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## **TECHNICAL SESSION –I**

### **TECHNOLOGIES IN FOOD PROCESSING (TFP)**

#### **TFP-O-01**

#### **MEMBRANE FILTRATION OF FRUIT JUICE - AN EMERGING TECHNOLOGY**

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India is the largest producer of fruits in the world. The traditional or commercial fruit juice method involves heat treatment which is responsible for nutritional loss, vitamin loss, 'cooked flavour' and loss of color and aroma. Overall qualities of the juice deteriorate. Moreover these technologies are labour and time consuming. Whereas membrane filtration method {Ultra filtration (UF), Microfiltration (MF), Nano-filtration (NF) and Reverse osmosis (RO)} is a good alternative for the fruit juice and beverage industry, has a significant impact on the organoleptic and nutritional properties of the juice. The use of membrane process associated to the enzymatic hydrolysis resulted in a clarified and concentration of fruit juices with a high nutritional quality and sensory quality. Microfiltration was efficient in removing the substance that causes haze. Resulting in clear juice free of pulp or suspended particles. The advantage of non-cellulosic membrane, having high retention of low molecular weight organics and good physical and chemical stability, has enabled reverse osmosis to be used commercial scale for the concentration of juice. This article provides an overview of recent developments and the published literature on Microfiltration, Ultrafiltration and Reverse osmosis with regard to fruit juice processing and its integration with other membrane processes. Various components of the fruit juices that impose problems during filtration process along with their quality requirements and regulatory concerns also been included in this review, so as to identify the constraints related to concentration of fruit juices using various separation methods.

Keyword: Fruit juices, Microfiltration, Ultrafiltration, Reverse osmosis (RO), membrane fouling, integrated membrane processes.

#### **TFP-O-02**

#### **SHOREA ROBUSTA (DIPTEROCARPACEAE) SEED AND ITS OIL AS FOOD**

**Shashi Kumar C, Payel Ghosh, Sandeep Singh Rana and R.C. Pradhan**

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*Shorea Robusta* (Sal) belongs to family Dipterocarpaceae family. It is playing an important in the

economics of Central Indian states of Orissa, Jharkhand and Madhya Pradesh. These three states cover 45 % of forest area. Sal is a deciduous tree that reaches up to 50 m height. Sal trees it is famous for seed and its seed oil. Sal fruit pulp contains sugar, gum, malic and citric and tartaric acids, the fruit pulp are edible and also sometimes consumed. Sal tree is a crucial plant for veterinary medicine. Sal fruit content is 66.4% kernel and pod; 33.6 % is shell and calyx. Sal seed processed mainly for fat or oil. It is play primary role in food and cosmetic sectors. The extracted Sal oil is greenish brown colour and characteristic odour; the refined oil is used as substitute for cocoa butter in chocolate manufacture. And also used as a vanaspati, paints, pigments, lubricants and production of biodiesel. Besides, the de-oiled cake also has a good export market for cattle, poultry and fish feed.

Kew words: *Shorea Robusta*, Dipterocarpaceae, Sal seed oil.

#### **TFP-O-03**

#### **EFFECTS OF PRE-TREATMENT ON SUN DRYING OF VEGETABLES**

**N. Pathak, P.P. Said, S. Kaushik, V. Nirmalkar and K. R. Sahu**

Krishi Vigyan Kendra, Bilaspur

The vegetables are found to be rich source of ascorbic acid, carotene, minerals and fair source of protein, fat, and fiber. But their perishable nature limits their use throughout year and hence required to preserve. Sun drying is only possible in areas where, in an average year, the weather allows foods to be dried immediately after harvest. Effect of pretreatments on sun drying of Brinjal and Tomato was studied at Krishi Vigyan Kendra, Bilaspur. Blanching and Potassium metabisulfite treatments were used. The study showed that the blanching was more effective among the treatments used on hedonic scale as it preserves colour and texture of both Brinjal and Tomato. Hence, blanching at 70°C for 5 minutes is recommended as pretreatment before sun drying.

Key words: Sun drying; Pretreatments; Blanching; Tomato; Brinjal

#### **TFP-O-04**

#### **RETENTION OF ANTIOXIDANTS DURING HEAT PROCESSING OF VEGETABLES**

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Fruits and vegetables are valued for not only the nutrients but also for the nutraceuticals like antioxidants in them. They are the most important dietary sources of nutraceuticals that are valued for preventing lifestyle diseases like cancer, diabetes and cardiovascular disease. Such foods should be cooked/processed in a way to retain the goodness

of nutraceuticals. Retention of antioxidants during heat processing such as boiling, pressure cooking, microwave cooking, stir-frying and frying of vegetables was investigated. Fresh and cooked vegetables were analysed for ascorbic acid content (AA), total polyphenols (TP), total flavonoids (TF), tannin and total antioxidant activity by 1,1-diphenyl-2-picrylhydrazyl (DPPH) and ferric reducing antioxidant power (FRAP) assays. Results showed that the AA, TP, TF, tannin and antioxidant activities were affected by heat processing, the retention varying among individual compounds. Boiling, pressure cooking and microwave cooking brought about appreciable reduction in AA, TP, TF, tannin and antioxidant activity in vegetables, while frying and stir-frying showed less losses. The highest antioxidant retention was observed in frying followed by stir-frying, microwave cooking, pressure cooking and boiling. The study indicated that short time heat treatments such as frying and stir-frying help to retain the antioxidant properties of vegetables.

### **TFP-O-05**

#### **IN VITRO AND IN VIVO STUDIES ON ANTIOXIDANT POTENTIAL OF METHANOLIC EXTRACT OF POMEGRANATE FRUITS**

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The present study was aimed at investigating the antioxidant activities of the methanolic extract of pomegranate (*Punica granatum*) fruit. The antioxidant activities of extract have been evaluated by using *in vitro* assays and *in vivo* model. In case of *in vitro* studies, the antioxidant activity of methanolic extract of pomegranate fruit was 198.31 mg/100g; 192.25 mg/100g; 181.13 mg/100g and 143.24 mg/100g by DPPH, nitric oxide, superoxide radical scavenging assays and ferric reducing antioxidant power assay, respectively. In case of *in vivo* studies, the levels of antioxidant enzymes superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and lipid peroxidation (LPO) were restored towards the normal value in fruit supplemented alloxan induced diabetic rats. The free radical scavenging and antioxidant activities may be attributed to the presence of total poly phenols (148.61 mg/100g), total flavonoids (209.83 mg/100g) and ascorbic acid content (24.21 mg/100g) present in pomegranate fruit. The results obtained in the present study indicate that the pomegranate fruit is a potential source of natural antioxidant.

### **TFP-O-06**

#### **WHEY-BASED PAPAYA HERBAL BEVERAGE**

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Growing concern over pollution and environmental

control renewed the pressure on cheese/paneer manufacturers to stop dumping whey in sewage directly rather converting into useful product. Cheese/paneer whey can be used to develop nutritive soft drinks or high protein beverage. In the present study an attempt was made in this direction to take advantage of health benefits of fruits, herbs and spices to prepare a soothing and nutritional beverage by using whey with papaya, lemon grass and cardamom extracts. Lemon grass and cardamom extracts were used ranging from 0.25-0.8% and 0.5-1.5%, respectively, with whey already containing 10% papaya pulp. The levels of extracts were optimized by using CCRD design of RSM. The beverage was analyzed for sensory evaluation, shelf life and physicochemical attributes. Results revealed that there was no substantial variation in TSS, whereas pH varied from 4.7-4.95, acidity 0.258-0.292 and total solids were 15.14-15.76. Overall acceptability score varied from 6.43-7.89. Effect of lemongrass ( $p < 0.05$ ) and cardamom ( $p < 0.01$ ) was found significant on overall acceptability of the beverage at quadratic level. Shelf life of prepared beverage was more than 1 month and 2 weeks at ( $5 \pm 1^\circ\text{C}$ ) and ( $30 \pm 1^\circ\text{C}$ ), respectively.

### **TFP-O-07**

#### **ANTHELMINTIC PROPERTY OF TRICHODESMA ZEYLANICUM (BURM.F) R.BR IN RELATION TO OXIDATIVE STRESS**

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Helminths are the most common infectious agents affecting the humans in developing countries. To combat the morbidity and other effects of helminthiasis by natural medicine, the present study was undertaken to evaluate the anthelmintic efficacy of the plant *Trichodesma zeylanicum* (Boraginaceae) known for its medicinal and therapeutical uses. The leaf and inflorescence of the plant were extracted using different solvents and phenolic, tannin and flavonoid contents were quantified. The antioxidant properties were analyzed using DPPH\* ( $\text{IC}_{50} - 18.28 \mu\text{g/mL}$  for methanol extracts of both leaf and inflorescence), ABTS<sup>+</sup>, NO<sup>+</sup> scavenging, FRAP, metal chelating and phosphomolybdenum reduction assays. The bioefficacy of active ethyl acetate and methanol extracts was investigated by anthelmintic study *in vitro* using *Pheretima posthuma*. To identify the active constituents responsible for the anthelmintic activity, GC-MS analysis of ethyl acetate extract of inflorescence (anthelmintic mortality time – 2.79 hours) was done which revealed chemical derivatives similar to the synthetic anthelmintic drugs. HPLC analysis of methanol extracts of leaf and inflorescence that exhibited better antioxidant activities, was carried out which showed the presence of 8 phenolic-like compounds. These findings justify that this plant can serve as a source of natural

therapeutic agent against intestinal parasites and stress related disorders.

Key words: Anthelmintic, *Pheretima posthuma*, antioxidant, GC-MS, HPLC.

### **TFP-O-08**

#### **SPRAY DRIED TENDER COCONUT –PINEAPPLE JUICE**

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Coconut water is one of the natural health drinks with high vitamins, minerals and medicinal properties. It rapidly deteriorates once exposed to air and warm temperatures and loses most of its nutritional benefits. High temperature processing destroys some of the nutrients in coconut water and almost the entire delicate flavor. This severe limitation will affect product marketing. It is, therefore, considered desirable to process coconut water into powdered products that retain the 'fresh' natural flavor and nutritional benefits to meet demand of the natural health drink market. Here studies were made to develop spray dried coconut water pineapple juice powder, in order to improve the flavor and other nutritional properties. Spray drying technology was used to convert it into powdered form. Different formulations were prepared with different ratios of tender coconut water and pineapple juice. The most acceptable formulation was selected using a nine point hedonic scale. Feed mixture was prepared using maltodextrin as the carrier agent and the sample was spray dried at an inlet temperature of 165<sup>o</sup>C and at an outlet temperature of 80<sup>o</sup>C, aspirator speed 1350 rpm and atomization pressure 2 Kg/cm<sup>2</sup>. The quality of coconut water pineapple juice powder was analyzed. It has a Vitamin C content of 5.3mg per 100gm, TSS 15<sup>o</sup>Brix and acidity 0.2 per cent.

### **TFP-O-09**

#### **MICROENCAPSULATION OF BIXIN EXTRACTED FROM ANNATTO SEEDS**

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*Bixa orellana* L is commonly known as annatto or achiote tree. Annatto colour or pigment is extracted commercially from the seeds of this plant and is widely used as a colouring agent in food as well as pharmaceutical and textile industries. In this study, efforts were made to extract annatto using hot water, commercial ethanol and hot glacial NaOH. The chemical properties were investigated using spectrophotometer and chromatographic techniques. The extract was microencapsulated using spray drying for easy handling and preserve bioactive compounds. Gum Arabic acted as the wall material. Microencapsulation carried out

with inlet air temperature 160<sup>o</sup>C, outlet air temperature 80<sup>o</sup>C, concentration 20%, aspiration speed 1400 rpm and feed flow rate 40 rpm. From 30 gm. annatto sample ethanol yield 1.21gm extract, hot NaOH yield 3.26 gm extract. and hot water yield 0.687gm extract. Percentage carotenoid content found in the extract extracted by commercial ethanol is 0.238. , hot NaOH is 0.303 and hot water is 0.238. The Rf value found out from the extract extracted by using ethanol found out as 0.50. So which is recognised as bixin and the Rf value found out from the extract extracted by using hot NaOH found out as 0.45. So which is recognised as norbixin. The yield of microencapsulated product from 0.1gm of bixin in 80 gm. gum arabic and 200 ml of water is 10.244gm.

### **TFP-O-10**

#### **STUDIES ON PREPARATION OF SHRIKHAND FROM SWEET CORN MILK BLENDED WITH BUFFALO MILK**

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*Shrikhand* blended with sweet corn milk was prepared from different preparation of sweet corn blend. The product obtained was subjected for chemical analysis and organoleptic evaluation by panel of judges. On an average the moisture content of *Shrikhand* blended with sweet corn milk was found to be 32.5, 33.8, 34.3 and 35.9 per cent, fat 9.3, 8.4, 7.4 and 6.5 per cent, protein 9.14, 8.72, 8.33 and 7.74 per cent, ash 0.84, 0.73, 0.64 and 0.45 per cent, carbohydrate 60.3, 65.2, 70.3 and 74.5 per cent and total solids 67.45, 66.2, 65.65 and 64.07 per cent for treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively. It was also observed that as the blending of sweet corn milk increased, there was decrease in fat, protein, ash, total solids content of *Shrikhand* blended with sweet corn milk and increase in moisture and total sugar content. It can be concluded that the sweet corn milk can be very well utilized for preparation of nutritious, palatable and low cost *shrikhand* by blending 30 per cent sweet corn milk with 70 per cent buffalo milk on weight basis.

