Year: 2006-07

1. Cleaner-cum-Grader for Cumin

The cumin cleaner-cum-grader machine developed by Junagadh Agricultural University has cleaning efficiency of 75 per cent at the capacity of 50 kg/h and a low cost of cleaning (Rs. 0.31 per kg). It is recommended for the use of farmers, processors and other users.

2. Peanut butter

The entrepreneurs/farmers interested in value addition in peanut are recommended to select the GG-20 cultivar (in comparison to GG-2, GG-7, GG-11, GG-13) of peanut for the production of good quality peanut butter.

Year: 2007-08

1. Grader for Sapota

Hand-operated grader developed by Junagadh Agricultural University for grading sapota on the basis of size is released for the use of farmers, manufacturers and processors. The same machine can also be used for grading of similar types of fruits and vegetables.

Year: 2008-09

1. Drying and storage study on seed quality of groundnut

Thefarmers of South Saurashtra Agro-climatic Zone are advised that after shade drying of summer groundnut having about 8.00 to 8.50 per cent moisture content (WB), considering the minimum weight loss in pods (4.86 %) and kernels (4.92 %), higher germination (81.04 %), minimum pod damage (10.66%) and higher vigour index. The groundnut variety GG-7 followed by GG-2 was found better for four months storage period.

Also, in *kharif* groundnut having about 8.00 to 8.50 per cent moisture content (WB), considering the minimum weight loss in pods (2.06 %) and kernels (4.28 %), higher germination (81.66 %), minimum pod damage (9.22%) and higher vigour index, the groundnut variety GG-7 followed by GG-2 were found better for six months storage period.

Year: 2009-10

1. Storage study of wheat obtained by combine harvester and thresher

Thefarmers growing wheat for seed purpose are advised to use thresher for better germination and vigour as compared with self propelled combine harvester.

2. Studies on drying characteristics of vegetables using crop residue dryer

The agro processor interested in using the crop residue based dryer developed by Junagadh Agricultural University for drying serrated carrot, carrot slices, cabbage leaves, cauliflower pieces, tomato slices and whole green chillies are recommended to use following operating parameters :

1.	Air temperature	:	51 to 55 ^{0}C
2.	Air velocity	:	1.5 m/s
3	Bed thickness	:	8.0 cm
4.	Average fuel required	:	5.5 kg/h

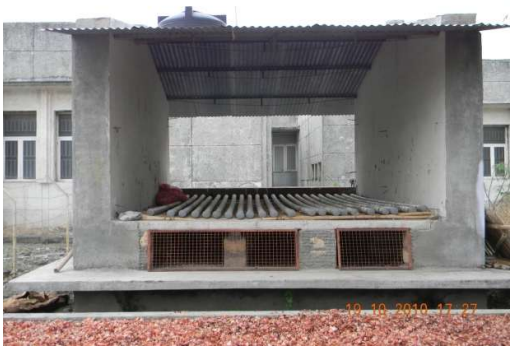
Year: 2011-12

1. Dehydration and storage of vegetables

The processors, exporters are advised to store dehydrated onion, garlic and unripe mango powder in polyethylene (HDPE) bags of 50 micron in vacuum packaging (740 mm Hg) to retain the quality up to 120 days of storage period.

2. Storage of onion

Thefarmers and traders who are interested to store the onion for more than four months are recommended to use forced air ventilated storage structure to get 36 per cent of more marketable red onion.



Year: 2013-14

1. Standardization of packaging technology of fresh guava fruits

The farmers, processors and exporters are recommended to adopt packaging technique developed by Junagadh Agricultural University for increasing the shelf life of guava fruit up to 18 days at room temperature by packing in 50 µ polyethylene bag at a vacuum level of 700 mm Hg.

