Processing and value addition Machineries in food grains

Power Operated Double Screen grain Cleaner-Grader

The machine clean the grains based on difference in terminal velocity of the different fractions of grain and accompanying material while classifying the food grains based on their difference in size. Suitable for all types of food grains.

Power source: electric motor (0.375 kW)

Weight: 100-110 kg

Capacity:900 kg/h (Power operated)

600 kg/h (Pedal operated)

Cleaning Efficiency: 78-80%, Cost:Rs. 20000/-

Millet Cleaner cum Grader

Millet cleaner cum grader is suitable for cleaning and grading of all types of millets.

Cleaning efficiency : 90-95 %

Capacity : 70-80 kg/h

Cost of operation of the machine : Rs. 40/-

Millet Destoner

Millet destoner is applicable for separation of stones and other impurities after cleaning.

It is suitable for all types of millets.

Separation Efficiency : 90-92 %

Capacity : 70-80 kg/h.

Cost of the Machine : Rs. 60,000/-

Grain handling, treatment and bagging machine

This is an integrated self-propelled machine perform the multiple operations like collection, conveying, surface treatment and bagging of the food grains spread over yard or in the form of heap. Suitable for all types of food grains.

Power source: electric (3.2 kW)

Weight: 200 kg

Capacity: 0.6 t/h, Cost: Rs. 1,00,000/-

Groundnut Decorticator

This is an oscillatory type device having cast iron shoes with projections for decortication of groundnut pods.The pods are fed in batches. There are two modelsstanding type and sitting type.

Power source: Manual

Weight: 10 kg

Capacity: 35-40 kg/h

Cost:Rs. 5000/-

Dal Mill

The machine suitable fordehusking and splitting of pulses like pigeon pea, black gram, green gram and lentil. The machine is operated in integration with standardized pre-treatment process protocol and grain cleaner cum grader.

Power source: electric motor (1.5 kW)

Capacity:100-110 kg/h

Dal recovery:72 %, Cost:Rs. 20000/-

Millet Mill

The machine is suitable for dehulling of minor millets. The machine is suitable for dehulling of foxtail millet, little millet, kodo millet, proso millet, barnyard millet etc.

Power source: electric motor (0.75 Kw)

Capacity: 100-110 kg/h

Dehulling efficiency: >70%

Cost : Rs. 20000/-

Millet Dehusker

The machine is suitable for de-husking of variety of millets like kodo, kutki etc. It works on the principle of shearing and crushing.

Capacity: 50 kg/h

De-husking efficiency: 70-75 %

Broken percentage: 3-5

Millet Polisher

Machine is suitable polishing of different types of millets.

It works on the principle of shearing and abrasion for removal of outer layer.

Capacity: 50 kg/h

Polishing efficiency: 70-80 %

Millet Popping Machine

The machine is useful for obtaining the popped millets and it is continuous in operation.

Popping efficiency: 75-80 %,

Capacity : 8-10 kg/h

Cost of machine : Rs. 80,000/-

Millet Roaster

A millet roaster has been developed for production of roasted millets which can also be used for different value added products.

Roasting capacity : 50-60 kg/h

Cost of Machine : Rs. 60,000/-

Millet Fermenter

Multi-millet fermenter is suitable for fermentation of millets for preparation of different value added products.

It has provision to adjust required temperature (25-100°C).

Capacity : 40 kg/batch

Cost : Rs. 70,000/-

Flour Mill

The machine consists of pair of emery disc between which the millet is crushed to obtain the flour.

Capacity: 50 kg/h

Milling efficiency: 90-95 %

Gluten Extractor

The machined used for the production of fresh gluten, gluten flour and gluten free flour. The machine operated with the standardized process for particular fraction of the gluten.

Power source: electric motor

Capacity:100 kg/h

Screw rpm: 50 rpm

Fresh Gluten: 27%

Cost:Rs. 1,00,000/-

Automatic Soymilk Plant

In the plant, the boiler and cooker are connected by automatic pressure valve and released steam easily to the cooker at steam pressure of 5 kg and temperature of 150 °C.

Power source: electric /LPG

Capacity: 100 lit/h

Pressure setting: 2.5 kg

Temperature setting: 120°C.