Keywords: Organoleptic evaluation, Sweet Corn Milk, *Shrikhand*.

### **TFP-O-11**

#### **EFFECT OF INCORPORATION OF BLACK GRAM FLOUR ON QUALITY OF RESTRUCTURED SPENT HEN MEAT BLOCKS**

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The present study was conducted to study the effect of incorporation of black gram flour on quality characteristics of restructured spent hen meat blocks. The

effective utilization of spent hen meat is of prime interest to the poultry industry. Restructuring of meat is one of the innovative and process friendly technologies. Black gram flour (1:1 hydration, w/w) was incorporated at the levels of 8, 12 and 16% by replacing the lean meat in prestandardized restructured spent hen meat blocks (RSHMB) formulation. The product yield and pH of RSHMB with black gram flour at all levels were significantly higher as compared to the control. Moisture and protein percentage of RSHMB were significantly lower at 12 and 16% levels of black gram flour as compared to the control. Fat percentage and shear force values of RSHMB at all levels of black gram flour incorporation were significantly lower than that of control. Flavour, juiciness, texture, binding and overall acceptability scores of RSHMB decreased significantly at 12 and 16% black gram flour levels than control where as these were comparable at 8% level of black gram flour to control product. Thus, the optimum incorporation level of black gram flour in restructured spent hen meat blocks was adjudged as 8%.

#### **TFP-O-12**

### **DEVELOPMENT OF EGG SNACK AND EVALUATION OF ITS QUALITY CHARACTERISTICS**

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Development of convenient, ready-to-eat, functional snack food items based on egg invites lot of interest due to the availability of quality proteins and other important micro-nutrients. Shelf stability and retaining physico-chemical and microbiological quality characteristics is a challenge in developing these snack foods. So studies have been conducted to standardize the dough characteristics with different flours such as corn, wheat, Bengal gram and rice flours in combination with whole egg, albumen and yolk. Parameters like dough extensibility and Hunter color attributes were taken to optimize the product. The dough was extruded to obtain desired shape of thin cylinders and fried in rice bran oil (RBO) and sunflower oil (SFO) to obtain a ready-to-eat egg snack. The frying parameters were standardized with respect to RBO and SFO as 140°C for 2 min. Oil uptake was found to be lesser in the product fried in RBO (19.1%) than SFO (24.6%). Products fried in SFO showed significant difference ( $p < 0.05$ ) in physico-chemical parameters like crispiness (15.2-10.1N), sensory scores (8.3-6.2), free fatty acids (0.2-0.7 as% oleic acid) and thiobarbituric acid values (0.15-1.23 mg malonaldehyde/kg) during storage at 28±2°C, but in the case of RBO upto 6 months the product did not show any significant difference ( $p > 0.05$ ) in the above physico-chemical quality attributes. Low standard plate counts (1.5–2.5 log cfu/g), spore counts (1.1–1.5 log cfu/g) and absence of yeasts and molds, coliforms, Salmonella and *E.coli* throughout the storage

period ensured the microbiological safety of egg snack. RBO as a frying medium extended the shelf-life of the product by 3 months at 28± 2°C in terms of physico-chemical attributes. The present study suggests that egg snack fried in RBO can produce superior quality egg snack which will have wider acceptability amongst civilian and service sectors.

#### **TFP-O-13**

### **CHANGES ON NUTRITIONAL EVALUATION OF SELECTED BLACK GRAM BASED KALI AND JEALABI**

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The quality characteristics of selected black gram varieties *viz.*, TMV, VBN 5, VBN 6, VBN 7 and T9 was evaluate for their suitability for Indian traditional foods namely kali and jelaebi Based on the physicochemical characteristics and product development characteristics varieties *viz.*, TMV, VBN 5, VBN 6, VBN 7 and T9. Where found to be best suited for kali preparation and varieties VBN 7, VBN 5, T9 and TMV. The protein content of kali samples was 24.69, 25.50, 24.00 and 23.00 g/100g in the kali samples prepared from varieties T9, VBN 5, TMV and VBN 7 respectively. The fat content of the kali sample ranged from 1.16 to 1.50 g/100g with minimum and maximum values noticed in the kali prepared from varieties VBN 7 and T9. The calcium content for the other kali samples prepared from T9, VBN 5 and TMV was 21.00, 22.70 and 22.70 mg/100g. The corresponding values for iron content were 4.00, 4.16 and 4.16 mg/100g. The protein content of jelaebi samples was 23.00, 23.40, 22.00 and 21.00 in the jelaebi prepared from varieties T9, VBN 6, VBN 7 and VBN 5. The other nutrient content such as starch, calcium and iron content was high in variety VBN 6, VBN 5 and T9 recorded the values was 25.00 g / 100g, 22.80 and 4.15 mg / 100g respectively. The quality attributes assessed were colour, flavour, texture, taste and overall acceptability score values better in jealebi and kali preparation varieties were VBN 6, VBN 5 and T9.

Key words: Black gram varieties, Nutritional evaluation, Sensory score, Jelaebi and Kali.

#### **TFP-O-14**

### **MUSHROOM IS SOURCE OF NUTRIENTS AND FUNCTIONAL COMPOUND IN THE DEVELOPMENT OF CEREAL PRODUCTS**

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Macaroni popularly known as pasta is one of the

extruded product. Macaroni (pasta) which is made from semolina flour derived from durum wheat and consumed in most of the countries worldwide. It is very popular due to its improved palatability and easy to cook ability. Macaroni provides significant quantity of complex carbohydrate, vitamin-B but deficient in quality protein (less than 15%). Present study conducted to prepare the mushroom supplemented macaroni (pasta) and effect of supplementation on nutrients and functional compounds (antioxidants). The semolina was supplemented with white button mushroom (WBM) from 10% to 50% increments (T<sub>1</sub> to T<sub>5</sub>). Moisture was decreased with in the treatment but ash, fiber, crude protein were increased from 0.99% to 2.66%, 0.79% to 5.79% and 11.39% to 22.50% respectively. The cooking weight was decreased within the treatments while cooking loss was decreased. The antioxidant activity was increased in white button mushroom supplemented macaroni (pasta). In textural analysis the hardness was increased and stickiness was decreased with increases the supplementation from 287.47 to 735.93 g and 0.023 to 0.002 g respectively. Based on the physico-chemical and rheological properties, semolina to mushroom ratio of 90:10 was recommended

Keyword: macaroni, nutritional properties, antioxidant, textural analysis and extrusion.

#### **TFP-O-15**

### **DEVELOPMENT OF FUNCTIONAL RESTRUCTURED CHICKEN ROLLS INCORPORATED WITH ANTI-OXIDANT RICH FRUIT PULP**

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A research was undertaken to evaluate effect of incorporation of natural anti-oxidant rich fruit pulps viz., plum (*Ziziphus mauritiana*) and mulberry (*Morus alba*) separately on physico-chemical, sensorial and microbiological qualities of restructured chicken rolls (RCR). A standardized formulation was treated as control, where as 10% lean meat was replaced from the formulation with mature plum and mulberry fruit paste and taken as Treatment-I and II respectively. Both T-I and T-II showed significantly lower ( $P<0.05$ ) pH and cooking yield compared to control. Moisture percentage were comparable among all products where as a decreasing trend was observed for protein, fat percentage and moisture protein ratio. Sensory attributes like general appearance, flavor and texture scores were comparable to control. Storage study was conducted under refrigerated storage ( $4\pm 1^\circ\text{C}$ ) on 0, 5<sup>th</sup>, 10<sup>th</sup> and 15<sup>th</sup> day for pH, TBARS, microbial counts and sensory parameters. TBARS showed an increasing trend on storage, but it was significantly lower ( $P<0.05$ ) for both the treatments compared to control. The total plate count and psychrophilic

count increased during storage, but both the treatments showed lower values compared to control. Colour and flavor scores were higher for both the treatments compared to control and were found to be acceptable up to 15<sup>th</sup> day of storage. The findings showed that anti-oxidant rich fruit pulps (plum and mulberry) can be used to improve the functional quality and storability of meat products.

#### **TFP-O-16**

### **STORAGE QUALITY OF AEROBICALLY PACKAGED FUNCTIONAL RESTRUCTURED SPENT HEN MEAT BLOCKS**

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The present study was envisaged to study the effect of aerobic packaging on storage quality of functional restructured spent hen meat blocks. Functional restructured spent hen meat blocks (FRSHMB) were prepared by replacing 18.6% lean meat in prestandardized restructured spent hen meat blocks formulation with barley flour, oat meal, texturized soy protein, potato and whey protein concentrate. These were packaged aerobically in LDPE and analyzed at regular interval of 7 days for 21 days during refrigerated storage ( $4\pm 1^\circ\text{C}$ ). The pH of FRSHMB was significantly higher than control on 0 and 7<sup>th</sup> day. TBA value of FRSHMB was significantly lower as compared to that of control on 21<sup>st</sup> day. There was a significant increase in the standard plate count of control as well as FRSHMB with increase in storage period. Psychrophils were detected on 14<sup>th</sup> day of storage and thereafter increased significantly in both control and FRSHMB. Coliforms were detected only on 21<sup>st</sup> day of storage in both control and FRSHMB. Although, the sensory attributes of control and FRSHMB were affected from 14<sup>th</sup> day onwards, the products remained quite acceptable with sensory rating between good to very good up to 21 days during refrigerated storage. The functional restructured spent hen meat blocks could be stored safely in aerobic packaging for 21 days at refrigeration temperature.

#### **TFP-O-17**

### **INFLUENCE OF MOISTURE CONTENT ON FLOW CHARACTERISTICS OF SPRAY DRIED MILK-MALTED BARNYARD MILLET POWDER**

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Drying technique adopted in powder production influences the final quality and flow properties of the

product. The flow of powders is an important problem faced by the industry. Tendency of a powder to compact and form large agglomerates needs to be studied which impact on storage and transportation. Inter-particle interaction varies with moisture content and the way these powder particles pack and flow could have a significant impact on the quality of end product and customer satisfaction. The main reason is the cohesion of the small particle powders, and eventually arching. Some of these powders do not flow in certain temperature conditions because of the structural changes in the fat. Milk was blended with barnyard millet wort in the ratio of 1:1 and to 22% TS. The milk-malted barnyard millet powder was produced by spray drying, and the flow characteristics were compared with hand-blended milk-millet powder. The Stable Micro Systems powder flow analyzer with a rotor-blade was used to measure the caking strength and mean cake strength of spray dried and hand-blended milk-malted barnyard millet powder product at 3, 6 and 9% moisture contents. Significant change in caking strength, from 17137.6 g.mm<sup>-1</sup> to 3077.5 g.mm<sup>-1</sup>, was observed with increase in moisture content from 3 to 9% (w.b). Similarly, the mean cake strength decreased from 503.8 g to 157.6 g as moisture increased from 3 to 9%. Hand blended powder showed caking strength of 11155.5 g.mm<sup>-1</sup> and mean cake strength of 296.5 g at 3 % moisture content. The results showed that, caking parameters were greatly influenced by moisture content present in the spray dried powder. Furthermore, it was clear that the caking strength and mean caking strength values were less in hand-blended product as compared to spray dried powders. The study confirmed that the spray dried milk-barnyard powder, being more hygroscopic in nature has greater tendency for caking than hand blended product.

#### **TFP-O-18**

### **EFFECT OF PHASE RATIOS AND INGREDIENT LEVELS ON BITTERNESS MASKING PROPERTY AND TEXTURE PROFILE OF O/W/O BASED HERBAL SPREAD**

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Double emulsions have gained popularity in the recent past for their potential to be used in functional foods as encapsulating matrices. The current study attempts to mask the bitter flavour of *guggul* extract in a oil-in-water-in-oil (O/W/O) based mixed fat spread by varying the ratio of the phases and level of ingredients. The ratio of three phases i.e. inner oil phase, middle aqueous phase and outer oil phase (9:21:70, 16:24:60 and 25:25:50) had significant ( $P < 0.05$ ) effect on bitter flavour perception and hardness of the spread. The level of ingredients (sodium caseinate, salt and PGPR) also affected the bitterness masking property and texture of the spread. Sodium caseinate (up to 6%) had direct effect on reducing the perception of bitterness and made the texture softer. The interaction of salt and PGPR were able to mask

bitter flavour up to a certain level, after which they decreased the flavour scores significantly. Salt increased the cohesiveness of the product, making it firmer. The selected combination of ratio of phases and ingredient levels were applied for further optimization.

#### **TFP-O-19**

### **INFLUENCE OF MULTIGRAIN PREMIX ON RHEOLOGICAL, TEXTURAL, MICROSTRUCTURAL CHARACTERISTICS OF WHEAT FLOUR AND QUALITY OF SHORT DOUGH BISCUITS**

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Effect of developed protein and dietary fiber rich multigrain premix (MGP) on rheological, textural, microstructural, biscuits making quality and effect of emulsifiers were studied. MGP was developed with combinations of pearl millet, finger millet, green gram, oats and defatted soya flours at 20% level and grinded to 200µm size. The MGP is rich in protein (23.96%), total dietary fiber (17.5%), and micronutrients like calcium (17.89 mg), iron (5.88 mg) and zinc (42.31 mg). The increase in levels of MGP incorporation (10 to 50%) significantly decreased the water absorption capacity (56.0% to 50.9%), stability of dough (332 to 103 s), peak viscosity (273 to 166 RVU) and increased the TPA dough hardness (311 to 398 N), pasting temperature (67.1 to 78.2°C). Disruption of protein matrix in dough and partial gelatinization of starch in biscuits observed with the help of Scanning Electron Microscope (SEM). The spread ratio of biscuits decreased by addition of MGP and braking strength increased. Sensory studies indicated that acceptable quality biscuits can be prepared by adding 30% of MGP along with emulsifier glycerol monostearate or sodium stearyl lactylate at 0.5%. This study concludes that biscuits prepared by incorporation of MGP (30%) are rich source of micro and macronutrients with better flavor, aroma and taste.