PACKAGING OF GUAVA FRUITS USING VACUUM PACKAGING MACHINE

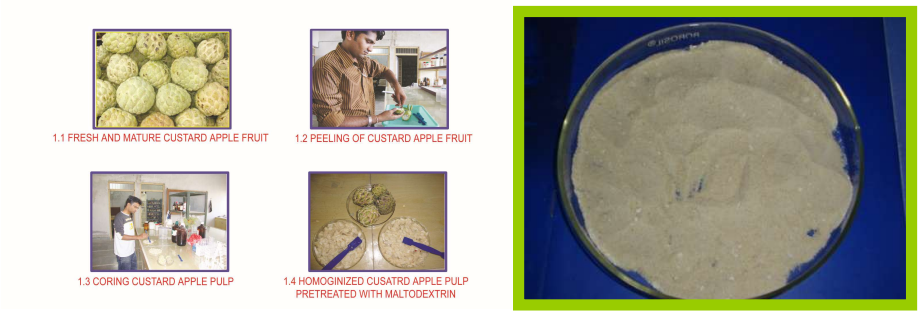
2. Standardization of packaging technology of processed guava fruits

The farmers, processors and exporters are recommended to adopt hot air drying technique developed by Junagadh Agricultural University for preparing of guava powder by drying of fresh guava slices (3 mm thick) pretreated with 1 % $CaCl_2$ + 2 % Potassium Meta bi Sulphate (KMS) solution for 10 minutes at 60 ^{0}C drying air temperature and 1.25 m/s air velocity in drying period of 17 hours. The powder prepared by this method can be stored up to 80 days at room temperature by packing in 50µ polyethylene bag at a vacuum level of 700 mm Hg.

LOADING OF DRYING TRAYS IN THE DRYING CHAMBER.

3. Preparation of custard apple powder by freeze drying methods

The processors and exporters are recommended to adopt freeze drying technique developed by Junagadh Agricultural University for preparing custard apple powder by freeze drying of fresh custard apple pulp (1.5 kg) pretreated with 5 % maltodextrine at -40 ^{0}C temperature with a drying period of 41 hours. The custard apple powder obtained by this method has better product quality and could be stored up to 90 days at room temperature when packed in 50 µ polyethylene bag at a vacuum level of 700 mm Hg.

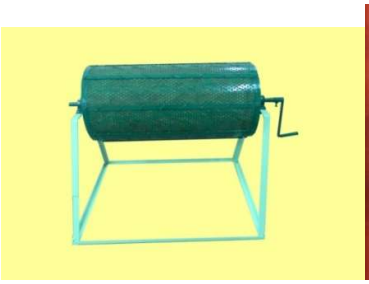


4. Extraction of enzymes from potato peels substrate using *bacillus* group of bacteria

Potato processors and entrepreneurs are recommended to adopt a process technology developed by Junagadh agricultural university for the production of Alpha-amylase and protease enzymes through microbial and biochemical methods from bio waste (potato peel) using Bacillus Subtilis bacteria. This process is beneficial (BCR 7.54:1) as compared to readymade available enzymes in market.

5. Development of manually operated sapota cleaner

The farmers growing sapota are recommended to use hand operated Junagadh Agricultural University developed sapota cleaner(capacity: 120 kg/h) having perforated metal sheet drum (45 cm diameter and 90.5cm length) lined with jute cloth on inner surface and be operated at 65 rpm for 90 seconds with 66% free space (in batch) for cleaning and shining the sapota surface after harvesting to reduce human drudgery.



Year: 2014-15

1. Storage study of wheat harvested by combine harvester

The farmers storing wheat are advised that wheat harvested by combine harvester (up to 6 % mechanically damaged grain) to be stored with the treatment of castor oil (15 ml/1.0 kg grain) and can be kept in GI bin container to keep safe against lesser grain borer up to eight months of storage as it reduces pest population, grain damage, weight loss as compared to untreated wheat kept in jute bags.

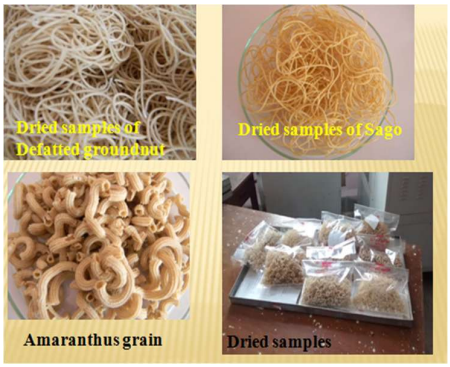
2. Extraction of Pectin from Kesar Mango Peel by Resins

Mango processors are recommended to adopt a process technology developed by Junagadh Agricultural University for the production/extraction of pectin from mango peel using cation exchange resin as an extracting medium with peel to extracting medium ratio of 1:4, extraction pH of 2.56, extraction temperature of 80 °C, extraction time of 60 min and two extractions. This method can give better yield and quality of pectin with benefit cost ratio (BCR) of 1.17.