Processing and Value Addition Machineries in Horticultural Produce

Power cum Manual Operated Fruit and Vegetable Grader

It is a size based grading machine in which along the length of rollers the diameter is decreasing in steps, thereby the opening space between the rollers is increasing which facilitates the sorting of the moving commodities in different size lots.

Power source: Electric motor (0.74 kW)

Capacity:2 t/h

Grading Efficiency: 92-95%

Cost: Rs. 50,000/-

Stepwise Expanding Pitch Fruit Grader

It is a commercial scale multi fruit grader suitable for grading different types of spherical shaped fruit. The grader has provision to separate fruits into five grades by adjusting flap spacing between 30 and 145 mm.

Power source: Electric motor (0.74 kW)

Capacity:5 t/h

Grading Efficiency: 97%, Cost: Rs. 1,00,000/-

Smart Packaging System

A naturally extracted dye infused paper strip based intelligent indicator for packaging of fresh agro commodities. The indicator shows visible colour change with respect to change in pH and VOC's of the commodities. For Sapota: on 0th day colour was light yellow (fresh) and changed to light pink on 16th day (spoiled)

Ripening Chamber

It is suitable for ripening of fruits like banana, mango and papaya using ethylene gas under controlled conditions oftemperature and relative humidity.

Power source: electric motor (1.5 kW)

Weight: 70 kg

Capacity: 1 ton of fruits/ batch

Temperature: 18±1°C

Relative Humidity: 90 %; Cost: Rs. 1,00,000/-

Modular Onion Storage Structure (Model-I & Model-II)

The structure is foldable modular in nature. The storage unit equipped with sensor based automated aeration system. The structure has arrangement for easy filling and automatic discharge system. The storage system is suitable to store rabi harvest of the onion during rainy season.

Power source: electric motor (0.372 kw)

Capacity: 1 tonne (Model-I) & 3 tonnes (Model-II)

Cost: Rs. 20000/- (Model-I) & Rs. 35000/- (Model-II)

Onion Descaler

Onion bulb descaler developed to reduce drudgery in manual operation and clean the onions effectively. Soft bristle rollers simultaneously remove the dry peel and conveyed bulbs towards down for bag filling.

Power source: electric motor (0.75 kW)

Capacity:1000 kg/h

Descaling Efficiency: 88%

Cost:Rs. 35000/-

Technology for Production of Chemical Free Grape Raisins

A package of technology with chemical free process for the production of grape raisins. The technology includes mechanically de-bunching the berries followed abrasive surface treatment and drying as per standard protocol.

Power source: electric motor (total 1.5 kW)

Capacity: 130-150 kg/h

De-bunching Efficiency: 93-95%

Abrasion efficiency: 97%

Cost: Rs. 1,50,000/-

Pilot Plant for Minimal Processing of Cut Vegetables

This is a pilot plant of various machinery suitable for producing minimally processed cut vegetables like carrot slices/ shreds/ cubes/ grates, cauliflower florets, cabbage shreds etc.

Capacity: 100 kg/h

Sanitizing agent: Ozone and UV-C radiation.

Cost: Rs. 5.5 lakhs

Package for Processing of Tender Jackfruit

It is the package of machinery for processing of tender stage jackfruit for minimal processing and production of powder. It includes peeling of whole tender jackfruit, make their cut pieces, anti-browning treatment which can be used for vegetable purpose or shredded, dried and converted into powder.

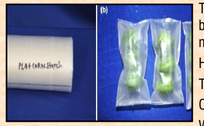
Power source: Electric

Overall capacity: 100-120 kg/h

Peeling efficiency: 90-95%

Cost: Rs. 5.0 lakhs

PLA + Corn Starch based Biodegradable Film



This biodegradable film was developed through commercial extrusion blown moulding method using PLA and corn starch. The developed film may be used for carry bags.

Haze %: 83.23%

Tensile strength: 31.51 MPa

OTR: 208.3 cc/m^2/ day

WVTR:83.33gm/m^2/day

PLA + Cassava Starch based Biodegradable film

This biodegradable film was developed through commercial extrusion blown moulding method using PLA and Cassava starch. The developed film may be used for handling of various agro commodities.