#### **TFP-O-20**

### **EFFECT OF OHMIC HEATING ON THE PHYSICAL PROPERTIES OF CASHEW NUT**

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Cashew is one of the important tropical crops called as the poor man's crop, rich man's food. India is the largest

producer and processor of cashews in the world. The objective of this work is to study the physical properties such as true density, bulk density, porosity, sphericity index and aspect ratio of ohmic heated cashews. The true density ( $P_t$ ), bulk density ( $P_b$ ), porosity ( $E$ ), sphericity index ( $\Phi$ ) and aspect ratio of ohmic heated cashews was found to be 1122.47 Kg/m<sup>3</sup>, 534 Kg/m<sup>3</sup>, 52.42%, 75.87% and 76.72% respectively while that of raw cashews was found to be 1076.09 Kg/m<sup>3</sup>, 596.67, 43.59%, 77.26% and 77.38%.

### **TFP-O-21**

#### **STUDIES ON THE EFFECT OF OHMIC HEATING ON THE BIOCHEMICAL, MICROBIAL AND SENSORY QUALITIES OF ANACARDIUM OCCIDENTALE**

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Ohmic heating is a process in which the food material, serves as an electrical resistor, is heated by passing electricity through it. Electrical energy is dissipated into heat, which results in rapid and uniform heating. The objective of this study is to compare the effect of ohmic heating on the biochemical and microbiological properties of cashews with that of the conventionally processed cashews (CPC). Biochemical properties such as protein, acid value, fibre, carbohydrate and ash content were studied. It was tested for salmonella, *Staphylococcus aureus*, coliforms, yeast and molds. The protein content, acid value, fiber content and carbohydrate content of ohmic heat processed cashews was found to be 14.5 per cent, 3.36 mg KOH/g, 1.4 per cent, and 39.95 per cent respectively and for that of conventionally processed cashew was found to be 11.66 per cent, 6.16 mg KOH/g, 1.58 per cent and 43.21 per cent respectively. There was no significant difference in the ash content of ohmic processed cashews and conventionally processed cashews. The Ohmic processed cashew was found to be microbiologically safe for consumption and recorded an overall acceptability of 8 on the hedonic scale.

### **TFP-O-22**

#### **EFFECT OF VARYING LEVELS OF MALTODEXTRIN ON PHYSICAL PROPERTIES AND GLASS TRANSITION TEMPERATURE OF FREEZE DRIED AVOCADO PULP POWDER**

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Avocado (*Persea Americana Mill.*) is known for its pleasing taste and predominance of monosaturated fatty

acids. It is also recognized as a functional food that contains health-promoting phytochemicals such as glutathione and beta-sitosterol. Freeze drying of avocado pulp with 5, 10 and 15% of maltodextrin were performed. The glass transition temperature ( $T_g$ ) of freeze dried avocado pulp powder was studied in order to investigate its stability. A differential scanning calorimeter was used to determine the  $T_g$  of the samples. The compositional analysis of fresh avocado pulp revealed the presence of 15% fat in the fruit unlike other fruits rich in carbohydrates. The greenish colour retained well in all samples containing MD. The water activity reduced from 0.961 of fresh pulp to 0.06 of freeze dried powder containing 15% MD. Hygroscopicity of samples ranged between 1.94% and 2.02% showing decrease with increasing level of MD. Bulk density decreased from 0.589 to 0.48 g/cm<sup>3</sup> as MD increased from 5 to 15%. The addition of carrier agent maltodextrin increased the  $T_g$  of the freeze dried avocado pulp powder, decreasing its hygroscopicity and consequently increasing the storage stability.

### **TFP-O-23**

#### **APPLICATION OF NEAR INFRARED SPECTROSCOPY (NIRS) FOR RAPID PREDICTION OF NUTRIENT & NON-NUTRIENT CONSTITUENTS IN MILLET GRAINS**

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Millet being small sized grains are nutritious in several components when compared with several commonly consumed cereal grains globally. These grains being rich in nutritional value are underutilized due to several reasons after post harvesting. In recent years these grains have gained attention by food biochemists & food scientists due to their unmatched and various better qualities. An attempt was made in the present study to screen the millet grains which are rich in nutrient and non-nutrient components by the non-destructive method of analysis by NIRS. Foxtail millet (*Setaria italica*) (n=150) and Little millet (*Panicum sumatrense*) (n=100) landraces collected from eight districts of Karnataka state which were cultivated in different agro-climatic regions were selected for the study. Millet grains were subjected to homogenization by lab blender to get fine powder which was passed through scientific sieve to get the particle size of about 180 $\mu$ . A multivariate calibration was performed by partial least square regression (PLSR) in NIRS analytical equipment for nutrient constituents (protein, crude fat, carbohydrates, minerals) and non-nutrient constituents (dietary fibre, crude fibre, phytic acid, water activity) concurrently with the 50 selected grain cultivars of foxtail and little millet. The collected landraces were subjected to NIR scanning between the wavelength 700 to 2500nm. Selected landraces of foxtail and little millet (n=10) which

are high in nutrient and non-nutrient components were selected based on the NIRS scanning results. Grains collected from different agro-climatic region had significant variation in nutritional and non-nutritional biochemical components which are required for human beings for good health also NIRS method of analyzing the quality parameters in grains is relatively inexpensive, rapid and fast.

Keywords: NIRS, foxtail millet, little millet.

### **TFP-O-24**

#### **TEXTURAL CHARACTERISTICS OF RICE KHEER**

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In present study, textural characteristics of rice *kheer* have been investigated. Rice *kheer* is a popular rice based heat concentrated and sweetened dairy dessert. Fresh cow milk was used for Rice *kheer* preparation. Pre-cleaned Basmati rice grains (2.5 % by weight of original milk) was washed and soaked in water (rice to water ratio 1:2) for 30 minute and cooked at 95°C using steam kettle. Refined granulated sugar (5 % by weight of original milk) was added before end of cooking process and prepared rice *kheer* was cooled to room temperature. Textural characteristics of rice *kheer* were determined at various total solids content (25.5% to 45.1%) using a texture analyzer (Model: TAXT2i, Stable Micro Systems Ltd., Surrey, England, Probe: cylindrical probe P/25) equipped with a load cell of 25 kg and Texture Exponent Programs. Firmness, work of adhesion, work of shear and stickiness ranged between 0.2909 to 0.449N, -007 to -0.117mJ, 1.040 to 2.003mJ and -0.020 to -0.034N, respectively. Firmness, work of adhesion and work of shear were increased with increasing total solids. Hardness of cooked rice grain decreased from 11.068 to 4.180N with increase in total solids. Textural characteristics are helpful in developing equipments for its processing.

### **TFP-O-25**

#### **GENETIC DIVERSITY FOR GRAIN NUTRIENT CONTENT IN LITTLE MILLET GENOTYPES**

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Little millet (*Panicum sumatrense* Roth. ex. Roem.  
and Schultz.) is an important indigenous small millets crop.

The nutritional quality of little millet grain is superior to major cereals. The present experiment was carried out to identify the sources of zinc, iron and calcium rich genotypes. within this objectives 30 selected high yielding genotypes comprising of 26 germplasm accessions and four check varieties viz., CO 2, CO 3, CO (Samai) 4 and OLM 203 were evaluated in a Randomized Complete Block Design (RCBD) with three replications during summer, 2013 (Jan – May) at Millets Breeding Station, Tamil Nadu Agricultural University, Coimbatore. All the 30 genotypes were subjected for grain nutrient analysis (zinc, iron and calcium) using Atomic Absorption Spectrophotometer. Nutrient analysis results revealed that zinc, iron and calcium contents in dehusked grains of little millet genotypes differed significantly among the genotypes. The zinc content was varied from 2.04 to 8.00 mg/g with a mean of 5.23 mg/g. Wide variation in iron content was observed and it ranged from 1.49 to 23.38 mg/g with a mean of 4.95 mg/g. The grain calcium content ranged from 1.14 to 13.15 mg/g with a mean of 3.90 mg/g. The genotypes TNPsu 25 (8.00 mg/g), TNPsu 23 (7.42 mg/g), TNPsu 21 (6.95 mg/g) and TNPsu 9 (6.85 mg/g) had higher zinc content. Similarly the accessions TNPsu 23 (23.38 mg/g) and TNPsu 22 (19.22 mg/g) were superior in grain iron content. The CO 3 (13.15 mg/g), CO 2 (8.45 mg/g), TNPsu 141 (8.23 mg/g) and CO (Samai) 4 (6.52 mg/g) were some of the accessions which had significantly higher calcium content when compared to standard check varieties. A few of the genotypes like TNPsu 25, TNPsu 23 and TNPsu 22 were rich in zinc and iron contents and TNPsu 141 was rich in zinc and calcium contents.

Keywords: Littlemillet, Nutritional quality, Grain micronutrient content, Genetic diversity, Variability

### **TFP-O-26**

#### **DEVELOPMENT OF GUAVA CHOCOLATE**

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The present project was taken up to develop a technology for the manufacture of guava chocolate. The purpose of fortification of guava powder to enhance nutritional and sensory property of chocolate. Due to rich in antioxidants, it helps to reduce the incidence of degenerative diseases such as arthritis, arteriosclerosis, cancer etc. Guavas are low in calories and fats but contain several vital vitamins, minerals, and antioxidant poly-phenolic and flavonoid compounds. The effect of various ingredients like guava powder, milk powder and cocoa powder level was studied and their levels optimized by RSM. For preparation of chocolate, the desired amount of cocoa powder, milk powder, sugar and guava powder were mixed homogenously. To this pre-heated cocoa butter and blended properly with the help of grinder. Then it was tempered manually in a cool

surface. Immediately, the mixture was distributed in different molds and crystallized in refrigerator at 3°C. The ingredients level was found to have considerable effect on sensory properties of the guava chocolate. The various characteristics like sweetness, color, flavor, body & texture, mouth feel, hardness and shelf life (2°C) were acceptable similar to conventional product.

### **TFP-O-27**

#### **POMEGRANATE PEEL FOR EXTRACTION OF NATURAL ANTIOXIDANTS**

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For utilization of agro-industrial waste and to overcome the drawbacks of using synthetic antioxidants study was conducted to utilize the antioxidant extracted from pomegranate peel. Pomegranate peel is good source of phenolic compounds and very potent to antioxidant and antimicrobial activity so can commercially be used as natural preservative in food. In research studied that yield of pomegranate arils is around 47% , Peel weight 28% , waste part (not usable) is around 25%. The effect of drying conditions on extraction of antioxidant was studied in order to obtain the best operational condition to preserve the antioxidants. The sample was cut in three different sizes of 1.5mm, 3.5mm and 6.5mm. The samples were dried at four different temperature i.e. 40°C, 50°C, 60°C and 70°C to a final moisture content 12%(wb) in hot air oven. Antioxidant value was measured by DPPH method and Total phenolic value was estimated by Folin –Ciocalteu method. The extraction results showed that the sample dried at 60°C can yield maximum antioxidants activity and radical scavenging activity. From the results conclusion can be made that the drying temperature 60°C was best suited for maximum preservation of antioxidants.

### **TFP-O-28**

#### **INCORPORATION OF NUTRACEUTICALS FROM BROCCOLI INTO SHRIKHAND**

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Shrikhand is a semi-solid, soft, sweetish-sour, whole milk lactic associative action of microorganisms on milk constituents and most popular in western India. The present project was taken up to incorporate nutraceuticals from broccoli into shrikhand. The purpose of incorporation of nutraceutical to enhance potential health benefits of consumers. Broccoli is a source of many phytochemicals, such as *thiocyanates*, *indoles* (I3C), *sulforaphane*, *isothiocyanates* and *flavonoids* like *beta-carotene*

*cryptoxanthin*, *lutein*, and *zea-xanthin*. These substances act as anti-oxidants, boost detoxifying enzymes in the body and prevent from cancer. The effect of ingredients like Broccoli extract (0.1-0.3%) and sugar level (30% - 35%) on colour and appearance, body and texture, flavour and sweetness, mouth feel, cohesiveness, consistency, viscosity, DPPH activity, ABTS activity and total phenols, was studied and their levels optimized. The method of preparation included receiving of standardized milk, pasteurization, Cooled to 35 – 37°C, Inoculation of culture @ 2.0%, Incubation for 6-8 h at 37°C, Hang in clean muslin cloth for 10-12 h, mixed with optimized Sugar and Broccoli extract in chakka, packing and storage at 10°C. This functional product showed antioxidant activities and may helpful to prevent many hazardous diseases like cancer, diabetes, cardiovascular, atherosclerosis, etc.