Year: 2015-16

1. Preparation of extruded products from flour of amaranth grain, sago and defatted groundnut

Food processors are advised to prepare quality cold extruded pasta by blending defatted groundnut flour, amaranth flour and sago flour (as a binder) in the ratio of 20, 70 and 10 % respectively followed by sun drying for 14 hours in summer months or in solar cabinet dryer for 1 hour at 55 ^{0}C. The product can be stored intransparent polyethylene (LDPE) bags of 75 micron to retain the good quality at least up to two months of storage period.



2. Development of power operated sapota cleaner

The farmers are recommended to use power operated sapota cleaner developed by Junagadh Agricultural University for cleaning and shining sapota surface after harvesting. This machines saves 90 per cent cost of cleaning as compared to manual cleaning. Machine capacity is 575 kg/hr.

Year: 2017-18

1. Enzymatic pre-treatment in the processing of pigeon pea

The pulse processing entrepreneurs are recommended to give enzymatic pre-treatment at specific concentration, time and temperature to get higher recovery and to reduce the dhal making time.

Year: 2018-19

1. To study the effect of different packing materials against Groundnut bruchid (Caryedon serratus Olivier.) during storage

Farmers are advised to store the well dried (8.0%MC) groundnut pods in PICS bag (Purdue improved crop storage bag) or Closely woven net bag for effective and economical management of bruchid pest up to six months.

Year: 2019-20

1. Lemon grading simulation based on image processing technique

Fruit grading machine manufacturers are recommended to adopt the image processing technique-based simulation developed by Junagadh Agricultural University, Junagadh for grading of lime (kagji) based on their size and colour. The limes can be graded in 3 x 3 different categories according to their size (small, medium and big) x maturity (immature, intermediate and mature) by applying the size and colour features of lime obtained through this simulation.

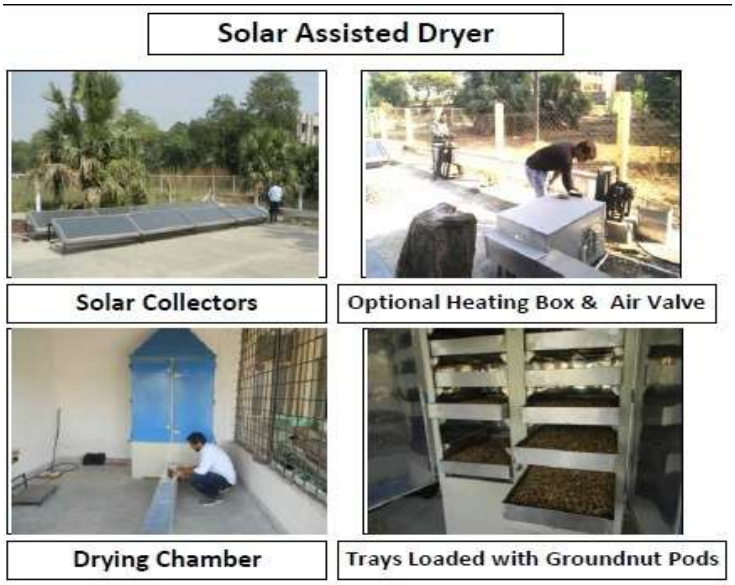
2. Design and development of on farm solar assisted dryer for drying of groundnut pods for longer storage

The farmers growing groundnuts and processors drying groundnut pods are recommended to use the solar assisted dryer developed by Junagadh Agricultural University. Use of solar assisted dryer for drying of threshed groundnut pods to reduce moisture content from 11 to 13.9 % (wb) to safer storage moisture content of 6 to 7 % (wb) using dryer condition of about50 °C air temperature andabout 0.099 m3 /s air flow in 7 to 8 hours (i.e. 1 day). Use of solar assisted dryer can reduce drying time (7 h) to seven times less than sun drying (50 h) and reduces the post harvest losses of groundnut pods in drying, handling, storage as compared to sun drying.