Haze %: 89.68%

Tensile strength: 25.16 MPa

OTR: 123.92cc/m^2/ day

WVTR:217 gm/m^2/day

PLA + PBAT based Biodegradable film

This biodegradable film was developed through commercial extrusion blown moulding method using PLA and PBAT. The developed film may be used for handling of various agro commodities.

Tensile strength: 75.49 MPa

OTR: 171.35 cc/m^2/ day

WVTR:101.47 gm/m^2/day

Value Added Products of Food Grains

RTE Millet Based Health Mixture

Millet-based mixes mainly include Millet grains, pulses (such as green gram, chickpeas, and peas), nuts and seeds, dried fruits, cocoa powder/vanilla powder, and soy milk powder.

Nutritional profile (per 100g): 18.5 g of protein, 60 g of carbohydrates, 14 g of fat, 149 mg of calcium, and 5.0 mg of iron.

RTS Millet Lassi

Fermented drink refreshing, nutritious, and gluten-free beverage of Fermented sorghum, coconut milk, and starter culture.

Nutritional profile (per 100 ml): 2.3 g protein, 60 g carbohydrates, 0.8 g fat, 10 mg calcium, and 14 mg magnesium

Millet Based Nutrient Dense Nutri-spread

Nutrient dense product developed using Fermented millets, green gram, peanut, soymilk powder, edible oil, sugar, salt, and cocoa powder.

Nutritional profile (per 100 g): 12-13 g protein, 50-52 g carbohydrates, and 25-27 g fat, 40 mg iron and 25 mg phosphorus.

RTC Millet Instant Dalia

Ready-to-Cook (RTC) Instant Dalia of fermented millets.

Nutritional profile (per 100 g): 10.3g protein, 1.89g fat, 62g carbohydrates, 1.34 g ash, and 140 mg magnesium

Millet Based Biscuit

Millet jaggery-based biscuit contains main ingredients like Whole wheat flour, pearl millet, foxtail millet, and jaggery.

Nutritional profile (per 100 g): 10.21g protein, 20.56g fat, 64g carbohydrates, and 1.65 g ash.

RTE Millet Based Laddu

Nutrient-dense superfood developed using millets, soybeans, peanuts, and sesame as major ingredients.

Nutritional profile (per 100 g):10.71g protein, 29.5g fat, 52.81g carbohydrates, 6.5 mg iron and 140 mg calcium.

Soy Milk Powder

Soy beverage powder is a nutritious food choice, known for its health benefits prepared from soybean as primary ingredient and natural sweeteners.

Nutritional profile (per 100 g):37 g protein, 20g fat and 32 g carbohydrate

Soy Chaap

Soy Chaap is rich in protein and provides a meat-like texture prepared using Soy Flour, Wheat Gluten, Edible Oil, salt.

Nutritional profile (per 100 g): water activity 0.54, pH 6.48, overall sensory quality 8.02.

Roasted Kodo Millet

Roasted Kodo Millet is a gluten-free, ready-to-eat, nutrient-dense snack. Each 100 g serving provides 8.6 g protein, 3.64 g fat, 2.72 g ash, and 43% antioxidant activity. The estimated cost of production is Rs.86/Kg.

Roasted Bajara

Ready-to-Eat (RTE) roasted bajra is a highly nutritious and versatile product. Each 100 g serving contains 9.96 g protein, 54 g carbohydrates, 5.6 g fat, 1.07 g ash, and 46% antioxidant activity. The estimated cost of production is Rs.84/Kg.

Millet RTS Instant Beverage Mixture

Millet-based Ready-to-Serve (RTS) instant beverage mix is developed using fermented ingredients. Each 100 g serving provides approximately 10 g protein, 2.5 g fat, 2.9 g ash, and 54% antioxidant activity. The estimated cost of production is Rs.300/Kg.

Millet Soya Fermented Powder

Millet soya based fermented powder is functional and ready-to-serve (RTS) beverage. Each 100 g of powder provides 12.08 g protein, 2.16 g fat, 1.62 g ash and 6.4% moisture content. The estimated cost of production is Rs.215/Kg.

Millet Bread

Bread is one of the most popular and consumed bakery product in India. Conventional maida based bread is causing serious health issues therefore, millet based bread has been developed for getting benefits of nutritional attributes of millets.