### **TFP-O-29**

#### **UTILIZATION OF CATECHU HEARTWOOD EXTRACT IN THE PREPARATION OF SAPOTA SHRIKHAND**

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The concentrated heartwood extract of *Acacia catechu* (Khair) is commonly known as *katha*. The extract of the heartwood of Khair tree gives reddish brown to brown colour and is known to possess several medicinal properties. The extract is a mixture of phytochemicals and finds use in leather and textile industry as colouring agent. However, it has not yet been tried in food industry as colouring agent. In this project, colour was extracted in water from catechu heartwood by heat extraction method. The extract was heat concentrated to get a concentrated colour preparation (CCP). The CCP was used as a colouring agent in Shrikhand preparation at various levels and its acceptance was studied. The addition of CCP imparted brown colour to Shrikhand and was well accepted when used at 2% level. The Sapota pulp was also used in Shrikhand preparation at various levels. The sapota pulp colour matched with the catechu colour, and was well accepted when used at 15% level. Colour was evaluated by measuring reflectance values as well as RGB values. Firmness, consistency and index of viscosity of Shrikhand were also studied. It was concluded that catechu heartwood extract can be used as a natural colouring agent in Shrikhand.

### **TFP-O-30**

#### **MICROENCAPSULATION OF FLAXSEED OIL USING SPRAY DRYING TECHNOLOGY**

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Flax (linseed) is a food and fibre crop. Flaxseed and

Flaxseed oil contain alpha-linolenic acid, which lower cholesterol levels. One hundred grams of ground flax seed supplies about 450 calories, 41 grams of fat, 28 grams of fibre, and 20 grams of protein. For better absorption, some people grind whole flaxseed before using it. Whole flax seeds are chemically stable, but ground flaxseed can go rancid at room temperature in as little as one week. Refrigeration and storage in sealed containers will keep ground flax from becoming rancid for a longer period. The present project was taken up to microencapsulate the flaxseed oil by using spray drying to prevent flaxseed oil from rancidity. Maltodextrin and cornstarch used as an efficient encapsulating agent for flaxseed oil. The method of preparation included dissolve maltodextrin and modified starch in water, addition of flaxseed oil, mixing, Homogenization, spray drying, collection of encapsulated flaxseed oil powder from the cyclone, Packaging and Storage. It was found that the combination of maltodextrin and cornstarch easily dispersed in water, release the flaxseed oil and protect the core (Flaxseed oil) efficiently during storage from oxidation.

### **TFP-O-31**

#### **DEVELOPMENT OF EXTRUDATES ENRICHED WITH OMEGA-3 FATTY ACID AND SAPONIN**

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Extrusion cooking has been considered as a potential tool for processing snacks and ready to eat foods. Vallarai (*Centella asiatica* L.) has been called as “brain food” and it is said to contain essential saponins. Flaxseed (*Linum usitatissimum*) is emerging as an important therapeutic food for heart disease patients in recent years as it possesses high amounts of omega-3 fatty acid. Further, soy flour and corn flour possess the required protein and starch content, respectively which are necessary for maintaining an optimum extrudate quality. Hence, different extruded products were trialed out using different combinations of vallarai, flaxseed, soy flour and corn flour with rice flour as base material using the twin screw extruder. The extruder was set at a temperature of 110°C by which different extruded products were prepared. The various quality analysis namely cooking quality, biochemical analysis, texture analysis and organoleptic evaluation revealed that the extrudates having a combination of soy flour 10%, flax seed 20% and vallarai 10% with rice flour as the base yielded better results in terms of quality. Key words: Extrudates, Saponin, Omega-3 fatty acids, Flax seed, Vallarai

### **TFP-O-32**

#### **TEXTURE – MICROSTRUCTURE RELATIONSHIP IN PANTOA DURING DEEP-FAT FRYING**

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*Pantoa* is a dairy sweetmeat made from *khoa* and *chhana*, very popular in Eastern India. Deep-fat frying is the key operation involved in the preparation of *pantoa*, during which the product undergoes physicochemical and microstructural changes. The objective of this study was to determine textural changes in the product as a function of its porosity. *Pantoa* was prepared by blending *khoa* and *chhana* in the ratio of 4:5, refined wheat flour (3%), semolina (3%), arrowroot (3%), ground sugar (0.7%) and baking powder (0.3%) to smooth and homogeneous dough. The dough was rolled into balls weighing 15 g each, and fried in sunflower oil at temperatures of 125, 135 and 145°C for 8 min. During frying, the texture profile analysis and porosity were determined at 60 s intervals. Hardness and chewiness, which determine the quality and acceptability of *pantoa*, were correlated with porosity. The hardness increased from 1.281 to 6.288, 6.893 and 8.230 N when fried at 125, 135 and 145°C for 8 min, respectively. The corresponding porosities were 53.53, 56.47 and 59.27%. A linear regression equation predicted the hardness as a function of porosity with R<sup>2</sup> value as high as 0.96. The chewiness of *pantoa* increased from 0.250 to 4.053, 4.331 and 4.526 after frying at 125, 135 and 145°C, respectively. The correlation coefficient (r) between chewiness and porosity ranged between 0-98-0.99. The moisture content of *pantoa* decreased from 66.10% (d.b.) to 39.61, 36.77 and 33.05 fried for 8 min at 125, 135 and 145°C, respectively. The porosity and hardness/ chewiness values were positively correlated. Thus, it could be concluded that, the texture development is characterized by moisture loss and an increase in porosity.

### **TFP-O-33**

#### **CHARACTERIZATION OF STARCHES ISOLATED FROM BARNYARD AND FOXTAIL MILLET**

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Millets are important crops in the semi-arid tropics of Asia and Africa (especially in India, Nigeria, and Niger), with 97 percent of millet production in developing countries. Starches composed of two major components amylose and amylopectin and contribute too many industrial applications as a thickener, colloidal, stabilizer, gelling agent, bulking

agent, water retention agent and adhesive. Considering the greatest industrial application and demand of starch in food system, this study aimed at evaluating functional, pasting, thermal properties, amylose/amylopectin ratio and SEM of the starches isolated from barnyard and foxtail millet using standard procedures. The highest water binding capacity (373.3%) and swelling power (5.6g/g) was observed in barnyard millet starch. The high light transmittance value was observed in foxtail millet starch (6.37%). The highest pasting temperature 94.45°C was observed in Foxtail millet starch. Barnyard millet starch had highest peak viscosity indicates its highest water binding potential. The low breakdown and high final viscosity of barnyard millet starch indicates its high resistance power of starch granules during heating. The low setback viscosity of foxtail millet starch (356 cP) indicates the lowest rate of starch retrogradation. The results of the DSC revealed that barnyard millet starch have high thermal properties indicate its structural stability and overall measure of crystallinity of amylopectin. High Amylose content (34%) was observed in foxtail millet starch and amylopectin was found to be higher in barnyard millet starch (7.6%). The SEM results revealed that two basic sizes and shapes- large polygonal, small spherical and large spherical were observed. Large polygonal shaped starch granules were predominantly present in the barnyard and foxtail millets starches. From the above results, it has been concluded that barnyard millet starch possess low glycemic index property to provide the good standard of life by decreasing the chances of developing life threatening ailments such as diabetes mellitus, obesity and hyperlipidemia.

#### **TFP-O-34**

### **3D FOOD PRINTING: A NOVEL FOOD DEVELOPMENT SYSTEM**

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3D food printing is one of the recent transformation technologies. The current food system for space craft and army are individually pre-packaged shelf stable foods, processed with technologies that degrade the micronutrients. Additionally, variety of foods is also a critical issue for maintaining health and performance. Hence a Solid freeform fabrication (SFF) of food is developed from hydrogels which allows complete control of the final product taste, nutritional value, and texture. The products prepared are thermally and rheologically stable with distinct flavour. Different additives can also be added for construction of complex geometries and mouth feel of meat and vegetables such as transglutaminase, agar, xanthan gum, gelatin etc. Using a novel combination of hydrocolloids and flavour agents, texture and flavour can be independently tuned to produce printing materials that simulate a broad range of foods, with

only a minimal number of materials. This method provides safety, acceptability, variety and nutritional stability of the food for long durations.

#### **TFP-O-35**

### **DEVELOPMENT OF LOW FAT CHICK PEA SNACK: STUDIES ON SPICE ADHESION, SENSORY QUALITY AND STORAGE STABILITY**

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Deep fat frying is the widely used method of food preparation. Frying improves the taste, flavor, color and texture of the product which attracts the consumers to munch more, though it has higher fat content and has a negative impact on consumer's health. Now a day's, consumers prefer low fat products and many industries have introduced low fat products by using several technologies such as dehydration techniques, additives, hydrocolloids, etc. The objective of the study was to develop low fat snacks using Bengal gram dhal and combination of spice mixture with different enrobing agents and estimate the adhesion of spices on the snacks. The sensory quality and effect of storage (30 days) on the quality of the product was also evaluated. Low fat snacks (18 No.) were developed by roasting Bengal gram dhal using 6 different enrobing agents (almonds, cashew, coconut milk, corn flour, water melon and pumpkin seeds,) and 3 different spice mixture (Chilli+salt+amchur, Pepper+salt+amchur and Chat masala+salt). The efficacy of adhesion of enrobing agent showed lesser values of left over spices in chat masala spice mixture compared to other two spice mixture. All the products were acceptable and a highly significant difference was observed between the samples for the sensory attributes. Pumpkin enrobed in chilli spice mixture obtained highest scores and showed highest shelf stability at room temperature. Among the spice mixture, pepper combination showed highest acceptability followed by chilli and chat masala.

#### **TFP-O-36**

### **MICROWAVE PROCESSING AND DIELECTRIC PROPERTIES OF FOOD MATERIALS**

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Microwave processing, measurements and the dielectric properties of materials are finding increasing application in agriculture, food processing and dairy industries. With the advent of commercial microwave heating and the wide acceptance of microwave ovens for the home, the concepts of dielectric heating have become more

popular. When microwave pass into foods, water molecules and other polar molecules tend to align themselves with the electric field, which reverses 2450 million times per second for a 2450 MHz microwave source. The molecules attempting to oscillate at such frequencies generate intermolecular friction, which quickly causes the food to heat. As heat is generated, it also is conducted between food components, tending to equalize temperature. For the selection of frequency of microwave source, the depth of penetration with the lower loss factor is desired in a given material. It was found that under similar conditions, by the time half of their incident energy is lost i.e. at their Half-Power Depth (cm), 915-MHz microwaves penetrate water to a depth of 76 mm, whereas 2450-MHz microwaves penetrate to a depth of about 10 mm, hence absorbed 50% within 10 mm only. Hence, most of the commercial microwave processing equipment is designed for operation at 2450 MHz.

#### **TFP-O-37**

### **OPTIMUM DOSE OF FAT AND WATER SOLUBLE VITAMINS IN DAIRY ANIMALS DIETS BASED ON *IN VITRO* ANAEROBIC FERMENTATION**

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Study was conducted to determine the optimum dose of water [Thiamine (B1), Riboflavin (B2), Niacin (B3), Pyridoxine (B6), Biotin, Folic acid, Pantothenic acid, Cyanocobalmin (B12), Choline and vitamin – C] and fat soluble vitamins (A, D and E) using anaerobic fermentation *in vitro*. Optimum values were determined based on pattern of accumulated fermentative gases which is characteristic of biological value of the substrate and fortified vitamins. Many of these vitamins secreted into milk, often high yielding cow requirement needs revision. Basic dose of vitamins recommended by the US-National Research Council were taken as referral dose ( $x \mu\text{g}$ ) and substrate was fortified at the doses of 1x, 2x, 3x and 5x. The accumulated gas production patterns were recorded for 72 h and kinetic were calculated. Based on the production of energy yielding substrate in the inoculum, optimum dose was determined. The optimum dose for B1, B2, B3, B6, biotin, Folic acid, Pantothenic acid, B12 and vitamin C was 3.1, 8.1, 18.25, 4.4, 1.05, 4.5, 47.9, 0.05, 25 and 2.5 as against recommended doses of 2.15, 8.1, 18.25, 2.7, 0.35, 2.25, 23.95, 0.05, 0 and 0  $\mu\text{g/g}$  of diet fed to dairy animals. Optimum dose for vitamin A, D, E and K was 8.1, 2.4, 0.6 and 0.004 as against 4.4, 1.2, 0.6 and 0 IU/ g of diet fed to dairy animals. However, vitamin C and K were abundant in diets consumed by dairy animals, their requirement could be ignored.

#### **TFP-O-38**

### **INFLUENCE OF CONCENTRATED PANEER WHEY ON TEXTURAL PARAMETERS OF MULTIGRAIN BISCUIT DOUGH**

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Textural quality of dough has a direct bearing on the quality of biscuit made from it. The dough quality depends primarily on the ingredients used in its preparation, including moisture content. The quality of multigrain dough further depends on the type and variety of grains used. In the present study, multigrain dough was prepared using four grain flours (ragi, oats, corn and rice) along with wheat flour, sugar, shortening and water. In order to enhance suppleness of multigrain dough as well as to enhance nutritional value, concentrated paneer whey (CPW) (25% TS) was used in place of water for dough preparation. The textural quality of the dough was evaluated by Texture Analyser using texture profile analysis technique. It was observed that the dough became more firm, but less adhesive on whey incorporation. The firmness of control multigrain dough was  $4.99 \pm 0.36$  N which increased to  $18.82 \pm 0.26$  N in whey incorporated dough; similarly, the adhesiveness decreased from  $0.91 \pm 0.02$  to  $0.35 \pm 0.03$  N.sec. This could be attributed to good water absorption property of whey proteins. However, there was not much change in cohesiveness and springiness parameters. Acceptable quality biscuits could be prepared using the dough prepared by complete replacement of water with CPW.