Details of solar assisted dryer

- Capacity of dryer : 125 kg per batch (Groundnut pods)

- Drying trays : 12 trays arranged in 6 tiers (10±0.50 kg per tray)
- Solar collectors: 8 Nos. (1 m x 2 m)
- Drying air temperature : about 50 °C
- Air flow rate : 1.0 m/s
- Blower capacity : 1.5 hp, 28 m^3/min
- Maximum increment in drying temperature : 26.9 ºC to 39.8 ºC
- Drying time : 7 to 8 hours



3. Forced air curing of onion

The farmers curing traditionally and storing red onion are recommended to use forced air curing at about 40 ºC temperature with air flow rate about 0.24 m^3/s and without foliage onion bulb for obtaining higher quantity of marketable onion after six months of storage.

4. Development of high protein extruded product using defatted peanut flour

Snack manufacturing units are recommended to adopt a process technology developed by Junagadh Agricultural University for the preparation of extruded product by using a proportion of defatted peanut flour and corn flour as 26:74 (w/w) with the help of twin screw extruder machine to increase the protein content in Ready-to-Eat extruded products. The suggested optimum conditions to prepare extruded product using defatted peanut flour are feed moisture content: 13% (wb), die head temperature: 135°C, feed temperature: 60°C, barrel temperature: 100°C and screw speed: 250 rpm. This process can prepare the extruded product of increased protein content with desired product characteristics.

5. Effect of ozonization against the microorganisms of fruits and vegetable.

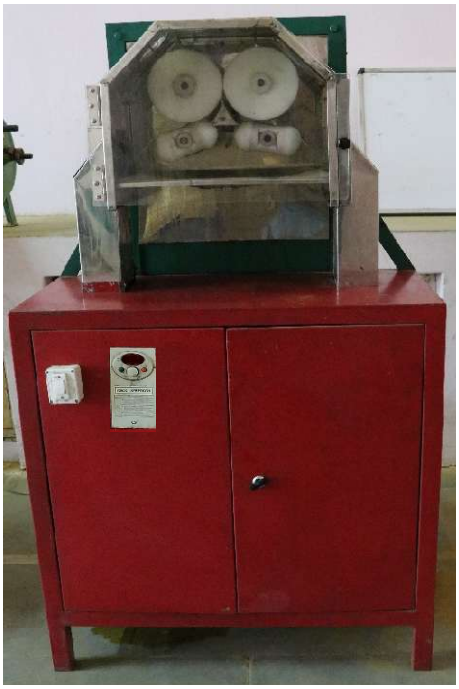
Scientific communities are advised to store mangoes & limes after applying a treatment of ozone 3 minutes (flow rate : 400 mg / hour) packed in 25 µ plastic bag (1 pinpoint hole per 2 x 2 square inch area of plastic bag) and kept at 10 ºC temperature remain safe against the microbial load up to 50 days & 120 days respectively.

Whereas exporters are recommended to store tomatoes up to 21 days by applying a treatment of ozone 3 minutes (flow rate: 400 mg / hour) packed in 50 µ plastic bag (1 pinpoint hole per 2 x 2 square inch area of plastic bag) and kept at 10 °C temperature remain safe against the microbial load.

Year: 2020-21

1. Design and Development of Pomegranate Juice Extractor.

The farmers and enterprenures are recommended to use pomegranate juice extractor developed by Junagadh Agricultural University to reduce the cost of juice extraction.



2. Low temperature grinding of spices (Fenugreek seed).

The processors are recommended to grind fenugreek seed feed at low temperature (-10±2 ˚C and using coolant (propylene glycol) circulation (15 lpm) through jacketed grinding mill for better recovery of biochemical compounds, volatile oil and volatile compounds.