Nutritional composition: moisture content 28.82 %, protein 10.61%, carbohydrate 52.96%, fat 5.76% and ash 1.85%.

Millet-Atta Bread

The organoleptic properties of the conventional Maida/atta based bread has been improved with incorporation of millet flour. The incorporation of millet enhances the nutritional quality and mineral content in the bread.

Nutritional composition: moisture content 31.23%, protein 12.66%, carbohydrate 48.61%, fat 5.38% and ash 2.12%.

Soy Fortify Mix Healthy Noodles

Nutritious product prepared using Wheat flour, refined wheat flour, defatted soy flour, vegetable powder.

Nutritional composition: 309.78 kcal energy value, 143.09 g hardness 0.97 g fat and 4.35% moisture content.

Extruded Functional Snack Foods

Grain-Based Protein Rich Extruded Snack Foods contains 20.52g1g protein, 1.34g fat, 55.13g carbohydrates and 337kcal energy with essential nutrients.

Value Added Products of Fruits and Vegetables

Onion Paste

The onion paste is developed using a standardized unit operations like peeling, cutting, blanching, wet grinding, concentration, preservative addition, packaging and retorting.

Nutritional profile (per 100 g): Moisture: 80-82%

pH: 3.93, Carbohydrate: 1.9 g, Titrable acidity: 0.07/100 g, Processing cost: Rs. 2.50/kg

Onion Powder

The process of onion powder includes sorting, descaling, washing and peeling of onions. Peeled onions then sliced, dried, and grinded in to powder. The powder may be used as ingredient for various food product applications.

Nutritional profile (per 100 g):302 Kcal, Protein: 10.2 g, Total Fat: 0.44 g, Total Carbohydrates: 74g, Dietary Fiber: 12 g, Sugars: 47 g

Tomato Puree

The series of operations like washing, blanching, peeling, pulping, grinding/crushing, sieving, cooking, bottling and cooling are performed for preparation of tomato puree. The concentration of the product is judged on the basis of Brix.

Nutritional profile (per 100 g):Protein: 1.4 g, Carbohydrate: 15.6g, Dietary Fiber: 1.4 g, TSS: 8.3°Brix, Acidity: 1.1, pH: 3.8, Viscosity(@30rpm):0.23 Pa. S

Tomato Ketchup

The series of operations like washing, blanching, peeling, pulping, grinding/crushing, sieving, cooking, preservatives and spice ingredients addition, final cooking, bottling and cooling are performed for preparation of tomato puree.

Nutritional profile (per 100 g):Protein: 0.9 g, Carbohydrate: 28.6g, Dietary Fiber: 0.4 g, TSS: 38°Brix, Acidity: 1.6, pH: 3.3, Viscosity(@30rpm): 4.08 Pa. S

Tomato Powder

The process for development of tomato powder includes washing and cleaning of tomatoes, slicing, drying, grinding, sieving and packaging. The powder may be used as ingredient for various food product applications.

Nutritional profile (per 100 g):Energy: 302 Kcal, Protein: 10.2 g, Total Fat: 0.44 g, Total Carbohydrates: 74g, Dietary Fiber: 12 g, Sugars: 47 g

Chemical Free Raisins

It is a product made with a chemical free process. The process includes de-bunching of grapes, removal of waxy layer with abrasive pre-drying treatment and drying under controlled condition.

Nutritional profile (per 100 g): Carbohydrate 80 g, Total fat 0.45 g, Protein 3.5 g, Total anthocyanin 0.88 mg, Phenol content 19.7 mg

Amla Powder

The powder from fresh and mature amla fruits has been prepared using selected processing operations like washing, shredding, drying, grinding etc. under standardized process conditions.

Prominent Technologies of Agro Produce Processing Division

Dr. S. Mangaraj

Dr. Adinath E. Kate

Dr. Manoj K. Tripathi

Dr. Dilip A. Pawar

Agro Produce Processing Division

ICAR-Central Institute of Agricultural Engineering

Nabi Bagh, Berasia Road, Bhopal – 462 038

Email: sukhdev0108@gmail.com | Contact No.: 07477269857