#### **TFP-O-39**

### **UTILIZATION OF LEMONGRASS LEAF EXTRACT IN THE PREPARATION OF FLAVOURED MILK**

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Lemongrass (*Cymbopogon flexuosus*) is a tropical grass whose extract has a pleasing aroma and can be used as flavouring material in milk products. In this study, lemon grass leaf extract was used in the preparation of flavoured milk. Three levels of lemon grass leaves were used for extraction by boiling in milk: 0.5, 1.0 and 1.5 g per 100 ml milk. As the leaf content increased, the flavour and aroma also increased. Leaf content of 1.5 g was found to impart pleasing flavour and aroma to milk. The leaves also imparted a greenish tinge to the flavoured milk, but did not influence the consistency. Among the three levels of sugar used in the study- 6, 8 and 10% on milk basis, 8% level was found to be optimum. Honey was also used as a sweetener. However, it was observed that honey did not enhance the acceptance of

the product. The consistency and viscosity of the milk was not affected by lemon grass leaf extraction into the milk. There was also no effect on the specific gravity of the flavoured milk. The developed technology can be employed for large scale production of lemongrass flavoured milk.

#### **TFP-O-40**

### **PROTEIN CHARACTERISTICS OF VARIOUS EDIBLE OILSEED MEALS IN COMPARISON TO MAIZE GRAIN**

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Edible oilseeds viz., groundnut (GM), soya (SM), copra (CC), mustard (MM), sunflower (SM), cottonseed (CM) and, palm (PM) proteins after oil extraction in their meals (OSM) was compared with Maize grain protein. OSM cater about 40% of the protein needs of milk producing cows. The quality of protein OSM is important in catering the cow requirement, milk yield and milk composition. Crude protein content of Maize grain was 11 % while OSM contains 47, 47, 22, 40, 33, 39 and 16% respectively in GM, SM, CC, MM, SM, CM and PM. Globulin fraction of proteins in total CP was 11% in maize grain while, it was 17, 9, 22, 15, 13, 6 and 14%, respectively in GM, SM, CC, MM, SM, CM and PM. Albumins plus glutemins fraction of proteins in maize grain was 56 % while it was, 55% in GM, MM and, SM; and, 63 % in CC, 61 % in CM and 59 % in PM. Albumins plus glutemins fraction of proteins were higher in SM being 72%. Prolamins were 19 % in maize grain that was much higher than OSMs. Prolamins in OSMs were 7, 5, 7, 12, 10, 9 and 7 % in GM, SM, CC, MM, SM, CM and PM, respectively. Except CP of SM (5%), all other OSMs and maize grain contains 7 to 9% of protein bound to secondary plant metabolites thus, interfere in the fermentative or enzymatic degradation of CP.

#### **TFP-O-41**

### **FREEZE CONCENTRATION TECHNOLOGY: AN OVERVIEW**

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Freeze concentration is a technique that minimizes losses of volatile and heat sensitive components in liquid foods. This technique involves lowering the temperature of the product to be concentrated to below its freezing temperature in a controlled manner in order to avoid reaching its eutectic temperature at which all the components of the product solidify at once. The objective of freezing is to obtain pure ice i.e. water without retaining any of the solids in the product. If it reaches the eutectic point of the liquid separation is very difficult. This technique is mainly applied in liquid products including fruit juices, milk products,

vinegar, coffee and tea extracts, beer and wine, and other flavor products. The very gentle concentration at sub-zero temperatures allows product freshness to be maintained and prevents biological degradation to occur. Since no vapor phase is present all volatile aromas will be preserved in the food concentrates. Additional advantages include low energy costs and a continuous process that enables long operating periods without intermediate cleaning. The process is suitable not only for a variety of products, but also for small-volume specialty runs and large-scale operations. The only factor of concern is that this technique requires high initial cost than other concentration techniques.

#### **TFP-O-42**

### **EFFECT OF FLAXSEED OIL AND FLOUR ON TEXTURE AND COLOUR PROFILE PARAMETERS OF STIRRED FRUIT YOGHURT**

**S Siva kumar<sup>1</sup>, BV Balasubramanyam<sup>1,2</sup>, K Jayaraj Rao<sup>2</sup>, P Heartwin<sup>2</sup> and B Surendra Nath<sup>2</sup>**  
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The objective of the study was to study the effect of flaxseed sources (oil/flour) on texture and colour profile parameters of stirred fruit yoghurt with incorporation of sapata, dates and raisins. The firmness value for the control yoghurt was 0.33N while the values for the experimental samples were in the range of 0.35-0.40N. The adhesive force (N) of control yoghurt was -0.17 and experimental yoghurt values varied between -0.20 to -0.25 N. sec. The increased adhesiveness in the experimental samples could be due to fruits and flaxseed flour incorporated in the yoghurt. RGB model was used to study the colour changes in yoghurt by addition of flaxseed oil and flaxseed flour. The Red, Green and Blue values were 231.52, 221.89 and 189.43 for control fruit yoghurt and Luminosity value was 221.82. When flaxseed oil and flour were incorporated at 1% level each, there values decreased to 228.53, 208.32 and 174.2, respectively. Incorporation of oil at 2% level further decreased these values reducing the glossiness of the product. The luminosity value indicates glossiness, which in the present study apparently decreased by incorporation of flaxseed oil and flaxseed flour incorporation of flaxseed oil and flour almost proportionately reduced the RGB values and thereby L values.

#### **TFP-O-43**

### **PHYSICO-CHEMICAL AND FATTY ACID PROFILE OF THE FLAXSEED OIL AND FLOUR INCORPORATED FRUIT YOGHURT**

**S Siva kumar<sup>1</sup>, BV Balasubramanyam<sup>1,2</sup>, K Jayaraj Rao<sup>2</sup>, P Heartwin<sup>2</sup> and B Surendra Nath<sup>2</sup>**  
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The objective of this study was to incorporate

flaxseed sources like flaxseed oil/ flour and fruits for the preparation of stirred fruit yoghurt and analysed for their physico-chemical and fatty acid profile. The mixture of sugar and fruits like sapota, dates and raisins has diluted the milk components and resulted in lower values in the fruit yoghurts. The increase in fat, protein, carbohydrate, minerals content in the experimental yoghurt was mainly contributed by the flaxseed oil and flour. The addition of flaxseed oil did not show any affect on the water activity of the yoghurt samples. The yoghurt had dietary fibre content of 1.24% in the final product. The fresh control fruit yoghurt showed the acidity value of 0.88% LA, while the corresponding value for experimental samples varied between 0.85-0.88% LA. The addition of 1% flaxseed flour has reduced the syneresis compared to that in control yoghurt sample and the values further reduced in 2% flour incorporated stirred fruit yoghurt samples. The TBA values increased with increased incorporation of flaxseed oil and flaxseed flour. The fatty acid analysis revealed that alpha linolenic acid (ALA) content increased from 0.45% of ALA in control sample to 22.80% of ALA in the final product.

#### **TFP-O-44**

### **EFFECT OF DIFFERENT METHODS OF COOKING OF RICE ON THE QUALITY OF CURD RICE**

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Curd rice is a most popular delicacy in southern part of India. Traditionally, curd rice is prepared by mixing cooked rice in previously prepared curd along with flavorings, salt and garnishes. In this study, raw rice to water ratio 1:3, 1:4, 1:5 for open pan cooking, 1:3, 1:3.5, 1:4 for pressure cooking were tried. It was observed that use of 1:3 and 1:4 ratios in open pan cooking resulted in unacceptable hardness of the cooked rice. While 1:5 resulted in soft cooked rice with optimum softness. Among the different ratios for pressure cooking tried, 1:3.5 was found optimum on the basis of texture profile analysis (TPA). After finalization of different ratio of raw rice to water ratio and mode of cooking, pressure cooking of rice was selected for further study because yield of both methods of cooking is varied among these two methods, pressure cooking gives higher yield as well as highly acceptable body and texture to the curd rice. Among the different cooked rice to milk ratio attempted i.e. 1:0.4, 1:0.6, 1:0.8, 1:1, 1:1.2, the 1:1 ratio was found to produce most acceptable curd rice based on the sensory evaluation on 9 point hedonic scale. Herbs and spices were added at different levels to enhance the flavour as well as palatability of product.

#### **TFP-O-45**

### **ACID – ALCOHOL MODIFICATION OF MUNG BEAN STARCH**

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Starch modification can be accomplished by several methods like enzymatic transformation, physical alteration and chemical modification to produce starch suitable for specific applications in processed foods. In the present study, mung bean starch was isolated and modified by treating with methanol with different amounts of hydrochloric acid (10-60 ml) at 30°C for 1 h. The recovery yield of the starch upon modification was >87%. Among the investigated physicochemical properties, it was observed that the solubility increased from 17 to 83%, whereas swelling power decreased from 14 to 2 g/g of the modified starch with the increase in the amount of acid. Further, upon storage at 4°C for 5 days, it was observed that the light transmittance of the starches decreased due to retrogradation. The X-ray diffractograms revealed a C-type pattern for mung bean starch, which was not affected upon modification. In case of amylose content, an irregular rise and fall of total amylose was observed. In conclusion, the acid-alcohol modification of mung bean starch brought about conspicuous changes in the starch properties, suggesting this may suit different food applications like binding, anti-staling, foam strengthening, gelling, shaping, thickening and stabilizing agent.

#### **TFP-O-46**

### **HIGH PROTEIN VERMICELLI**

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Vermicelli is a popular and convenient, ready to cook food item, falling under category of extruded product, normally made from wheat flour. The product was prepared with an objective to produce nutritive (protein and mineral rich) and palatable product preferred by children. Nutritive value of Soy vermicelli was increased by using composite flour consisting of wheat flour, defatted soy flour and semolina in definite proportion. Three levels of defatted soy flour (DSF) were used in preparation of vermicelli: 15, 20 and 25% of the composite flour mix. The product was prepared by blending white flour, DSF and semolina, to form dough, which was passed through extruder to provide texture and shape followed by drying. The protein content of wheat flour vermicelli was 6% whereas that in the developed product was 10.85%. The product was packaged in high density polypropylene (HDPP) packets & stored at 20° C. It was analyzed every fortnightly for sensory and chemical attributes. Among three level of addition of DSF, the product

prepared with 20 % DSF was found with best sensory and textural attributes. The shelf life of product was 6-8 months.

#### **TFP-O-47**

### **EFFECT OF PRE-TREATMENT AND MODIFIED ATMOSPHERE PACKAGING ON THE SHELF LIFE AND QUALITY OF FRESH CUT CARROT**

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Experiments were conducted to understand the effect of pretreatments and modified atmosphere packaging on shelf life and nutritional quality of minimally processed carrots. Different concentrations of edible coating materials viz., methyl cellulose, chitosan, carboxy methyl cellulose, polyvinyl alcohol and pectin were tested. Results showed that dipping in 0.75- 1.5% pectin and 4% polyvinyl alcohol helped to maintain the marketability related characteristics even after 10 days of storage at 8°C. These two treatments also helped in improved retention of colour in the treated carrots. Increased levels of antioxidants, flavonoids and phenolic acids were present in stored samples as compared to fresh carrot. Ferrulic acid, caffeic acid and coumaric acid content was high in control samples as compared to fresh and pectin treated samples. Flavonoids viz., hesperidin and naringenin content was highest in control samples stored for 10 days. Packaging of 0.75% pectin treated carrot rings in polypropylene bags to obtain an in-pack atmosphere of 16% oxygen and 4-5% carbon dioxide helped to obtain 21 days shelf life for the produce at 8°C storage. Lower in-pack oxygen concentration resulted in off odour generation and degradation of phenolics, even though carotenoids were maintained at levels on par with fresh carrot.

#### **TFP-O-48**

### **ANTIOXIDANT POTENTIAL OF THE UNDER-UTILIZED FRUIT KARONDA IN RELATION TO ITS PHENOLICS**

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Karonda, *Carissa carandas* Linn., is a hardy, drought tolerant, evergreen shrub fruit of the dry land, grown in the marginal, wasteland areas of Bihar, West Bengal, Uttar Pradesh and South India. Once established, the plant needs only minimum management and is succour to tribal communities in various parts of India. It is astringent and sour in taste due to its high pectin content, and finds use in

the processing industry for the preparation of jam, jelly, squash, syrup and chutney, but is not popular as a fresh fruit. A few table varieties of karonda have been identified by the Central Horticultural Experimental Station, Chettalli, Regional Station of the Indian Institute of Horticultural Research. The work presented here correlates the phenolics content with the antioxidant potential of three collections of karonda: Konkan Bold, (a promising variety released in 2004, by Konkan Krishi Vidyapeeth, Dapoli), II/7 and V/8, shortlisted based on preliminary evaluation. Total phenols and flavonoids revealed were highest in V/8 (158 mg gallic acid equivalents/ 100 gm fresh weight (fwt) and 167 mg catechin equivalents/ 100 gm fwt, respectively), followed by II/7 and Konkan Bold, while the anthocyanin content was marginally higher in II/7. Antioxidant potential as quantified by the DPPH radical scavenging activity (210 mg ascorbic acid equivalents/ 100 gm fwt.) and Ferric Reducing Potential (261 mg ascorbic acid equivalents/ 100 gm fwt.), revealed a good correlation between the phenolics and flavonoid content and the antioxidant potential. Characterization of the phenolics by LC-MS identified the major components to be chlorogenic acid, vanillic acid, protocatechuic acid, salicylic acid and caffeic acid. This study therefore identifies the potential of karonda as a functional food which further needs to be harnessed in the food industry.