Year: 2021-22

1. Design and development of grain treater for enzymatic pre-treatment to pigeon pea grains.

The pulse processors are recommended to use the pigeon pea grain treater developed by Junagadh Agricultural University for efficient enzymatic pre-treatment to increase the hulling efficiency, reduce the processing cost and improve the benefit-cost ratio as compared to the traditional dhal processing.

2. Low temperature grinding of spices (Turmeric).

The spice processors are recommended to use JAU developed grinding process for turmeric rhizome feed at low temperature (-10±2 ^{0}C) using coolant (propylene glycol) circulation

(15 lpm) through jacketed grinding mill for better retention of biochemical compounds, volatile oil and curcumin.

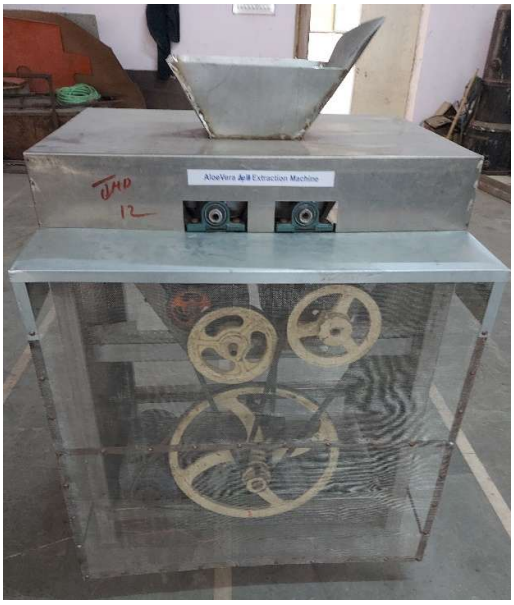
Year: 2022-23

1. Development of biodegradable packaging film based on whey protein isolate.

The entrepreneurs and industrialists are recommended to adopt a process technology developed by Junagadh Agricultural University for the preparation of biodegradable plastic film based on whey protein isolate by using 1:1.4 WPI to glycerol ratio, 6.6 pH and 93 % Ultra sonication power by casting method to replace synthetic plastic to use as carry bag and dry matter packaging film.

2. Modification of Gel Expulsion Machine for Aloe vera leaves.

The farmers and entrepreneurs are recommended to use Aloe vera Gel Expulsion Machine developed by Junagadh Agricultural University to get maximum gel recovery (39 %), gel expulsion efficiency (79 %) and output capacity (98 kg/h) with better quality of gel to operate at 75 rpm expulsion roller speed for Aloe vera leaves having thickness more than 20 mm to reduce 79 % cost of expulsion.



Year: 2024-25

1. Extraction of Peanut Protein Isolate from partially defatted peanut flour by Modifying Iso-electric Precipitation Method.

Industrialists are recommended to adopt a process technology developed by Junagadh Agricultural University for the production of protein isolate from partially defatted peanut flour. In this technique, peanut protein isolate is obtained by mixing the partially defatted peanut flour with water and enzyme at specific alkaline extraction pH and sonicated followed by incubation at specific condition. Then acid precipitation using HCl was done followed by freeze drying. With this, isolate recovery, protein yield and protein content are obtained as 59.17%, 89.99% and 91.25 %, respectively.

2. Extraction of Peanut Protein Isolate from partially defatted peanut flour Iso-electric Precipitation Method using organic acids.

Industrialists are recommended to adopt a process technology developed by Junagadh Agricultural University for the production of protein isolate from partially defatted peanut flour. In this technique, peanut protein isolate is obtained by mixing the partially defatted peanut flour with water and enzyme at specific alkaline extraction pH and sonicated followed by incubation at specific condition and precipitated using organic acid. The precipitation using citric acid resulted in isolate recovery, protein yield and protein content as 55.71%, 86.56% and 93.14% respectively. The precipitation using ascorbic acid resulted in isolate recovery, protein yield and protein content as 55.71%, 82.89% and 89.80%, respectively. The precipitation using acetic acid resulted in isolate recovery, protein yield and protein content 52.48%, 73.17% and 82.48%, respectively.

