Developed by:

Dr. S.N. Jha, *et al.*

ICAR-CIPHET Ludhiana



Licensing fee: 14.0 lakh

Patent no.: 434144

10. Fish Descaling Hand-tool

1. This tool efficiently removes fish scales with its removable Steel Bristle, boasting 97% efficiency and easy cleaning.
2. With varying bristle sizes on both sides, this tool suits big, medium, and small fish.
3. Made from lightweight polypropylene and stainless steel, weighing just 110g, its ergonomically designed handle ensures comfortable, prolonged descaling work.

Developed by:

Dr. Armaan U. Muzaddadi, *et al.*

ICAR-CIPHET Ludhiana



Licensing fee: 0.50 lakh

11. Indigenous Meat Patty Forming Machine

1. This machine provides a hygienic and user-friendly alternative to manual operations.
2. It offers automatic weighing and the ability to customize product size and shape.
3. Washable components are easily removable and reassembled due to their user-friendly design.

Developed by:

Dr. Yogesh Kumar, *et al.*

ICAR-CIPHET Ludhiana



Licensing fee: 0.75 lakh

12. Process for the preparation of fat-free flavoured makhana

1. Fat and oil-free flavored makhana product, retaining all nutritional properties.
2. This product boasts an extended shelf life while maintaining a natural appearance.
3. Suitable for health-conscious and obese individuals
4. Additionally, it is gluten-free, rich in antioxidants and minerals, ensures optimal nutrient availability, offers excellent sensory quality, and contains no artificial preservatives.

Developed by:

Dr. Mridula D. *et al.*

ICAR-CIPHET Ludhiana



Licensing fee: 0.50 lakh

Patent no.: 420645

13. Ready to constitute makhana kheer mix

1. The developed mix forms a homogeneous blend of ingredients, distinct from simple admixtures.
2. The use of this mix simplifies makhana kheer preparation, eliminating traditional cooking steps.
3. With an extended shelf life and lower transportation costs compared to popped makhana, it offers economic benefits and convenience in makhana kheer preparation.



Developed by:

Dr. S.N. Jha

ICAR-CIPHET Ludhiana

Licensing fee: 0.50 lakh

Patent no.: 287541

14. Cereal-gluten-free pasta with semi-popped makhana

1. A nutrient-rich, gluten-free instant pasta crafted from semi-popped makhana, fruits, and vegetables.
2. Ideal for fasting and celiac individuals, it offers a healthy, gluten-free alternative.
3. This instant product cooks in just 2 minutes, making it a convenient and nutritious choice.
4. Abundant in nutrients and antioxidants, it maintains a shelf life of 9 months in appropriate packaging.



Developed by:

Dr. Mridula D. *et al.*

ICAR-CIPHET Ludhiana

Licensing fee: 0.50 lakh

15. Groundnut based Beverage, Curd & Paneer

1. Lactose-free and easily digestible, making it suitable for those with lactose intolerance.
2. Rich in protein, essential minerals, and beneficial fatty acids like linoleic and oleic acids.
3. A good source of niacin, contributing to brain health and improved blood flow.
4. Flatulence-free and devoid of anti-nutrients, offering digestive comfort and nutritional benefits.
5. Cost-effective compared to dairy products, with readily available raw materials.
6. Cholesterol-free and rich in phytochemicals, promoting heart and overall health.
7. Remarkably efficient: 1 kg groundnut kernel yields 7 liters of beverage or 800g paneer plus 200 ml of peanut cream.



Developed by:

Dr. D.N. Yadav

ICAR-CIPHET Ludhiana

Licensing fee: 0.50 lakh

16. Low-fat, high-fiber processed meat products

1. The process reduces fat and improves fiber contents of processed meat products
2. The invention is based on totally natural ingredients from food industry by-products
3. The quality of low-fat meat products is almost similar to full-fat traditional meat products



Developed by:

Dr. Yogesh Kumar, *et al*

ICAR-CIPHET Ludhiana

17. Low-fat meat emulsion

1. The process reduces the fat content of meat emulsion and emulsion-type meat products
2. The process is based on totally natural ingredients which maintain the physico-chemical properties of meat products.
3. These meat products can reduce the risk of physiological disorders associated with the consumption of traditional full-fat meat products

Developed by:

Dr. Yogesh Kumar, *et al.*

ICAR-CIPHET Ludhiana



Licensing fee: 0.70 lakh