#### **TFP-O-49**

### **EFFECT OF HIGH HUMIDITY STORAGE ON FRESHNESS AND NUTRITIONAL QUALITY OF CORIANDER LEAVES**

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Coriander (*Coriander sativum*) is an annual herb leaves of which are rich source of vitamin C and minerals like potassium and iron. The coriander leaves are often used in fresh state for garnishing cooked dishes to enhance taste and aroma. Owing to the limited shelf life of even less than a day for fresh coriander leaves, an attempt was made to retain the freshness and increase the marketable life of fresh coriander leaves by placing them in bunches in specially designed and fabricated high humidity storage box of size 58"×41" (L×B), made of transparent acrylic sheet of 6 mm thick maintaining relative humidity of more than 90%. Bunches of coriander leaves placed in non-ventilated plastic crates covered with moist gunny bag, which is a general practice with the vegetable vendors was considered as control. Both the treatments were conducted under ambient conditions (temperature: 26-28°C, relative humidity: 54-58%). The marketable life of coriander leaves was 2 days in storage box without any yellowing and withering compared to control which had marketable life of only 1 day. At the end of the storage period, the coriander leaves kept in the storage box had relatively lesser weight loss (13%), higher

moisture content (80.23%), higher ascorbic acid (46.8mg/100g) and chlorophyll content (0.17mg/g) in comparison to control which showed weight loss of 19.6%, moisture content (78%), ascorbic acid content (36.4mg/100g) and chlorophyll content (0.16 mg/g). The samples in the storage box retained 86% potassium, 64% calcium and 99% iron compared to fresh ones even after 2 days of storage. Sensory evaluation score for marketability of coriander leave in the storage box was 4.5 (very good) on a scale of 5, while it was 2 for control samples on a 5 point scale.

### **TFP-O-50**

#### **OPTIMIZATION OF TEMPERATURE AND SCREW SPEED FOR HOT EXTRUDED KURKURE PRODUCTS FROM KODO MILLET**

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Minor millets are rich in dietary fibre and other nutritional components. The fiber content of the whole grain is very high. Kodo millet has around 11% protein, and the nutritional value of the protein has been found to be slightly better than that of foxtail millet but comparable to that of other small millets. As with other food grains, the nutritive value of Kodo millet protein could be improved by supplementation with legume protein. under the context, a study was undertaken to develop hot extruded kurkure product using proso millet and maize by twin screw extruder was employed. Among 3kodo millet grits and maize grits (BS 18 mesh) formulation (70%:30%, 60%:40% and 50%:50%) tested. The best one selected based on sensory evaluation namely 60%:40%. In case of best one, between 100-120°C barrel temperature and 350-400 rpm of screw speed, it was possible to get *kurkure* type products. The expansion ratio, water solubility index, water absorption index, bulk and true densities, tristimuluscolour values and sensory attributes of extrudates were determined. Based on expansion ratio lower screw speeds of 350 rpm, the expansion ratio of products was higher especially for barrel temperature of 100°C. However, good expanded products (Expansion ratio- 3.48) could be obtained also at lower screw speed of 350 rpm and 100°C barrel temperature.

Keywords: Kodo millet, hot extrusion, operational parameter, Sensory attributes

### **TFP-O-51**

#### **OPTIMIZATION OF OPERATIONAL PARAMETERS FOR KURKURE TYPE PRODUCTS FROM LITTLE MILLET**

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Minor millets are rich in dietary fibre and other

nutritional components. But their inclusion in daily urban diet is restricted due to lack of processing technology and value added products. Little millet rich is in essential nutrition, most popular type of millet in India and other parts of the world. Under the context, a study was undertaken to develop hot extruded kurkure product using little millet and maize by twin screw extruder was employed. Among 3 little millet grits and maize grits (BS 18 mesh) formulation (70%:30%,60%:40% and 50%:50%) tested. The best one selected based on sensory evaluation namely 50%:50%. In case of best one, between 100-120°C barrel temperature and 350-400 rpm of screw speed, it was possible to get *kurkure* type products. The expansion ratio, water solubility index, water absorption index, bulk and true densities, tristimuluscolour values and sensory attributes of extrudates were determined. Based on expansion ratio lower screw speeds of 350 rpm, the expansion ratio of products was higher especially for barrel temperature of 100°C. However, good expanded products (Expansion ratio- 3.69) could also be obtained with higher screw speed of 450 rpm at 120°C barrel temperature.

Keywords: Little millet, hot extrusion, operational parameter, Sensory attributes

### **TFP-P-01**

#### **A REVIEW ON JACKFRUIT: EMERGING TECHNOLOGIES AND NUTRITIONAL BENEFITS**

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Scientific name of jackfruit is (*Artocarpusheterophyllus*). It is native to parts of South and Southeast Asia (Bailey, 1949; Merrill, 1912), originated in the southwestern rain forests of India, in present-day Goa, Kerala, coastal Karnataka, and Maharashtra. Except India it is also cultivated in Bangladesh, Nepal, Sri Lanka, Cambodia, Vietnam, Thailand, Malaysia and Indonesia Jackfruit is the national fruit of Bangladesh. India is the 2<sup>nd</sup> largest producer of jackfruit (Area 1, 02,000 ha production 14, 36,000 t and productivity 11.4 t/ha). In South India, the jackfruit is a popular ranking next to the mango and banana. Unit operations for jackfruit are following Harvesting at Maturity, Pre cooling & washing, Cool/cold storage, Safe transport/handling, Fruit cutting, Value addition to bulbs, Value addition to peel and Value addition to stone. Processing is done with the help of indigenous equipment there is no standard procedure for processing. These processes are laborious, time consuming, tedious and unhygienic. Canning is the only process for preservation and storage of jackfruit. There is an urgent need for Development of Post-harvest technology for jackfruit. There is lot of research gap in processing of Jackfruit to overcome processing and handling problem of jackfruit this article is come up with extensive study on nutritional benefits, ethical

values, processing, processing equipment for jackfruit, which might be prove as a boon to jackfruit industry, eventually increase its market and will help any research on jackfruit.

Keywords: Jackfruit, Canning, Unit operation, post – harvest processing

### **TFP-P-02**

#### **A STUDY OF A CHOCO NUTRICOOKIES**

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Choco nutricookies are developed for a hypertensive patient. It is based on traditional different kinds of Choco cookies. The main ingredient of this product -soya flour which is very beneficial for hypertension. Other ingredients like soya oil, oats, dark chocolate and jaggery also confer beneficial effect on hypertension. Soya flour when compared with refined flour is more a beneficial for hypertension and nutritionally adequate. The product provides good amounts of energy, protein, micronutrients and adequate fibre and has a good satiety value. Shelf life study included sensory evaluation by scoring method based on a five point scale. Evaluation was done on sensory attributes like appearance, color, mouth feel, texture, taste of the product. After that product is standardized.

Keywords: soya flour, hypertension, metabolic syndromes, dark chocolate.

### **TFP-P-03**

#### **JOWAR SEVAIYA UPMA- AN INNOVATIVE FOOD PRODUCT FOR DIABETES MELLITUS**

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Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Hyperglycemia is a condition in which there is an elevated blood glucose level. The modified food product – Jowar Upma is Jowar and vegetable based food product. This product also contains tomatoes and other vegetables which make it nutritionally rich with antioxidant properties. Jowar improves insulin sensitivity and hence has anti diabetic properties. Tomatoes also show anti diabetic effects due to its contents of flavonoids and lycopene. Other vegetables also have low glycemic index, contains fiber and antioxidants which shows beneficial effect in diabetics. In sensory evaluation the attributes like taste, texture, mouthfeel, colour and appearance based on a five point scale was evaluated.

Key words: Diabetes, Hyperglycemia, Antioxidant, Jowar, Tomatoes, Sevaiya.

### **TFP-P-04**

#### **BAKED MULTIGRAIN BHAKARVADI- AN INNOVATIVE FOOD PRODUCT FOR OBESITY**

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Obesity is a condition in which excess body fat gets accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy and/or increased health problems. According to WHO cutoff, obesity is considered when the BMI of individuals exceeds 30 kg/m<sup>2</sup>, and with the BMI of 25-29.9 kg/m<sup>2</sup> is known as overweight. The modified food product – Baked multigrain bhakarvadi is multigrain based food product. This product also contains soya flour, besan, flaxseeds, garden cress seeds, poppy seeds and sesame seeds which make it nutritionally rich product. Jowar, bajra, wheat flour, poppy seeds and sesame seeds contains good amount of fiber. Flaxseeds and sesame seeds contain good amount of omega 3 and omega 6 fatty acids which makes the product beneficial for obesity. In sensory evaluation the attributes like taste, texture, mouth feel, color and appearance based on a five point scale was evaluated.

Key words: Obesity, multigrain flours, baked multigrain bhakarvadi, fiber.

### **TFP-P-05**

#### **NUTRI NACHOS – A HEALTHY SNACK FOR LIFE STYLE DISORDER**

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In today's scenario, a Life style disorder is increasing due to sedentary life style, and has become a serious concern. As food, plays a vital role, efforts are continuously made to minimize these disorders. Therefore, the present study is an attempt to modify the traditional food into an innovative and healthy product. The traditional Nachos recipe has been modified specifically for type 2-diabetic individual. The modified food attempts to improve fiber and protein content with the type of carbohydrates, which are beneficial for lowering blood glucose levels. The Multigrain flour used in this product – 'Nutri nachos', improves insulin sensitivity, and reduces hyperglycemia (a condition in which elevated blood glucose level is observed). The cheese-based sauces, which are served along with traditional nachos, are also modified, with low fat curd as base. With Garlic added to it as functional food, along with oregano and mint leaves for flavor and acts as a good source

of antioxidants. Further microbial analysis and sensory evaluation by 22 naïve panels based on likert scale was conducted.

Key words: Diabetes, nachos, Nutri nachos, Cheese-based sauce and low-fat sauce.

### **TFP-P-06**

#### **CONSUMER ACCEPTABILITY AND COST STUDY OF FIG BURFI**

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An attempt was made to assess acceptability of fig *burfi* standardized by the authors by offering it to 200 consumers belonging to different classes in the society for seeking their opinion. Fig *burfi* was manufactured as per developed protocol and offered to consumers in the size of rectangular pieces with an average weight of 30 g and requested asking them to indicate their observations about the product on the given proforma. Amongst the consumers (N=200) majority of consumers belonged to the young age group, (46.00 %), completed their graduation (25.00 %), having agriculture occupation (39.00 %). More than half of the consumer (54.00 %) rarely purchase fig *burfi* and 25.50 per cent of the consumers purchase fig *burfi* monthly. Only 10.00 per cent of the consumers were purchasing fig *burfi* fortnightly and weekly and equal number never purchasing fig *burfi*. The frequency distribution of the consumer perception of the fig *burfi* found that 59.50 per cent of the consumers reported excellent quality of fig *burfi* and 26.00 per cent reported very good remark about quality of fig *burfi*. Further 8.50 and 6.00 per cent of the consumer expressed good and fair status of fig *burfi*, respectively. The cost of production of fig *burfi* was worked out by using the prevailing price/rate of each ingredient and services. The cost of production of 100 kg fig *burfi* was estimated to Rs.14491.28 which comes to Rs. 144.91/kg.

### **TFP-P-07**

#### **NUTRITIONAL QUALITY AND STORAGE CHANGES IN CEREAL BASED HIGH ENERGY BAR**

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Energy bars are supplemented products specially designed to supply adequate energy and nutrients. The process technology was standardized using pomegranate peel extract as a functional aid. The major ingredients are oats, wheat flakes, liquid glucose, sugar, binders, honey and nuts. Each bar weighing 45g contains 3.8g protein, 4.5g fat, 31g

carbohydrates and 1.8g fiber. The energy value per 100g is 400-410 K cal. The polyphenol content of the bar is 176mg. Each bar provides calcium of 136mg, Iron 8.17mg and Copper 0.85mg. The bars have a shelf life of 6 months (28±2<sup>o</sup>C). The TBARS value is 0.015mg malonaldehyde/kg sample, FFA value 2.56 % oleic acid and microbial count is 3.1 log cfu/g respectively, at the end of storage period. The water activity is 0.403. There was a slight increase in the hardness during storage. No significant difference in texture was observed during storage and the product was highly acceptable. The colour measurement showed a decrease in the L\* and increase in a\* values. The bars prepared are very useful to the troops who are deployed in far flung regions where regular supply of fresh foods becomes almost impossible.

### **TFP-P-08**

#### **OPTIMIZATION OF CONDITIONS FOR NANO-ENCAPSULATION OF BACOSIDE BY RSM TECHNIQUE AND ITS CHARACTERIZATION**

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*Bacopamonniera* (Brahmi) is widely used as traditional medicine to treat cognitive disorders. It contains several bioactive compounds which are bitter in taste when consumed; therefore encapsulation was carried out to prepare nanoparticles of *Bacopamonniera* extract. To optimize the condition for Nano-encapsulation of extract, central composite rotatable design (CCRD) of response surface methodology (RSM) was implemented. The condition parameters were chitosan % (A1), TPP % (B2) and concentration of BME % (C3). Size and zeta potential were taken as responses. Multiple regression equations generated for two responses. The optimized conditions (0.1% chitosan, 0.15% TPP, 15 mg/ml of BME) showed a high potential value of about 52.0 mV and size was about 220 nm. Response surface methodology was implied for the prepared nanoparticles considering two responses (size and charge). Contour plots and 3D plots were designed. Initially central composite model were chosen. The optimized conditions were applicably fit to give a quadratic model. HPLC, total polyphenol contents, antioxidant assays (DPPH, ABTS) were carried to check the efficiency of the encapsulation and it was found to be 52.0%.