Year: 2025-26

1. Study on storage stability of pearl millet flour

Food processors and entrepreneurs are recommended to adopt the process technology developed by Junagadh Agricultural University for increasing the shelf life and better retention quality of pearl millet flour. The developed process can safely store the pearl millet flour atleast upto 90 days when packed in vacuum-sealed aluminium foil pouches.

2. Pasteurization of Kesar mango pulp through ohmic heating treatment

Mango pulp processors are recommended to adopt the ohmic heating process technology developed by Junagadh Agricultural University for enhancing the shelf life and maintaining the quality of Kesar mango pulp. The developed process involves treating the mango pulp in the ohmic heating system at voltage gradient of 20 V/cm till pulp attained the temperature of 80 °C. This process can extend the shelf life of Kesar mango pulp upto 75 days under 6-7°C refrigerated storage condition.

3. Optimization of process parameters for protein extraction from partially defatted peanut flour through fermentation

The processors involved in the peanut processing are recommended to adopt a process technology developed by Junagadh Agricultural University for the extraction of protein from partially defatted peanut flour. The process involves preparing a mixture of partially defatted peanut flour and water in a 1:10.5 (w/v) ratio and subjecting the mixture to sonication for 9.0 minutes. The suspension is then fermented using *Lactobacillus plantarum* bacteria at 37°C until the pH of suspension decreases to 4.3, followed by drying in a hot-air oven at 45°C for five hours. This method is capable to extract 42 % true protein from partially defatted peanut flour.

OR

The processors involved in the peanut processing are recommended to adopt a process technology developed by Junagadh Agricultural University for the extraction of protein from partially defatted peanut flour. The process involves preparing a mixture of partially defatted peanut flour and water in a 1:9.4 (w/v) ratio and subjecting the mixture to sonication for 9.5 minutes. The suspension is then fermented using *Pediococcus acidilactici* bacteria at 37°C until the pH of suspension decreases to 4.6, followed by drying in a hot-air oven at 45°C. for

five hours. This method is capable to extract 43 % true protein from partially defatted peanut flour.

4. Development of millet-based extruded product supplemented with partially defatted peanut flour

Snack manufacturing units are recommended to adopt a process technology developed by Junagadh Agricultural University for the preparation of pearl millet based extruded product supplemented with partially defatted peanut flour to increase the protein content in such products. The process involves blending of pearl millet flour with partially defatted peanut flour followed by extrusion cooking. This process enables the production of pearl millet based extruded product with improved protein content and desired product characteristics. They are also recommended to adopt storage method developed by Junagadh Agricultural University for this extruded product. This method can safely store the developed extruded product up to 180 days under ambient condition.

5. Development of Jamun leather using refractance window dryer

Food processors are recommended to use process technology developed by Junagadh Agricultural University to develop jamun leather at particular temperature and thickness in the Refractance Window Dryer. This jamun leather have good biochemical content and sensory score. This jamun leather could be stored in plastic bag or aluminum foil with vacuum condition in refrigeration for 60 days with good sensory score.

6. Standardization of process technology for preparation of peanut Sauce

Peanut processors are recommended to adopt a process technology developed by Junagadh Agricultural University for the production of peanut sauce through chemical process (Acid hydrolysis). The process involves blending of partially defatted peanut kernels with roasted wheat pieces in a 90:10 ratio, followed by acid hydrolysis using a 16.5% acid concentration for 25 hours. The developed process can efficiently prepare the peanut sauce from the partially defatted peanut kernels and roasted wheat pieces that meets the established quality standards for commercial peanut sauce. This peanut sauce can be stored in aluminium foil spout pouch, having a thickness of 100 µm up to 90 days under ambient condition.

7. Process technology for the preparation of peanut sauce through fermentation method

Peanut processors are recommended to adopt a process technology developed by Junagadh Agricultural University for the production of peanut sauce through fermentation process. The process involves blending of partially defatted peanut cake with roasted wheat pieces in a 66:34 ratio, followed by brine fermentation for 158 days. The developed process can efficiently prepare the peanut sauce from the partially defatted peanut cake and roasted wheat pieces that meets the established quality standards for commercial peanut sauce.