Key words: *bacopamonniera*, RSM, nanoencapsulation, antioxidant.

**TFP-P-09**

**THERMAL AND MOISTURE TRANSFER  
PROPERTIES OF *CHHANA PODO* DURING  
BAKING**

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*Chhana podo* is probably the only indigenous dairy product that is prepared by baking. It is characterized by a brown crust with white or light brown inner body, has a typical cooked flavour and rich taste. Traditionally, it is prepared by mixing *chhana*, semolina, refined wheat flour and sugar, and slowly baking the dough by keeping red hot burnt wood on top and bottom of a vessel for about 2-4 h. Baking is the key step in the preparation of *chhana podo*. In this study, the heat and mass transfer during baking of *chhana podo* was analyzed. The thermal properties such as thermal conductivity, thermal diffusivity and volumetric specific heat were measured by using a Decagon KD2 Pro thermal properties analyzer. Fick's second law was used to predict the moisture transfer. Surface, core and bottom temperatures increased with baking time and temperature. The thermal conductivity, thermal diffusivity and volumetric specific heat ranged respectively from 0.359 to 0.223 W/m.K, 0.112 to 0.105 mm<sup>2</sup>/s and 3.09 to 2.00 MJ/m<sup>3</sup>k. Moisture diffusivity increased from 3.55x10<sup>-7</sup> to 5.98x10<sup>-7</sup> m<sup>2</sup>min<sup>-1</sup> when baking temperature increased from 120 to 150°C. The optimized baking conditions would be useful in the production of *chhana podo* with optimum quality and desirable nutritional value, besides being in the most efficient and economical way.

**TFP-P-10**

**APPLICATIONS OF NANOTECHNOLOGY AND  
NANOCOMPOSITES IN FOOD INDUSTRY**

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The food industry demands technologies that are essential to keep market leadership by producing fresh authentic, convenient and superior quality food products at reasonable cost. Nanotechnology is the science of very small materials that can have a big impact in food packaging, production of functional foods, and development of foods capable of modifying their colour, flavour or nutritional properties. It is an interdisciplinary field that stretches across a whole spectrum of science such as physics, chemistry, and biology, as well as engineering, including micro-fabrication techniques. It is gaining momentum, and gradually becoming a worldwide important tool for the food and bioprocessing

industries. Nanotechnology has potential applications in all aspects of food chain including food safety by controlling microbial growth, delaying oxidation, providing superior functional properties, improving packaging and tamper visibility, better traceability, storage and convenience. Besides, it helps in the creation of on-demand interactive food that allows consumers to modify food, depending on the nutritional needs and tastes. Nanotechnology modifies the permeation behaviour of foils, increasing barrier properties (mechanical, chemical, and microbial), providing antimicrobial properties and by improving heat-resistance properties. A low concentration of nanoparticles may be sufficient to change the properties of packaging materials without significant changes in density, transparency and processing characteristics. This is because nanoparticles have proportionally larger surface area than their microscale counterparts, which favors the filler-matrix interactions and influences the performance of the resulting material. Properly designed bionanocomposites from starches and various biopolymers possess several superior functional properties and broaden the application range. Particularly, the tensile and moisture barrier properties of nanocomposites are much superior to that of the respective pure biopolymer films. It has been estimated that nanotechnology-derived packaging will make up to 19% of the share of nanotechnology products and applications in the global consumer goods industry by 2015. Nanotechnology also has demonstrated great potential in improving the efficiency of delivery of nutraceuticals and bioactive compounds in functional foods to improve human health. It can enhance solubility, improve bioavailability, and protect the stability of micronutrients and bioactive compounds during processing, storage and distribution. It can be applied to make foods such as soft drinks, ice cream, chocolate, or chips to be marketed as 'health' foods by reducing fat, carbohydrate or calorie content or by increasing protein, fiber or vitamin content. Moreover, lowering the costs of food additive ingredients and increasing the shelf-life of food products could be achieved using this technology. Thus, nanotechnology is a future-centric technology that has the scope to revolutionize the food industry.

**TFP-P-11**

**NEW SENSOR TECHNOLOGIES (QbD) FOR  
QUALITY FOOD**

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The new paradigm in the food industry is Quality by Design (QbD) includes that the quality of the food products should be incorporated by process design and not by postproduction quality testing. This shift in has been emerged due to regular demands in terms of quality control, safety and traceability of food products. Some new technologies like acoustic emission, (Optical Coherence

Tomography) OCT, micro and nano-carbon tubes are used to for the analysis of food quality. It will improve processability and improved product quality. These sensor technologies are focused on real time analysis in comparison to expensive, labor intensive and non-uniform quality analysis.

### **TFP-P-12**

#### **WATER SORPTION CHARACTERISTICS AND THERMAL PROPERTIES OF SPRAY DRIED AVOCADO MILKSHAKE POWDER**

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Due to the expanding market of dairy companies, there has been integration of dairy product and fruit beverage markets; with the introduction of hybrid instant nutritious dairy products which offer health, flavour and convenience. Avocado is recognized as a functional food that contains health-promoting phytochemicals and bioactive compounds. The avocado milk shake samples prepared with varying levels (2, 6, and 12%) of maltodextrin (MD) were subjected to spray drying; the inlet and outlet temperatures were set at 170°C and 90°C respectively. The water sorption isotherms and glass transition temperature (T<sub>g</sub>) of spray dried avocado milk shake powder were studied in order to investigate their stability. The sorption isotherm was determined by the gravimetric method. A differential scanning calorimeter was used to determine the T<sub>g</sub> of the samples. The thermograms of spray dried avocado milk shake powders containing 2, 6 and 12% MD had T<sub>g</sub> values 26.1, 27.52 and 33.9 respectively, showing increase with increasing levels of MD in the blend. Modeling of sorption isotherms was done. GAB model gave a good prediction of the sorption data. The data of T<sub>g</sub> versus solids content gave a satisfactory correlation with the Gordon-Taylor model. The addition of carrier agent maltodextrin increased the T<sub>g</sub> of the spray dried avocado milk shake powder, enhanced product quality and storage stability.

### **TFP-P-13**

#### **INFLUENCE OF STORAGE PERIOD ON THE RHEOLOGICAL AND SENSORY PROPERTIES OF HALVASAN PACKED IN DIFFERENT PACKAGES**

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*Halvasan* is one of the popular heat desiccated cereal

based indigenous milk sweet manufactured and sold in Khambhat region of Gujarat State and hence the product is not well known in other parts of our country. It is generally consumed fresh, as it has a limited shelf-life. The shelf life of a heat desiccated dairy product is generally determined by the conditions maintained after production because such product is almost sterile when produced. One way of maintaining its hygienic condition and avoiding such contamination restricting its shelf life is packaging in a suitable material. This investigation was planned to study the effects of different packaging materials and their role in extension of shelf-life of the product. The present investigation was planned to study various packaging materials used in commercial practice. *Halvasan* was made from standardized procedure and packed in these packages and stored at room temperature (30±2°C). The *Halvasan* samples were evaluated for rheological and sensory parameters at regular intervals of storage. Changes in sensory parameters and rheological attributes were found significant during storage. Visible mould was found on 10th day of storage at room temperature (30±2°C) which led to unacceptability of the product.

### **TFP-P-14**

#### **COMPARATIVE STUDY AMONG VACUUM OVEN, TRAY AND SUN DRYING FOR DRYING OF BITTER GOURD SLICES**

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*Momordica charantia* L. is known as bitter melon, bitter gourd, karalla and bitter cucumber, and used as vegetable. It is rich source of calcium, potassium, iron, zinc, phosphorus, sodium, and magnesium. It also contains tannin, flavonoid, terpenoid, cardiac glycosides, triterpin and sterol, resin, amino acid and phenolic content. The extract of bitter gourd has been wide use medicinal in the traditional system as hypoglycemic and anti-diabetic agents. Due to high moisture content (92.4%), it has low shelf life. The present project was taken to dry of bitter gourd by sun Drying, vacuum oven and tray drying, to increase shelf life of bitter guard. The method of drying included receiving of bitter gourds, washing, pretreatments, cutting, spreading on flat stainless steel, drying (at different drying methods), packing and storage (at ambient temperatures). The effect of bitter guard size and drying temperature was studied on DPPH inhibition activity, ABTS inhibition activity and total phenolic content. It was found that DPPH inhibition activity lower in vacuum oven dried, while ABTS inhibition activity and total phenolic content of vacuum oven dried sample was higher than the tray dried and open sun dried samples. Total bacterial count, total fungal counts were found to be under controlled while *Coliform* counts were observed nil during two month storage.

**TFP-P-15**

**REPLACEMENT OF SYNTHETIC ANTIOXIDANT (BHA) WITH NATURAL ANTIOXIDANTS EXTRACTED FROM ORANGE PEEL AND POMEGRANATE PEEL**

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Recent investigations demonstrated that orange peel and pomegranate peel are rich in bioactive compounds like phenols and other compounds, but these by-products have not been fully exploited to use for food preservation, quality, safety and shelf-life enhancement. Umpteen number of literatures revealed that antioxidant activity of orange peel and pomegranate peel are due to presence of phenolic compounds. Therefore, orange peel and pomegranate peel extracts were incorporated into ghee for their antioxidant activity and compared with ghee incorporated with synthetic antioxidant (BHA). Ghee incorporated with orange peel and pomegranate peel extract showed better antioxidant activities than ghee incorporated with BHA and control. Study revealed that orange peel and pomegranate peel extracts could be used in fat rich products like ghee in place of synthetic antioxidants.

**TFP-P-16**

**DEVELOPMENT OF BAEL (*AEGLE MARMELOS*) POLYPHENOLS EXTRACT FORTIFIED STIRRED YOGHURT**

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Bael (*Aegle marmelos*) being a natural antioxidant source has many health promoting effects. Its incorporation as a lyophilized extract of baelpolyphenol in dairy foods improves their antioxidant potential but also leads to sensory and rheological changes that may affect acceptability of final product. Rheological, sensory and antioxidant parameters of bael polyphenols extract (BPE) fortified stirred yoghurt were correlated with composition of ingredients i.e. bael polyphenols extracts, sugar and milk fat. With the aim of functional yoghurt development rheological, sensory, and antioxidant properties were studied and found to be significantly related to composition of ingredients. Sensory evaluation of the BPE fortified stirred yoghurt was carried out using 9-point hedonic scale. Rheological attributes such as consistency, cohesiveness and index of viscosity were analyzed using Texture Analyzer (TA.XT plus texture profile analyzer, Stable Micro Systems, UK). The proximate compositional analysis of the BPE fortified stirred yoghurt was 86.41% moisture, 3.26% protein, 3.92% fat, 0.83% ash content and 0.81% acidity. The water holding capacity was

found to be 80.34%. The product remained acceptable for two weeks. Antioxidant activity as % DPPH inhibition and total phenolic content were significantly related to composition of ingredients of yoghurt and decreased significantly during storage period.

**TFP-P-17**

**UTILIZATION OF FINGER MILLET FLOUR FOR PREPARATION OF "MATHRI" BY BAKING**

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The studies were conducted to explore the possibilities of raw, malted and popped finger millet flour (FMF) in preparation of mathri by baking method; with a view to lower the fat content in the mathri. Baked mathris are prepared using same stuff as in the deep-fat fried mathri and at 180°C for 12 minutes in baking oven. Formulation containing 30% raw, 30% malted, 30% popped FMF were selected for further optimization of product. Variations were made on the level of fat, baking powder, salt, water, CMC (carboxy methyl cellulose) and GMS (glycerol monostearate). The sensory evaluation suggested that an optimum level of 35% Fat, 2% baking powder, 30% water, 0.15% CMC and 0.15% GMS enhanced the overall quality of the baked mathri. The addition of 0.15% CMC and GMC reduced the fat level from 40 to 50% with good quality baked mathri which was comparable to its fried counterpart.

**TFP-P-18**

**MITIGATION OF FOOD SCARCITY BY EMPLOYING EMERGING FOOD TECHNOLOGIES FOR ESTABLISHMENT OF GLOBAL FOOD SECURITY**

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According to UNFAO data of 2012-14, about 805 million people in the world, or one in nine, were suffering from chronic undernourishment. Despite the efforts of various governments, about 13.5 % of the overall populations in developing regions still remain chronically undernourished. Asia is home to two out of three of the world's undernourished people. With the present global political turmoil and climatic changes it is only a matter of time that this situation, if not checked, is only going to get worse and might soon engulf the developed countries as well. The answer, however, is not to just grow more food, but the need of the hour is to incorporate newer technologies in the food industry to sustain the growing demand as well as to ensure proper distribution to all groups of people worldwide. We need novel methods of crop production, newer transgenic

seeds and curbing of plant diseases, introduction of newer and nutritious diets in famine stricken regions, alternative sources of rich food like fish, use of non-conventional water resources like sea- and rain-water harvesting, pipelines for water to remote dry areas, soil preservation, policy changes to preserve the livelihood of farmers and use of novel methods of preservation like irradiation and use of anti-microbial films in packaging to increase the shelf life of food to decrease wastage. The world is going through an insidious crisis, food industry needs to step up and nip the evil in the bud.

## **TECHNICAL SESSION –II**

### **DAIRY FOOD TECHNOLOGY – (DFT)**

#### **DFT-O-01**

#### **RHEOLOGICAL PROPERTIES OF GULABJAMUN PREPARED BY BLENDING OF BUFFALO MILK WITH SWEET CORN MILK**

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*Gulabjamun* prepared from *khoa* of blends of buffalo milk with sweet corn milk in different proportion. The proportion of buffalo milk with sweet corn milk were kept 80:20, 70:30, 60:40 for treatments T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, respectively and pure buffalo milk was used for control sample (T<sub>0</sub>). It was also observed that the overall acceptability score for treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> of *gulabjamun* prepared from buffalo milk blended with sweet corn milk for the treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 8.84, 8.31, 8.59 and 8.24 respectively. The hardness of the finished product was found to be in the range of 1910.15- 2913.20 gm for treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, respectively and 4538.45 gm for market sample. Cohesiveness of the finished product was found to be in the range of 0.24- 0.42 and 0.25 for market sample. Brittleness of the finished product was found to be in the range of 15.82- 16.65 cm and 18.200 cm for market sample. Elasticity of the finished product was found to be in the range of 7.77-9.45 mm and 6.30 for market sample. Gumminess of the finished product was found to be in the range of 473.44- 1245.54 g and 1097.15 g for market sample. Chewiness of the finished product was found to be in the range of 3681.95- 11753.16 and 7246.86 g-s for market sample. It was observed that the rheological properties of developed *gulabjamun* were comparable with control and market samples except hardness which was found highest in market sample and lowest in control *gulabjamun*.

Keywords: Rheological properties, Sweet Corn Milk, *Gulabjamun*.

#### **DFT-O-02**

#### **ADULTERATION IN GHEE: FEASIBILITY OF USING IMAGE ANALYSIS IN ITS DETECTION**

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Ghee is a highly priced dairy product of Indian sub-continent prepared by clarification of cow/buffalo/ mixed milk fat. Because of its high nutritional value, unique flavour and high demand, its adulteration has always been a serious concern. Various analytical and sophisticated instrumental methods are available for detection of adulteration, each having its own merits and demerits. With the need for more rapid and economical objective measurements of a quality, in recent times, image analysis is garnering prominence as a relevant tool for the qualitative and quantitative assessment of quality parameters in food processing. In present study, the methodology for test sample preparation up to image acquisition was developed. The images were acquired by flat bed scanner (Canon, canoscan, 9000F mark II) and saved in TIFF format. The protocol for processing the images was developed. Two morphological characters, two colour parameters, one texture parameter, two skeleton parameters and pixel intensity values were derived as quantitative descriptors for detection of adulteration. Two-way ANOVAs revealed that all the selected parameters were significantly different from each other at all adulteration levels and can detect more than 10% adulteration at 95% level of confidence.

#### **DFT-O-03**

#### **OPTIMIZATION OF SPRAY DRYING PARAMETERS IN THE PRODUCTION OF MILK-MALTED BARNYARD MILLET POWDER**

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Milk-malted millet powder was produced by spray drying in a lab-scale spray dryer. Malted barnyard millet extract (wort) was first prepared by enzymatic hydrolysis with alpha-amylase. The wort thus prepared was blended with milk at different ratios, maintaining the total solids content in the wet blend at 22%. The effects of spray drying process parameters such as inlet air temperature (180, 190 and 200°C), outlet temperature (70, 75 and 80°C) and blending ratio (milk to millet ratio of 1:1, 1:1.5 and 1:2) was investigated and the process was optimized using Response Surface Methodology. The response variables for optimization were moisture content, bulk density, powder yield, thermal efficiency and insolubility index. A

moderately hygroscopic and granular like product was obtained by spray drying. The yield of milk-malted millet powder was highly dependent on the drying process parameters. Moisture content and thermal efficiency were found to have a direct relationship with the inlet air conditions. Bulk density of the powder blends ranged from 0.37 to 0.45 g/cc, which was on par with commercial milk powders. Higher insolubility index was observed in the powders due to the addition of fiber-rich barnyard millet. The results showed that the spray dried milk-malted millet powder with better quality and desired physicochemical properties could be obtained by optimization through RSM technique.

#### **DFT-O-04**

##### **APPLICATIONS OF COMPUTATIONAL FLUID DYNAMICS IN DAIRY AND FOOD ARENA**

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CFD is a numerical design tool in engineering, which can predict fluid flow, heat and mass transfer, chemical reactions and other phenomena by solving set of governing mathematical equations in complex systems. Evolutions in computer technology, numerical algorithms and the hardware improvements have led to the development and application of CFD on a commercial scale. The CFD codes involve iterative methods to solve a whole set of discretized equations so that they may be applied to a single dependent variable. Therefore, in the recent years, CFD has been applied more and more to optimize and simulate many processes in food engineering such as drying, baking, mixing, rheology, heat transfer, sterilization, refrigeration, etc. In studies related to simulation of spray drying process, the main focus is on the complex atomizer spray patterns, particle trajectory and deposition, residence time, air-particle interactions, as well as, temperature and velocity distribution. In sterilization, CFD is being used to model many of the aspects pertaining with operational parameters like canning, bacterial deactivation etc to design related aspects like effect of rotation of cans, speed of rotation. In baking, most of the simulations are done stressing the design aspects like airflow pattern inside the oven, effect of different coils. ANN can also successfully used to model physicochemical processes also like Vitamin C destruction in sterilization, starch gelatinization during processing, etc. Now, attempts are being made in India to simulate and model various unit operations in the processing of indigenous dairy and food products. The advances in CFD research has meant that products can be processed and stored in more efficient systems. Thus, CFD has become an inevitable and progressive tool in present day modelling and simulations, and it is more accurate than mathematical models, besides being economical when compared to the didactic methods of experimentation.

#### **DFT-O-05**

##### **BETA-GLUCAN ENRICHED YOGHURT BY USING OATS AND BARLEY**

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Milk is a rich source of nutrients and energy. However, it lacks in any fibres. In the present study attempts were made to incorporate oats and barley which are rich in soluble fibre, beta-glucanin milk for preparation of yoghurt. The sensory, textural and microbiological analysis has been carried out. The studies indicated that the oats bran and barley could be added at 1% each for preparation of acceptable quality yoghurt. The sensory scores of the oats and barley incorporated yoghurt indicate that both the control and experimental yoghurt were equally accepted. The textural analysis showed that the yoghurt with barley and oats has firmer body compared to control with the firmness for yoghurt with 1% oats was 76.48 gms/sec while that of control was 48.02 gms/sec. The lactic growth during fermentation showed that the addition of oats and barley did not adversely affect the lactic growth and acidity development in the yoghurt. To conclude with, the overall acceptability scores indicate that the experimental yoghurt prepared by incorporating 1.0% barley and oats was comparable to the control yoghurt and the possible incorporation of oats and barley in the yoghurt without affecting its properties.

#### **DFT-O-06**

##### **APPLICATION OF ARTIFICIAL NEURAL NETWORK TECHNIQUES TO NON-LINEAR PREDICTION PROBLEMS IN DAIRY PROCESSING**

**M.Sivaram, P.Heartwin Amaladhas, F.Magdaline Eljeeva Emerald and K.C. Neethu**  
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Modeling physico-chemical, textural and thermal properties in dairy processing research are essential to predict outcomes for the various levels of the input factors which were not part of the experimentation. These properties very often follow non-linear models. Traditionally, a number of known mathematical models are fitted and the best amongst them is chosen based on minimum error criteria. Recently, Artificial Neural Network (ANN) has been found be promising technique in increasing the prediction accuracy in several research fields. ANN is a powerful tool that is able to capture, learn, adapt and represent complex nonlinear relationships. In this study, an attempt was made to evaluate the comparative performance of mathematical models and ANN in the modeling of physico-chemical, textural and thermal properties which influence the quality and their

kinetics during deep-fat frying of *pantao* (Indian dairy dessert). The process factors were temperature and time duration. The ANN models were found to perform better than the respective mathematical models in the prediction of the quality attributes.

#### **DFT-O-07**

### **COMPARISON OF MICROSTRUCTURE EVOLUTION OF *PANTAO* FRIED IN SUNFLOWER OIL AND GHEE**

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*Pantao* is a *chhana*-based traditional and popular dairy product of the Indian subcontinent. Preparation involves frying the *chhana-khoa* dough in oil or ghee. In this study, *pantao* was prepared by blending *khoa* (40% w.b.) and *chhana* (58% w.b.) in the ratio of 4:5 along with refined wheat flour (3%), semolina (3%), arrowroot powder (3%), ground sugar (0.7%) and baking powder (0.3%) to homogeneous and smooth dough. The dough was rolled into balls weighing 15 g each, and fried in sunflower oil and ghee at temperatures of 125, 135 and 145°C for 8 min. Crust and core moisture content and porosity was determined at 60s intervals of frying. The crust moisture content of *pantao* fried in sunflower oil decreased from the initial value of 65.67 (% d.b.) to 23.28, 20.39 and 17.47 (% d.b.) after 8 min of frying at 125, 135 and 145°C, respectively. The respective crust moisture content of *pantao* fried in ghee decreased from 18.23, 16.01 and 13.47 (% d.b.) after 8 min of frying. A significant difference ( $p < 0.01$ ) in the crust and core moisture contents of *pantao* with respect to frying medium, frying temperature and frying time was observed. The porosity of *pantao*, measured by image analysis, was found to increase from 6.59% to 53.53, 56.47 and 59.27% when fried in sunflower oil and 57.46, 58.44 and 60.55% when fried in ghee at 125, 135 and 145°C, respectively. The correlation coefficient between average moisture content (% d.b.) and porosity of *pantao* was found to as high as -0.95. The pore development was more uniform and stable when ghee used as frying medium. The average pore diameter (in mm) of *pantao* fried for 8min was found to be 3.76, 3.83 and 4.01 in case of sunflower oil and 4.28, 4.32 and 4.51 in case of ghee at 125, 135 and 145°C, respectively. A sharp decrease in moisture content and a dramatic pore development was observed in *pantao* during the early stages of frying in ghee than in sunflower oil. Thus, it could be concluded that *pantao* fried in ghee had superior quality, making it a superior frying medium.

#### **DFT-O-08**

### **MOISTURE SORPTION ISOTHERMS MODELING FOR SPRAY DRIED MILK-MALTED FOXTAIL MILLET EXTRACT POWDER**

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Milk and malted foxtail millet (w/w) wort were blended in 1:1 ratio, maintaining a solids content of 22%. The blend was spray-dried in a lab-scale spray dryer. The moisture sorption isotherms of the powder were determined at 10, 25 and 40°C using isopiestic method. The isotherms were sigmoidal in shape, belonging to type II of B-D-D-T classification. Empirical sorption models such as BET, GAB, Caurie, Modified GAB, Lewcki, Ferro Fontan, Peleg, Modified Mizrahi and artificial neural network (ANN) models were fitted to the sorption data. The ANN architecture had three layers comprising of input layer, output layer and a hidden layer of 7 neurons. The best results were obtained from Levenberg-Marquard backpropagation algorithm with training=60%, validation=20% and testing 20%. ANN model was able to predict accurately with RMSE ranging between 0.003-0.029. Among the empirical models, Ferro Fontan model (RMSE= 0.051-0.095) performed best fit followed by modified GAB (RMSE= 0.053-0.143) model. The results revealed that the ANN was able to learn the complex non-linear moisture sorption behaviour and gave a superior prediction with greater accuracy as compared to the empirical models.

#### **DFT-O-09**

### **OPTIMIZATION OF SPRAY DRYING PARAMETERS OF MILK BLENDED WITH MALTED FOXTAIL MILLET EXTRACT USING RESPONSE SURFACE METHODOLOGY**

**Vikram Simha, H.V., Arun Kumar, P., Heartwin A. Pushpadass, F. Magdaline Eljeeva Emerald, M. Manjunatha, B. Surendra Nath and B. V. Balasubramanyam**

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In the present era of specialized and personalized foods, the importance of milk-malted millet mixes is well-recognized. Though milk is regarded as a near complete food, it is still deficient in some important vitamins and minerals, and completely lacks fibres that are essential in our daily diet. Malted milk foods have registered a growth rate of 5-8% over the last decade (Dhillon, 2005). Incorporation of millets into milk to make convenient and healthy foods also could add value and help in product diversification of milk.

The quality and shelf-life of spray-dried milk-malted foods are influenced by the raw materials used, processing and manufacturing conditions followed and the storage conditions. The present work reported here is on optimization of process parameters for spray drying of milk-malted foxtail millet extract using response surface methodology (RSM). The experiments were designed using central composite face centered tool. The spray drying process parameters studied for optimization were: inlet air temperature (170, 185 and 200°C), feed rate (4, 6 and 8 mL/min) and blending ratio (milk: millet extract 1:1, 1:1.5 and 1:2) while, outlet temperature (80°C), atomization pressure (1.5 kg/cm<sup>2</sup>) and aspiration rate were kept constant (65 mm WC). The responses measured were moisture content, bulk density, powder yield, thermal efficiency and insolubility index, and they were used for optimization. Moisture content was found to decrease with inlet air temperature and low feed rate whereas, thermal efficiency was higher. The bulk density of the product was directly related to moisture content. The moisture content of the product ranged between 2.540 to 5.950% (d.b). Bulk density varied from 0.395 to 0.556 g/cc. The product recovery, thermal efficiency and insolubility index ranged between 61.376 to 93.022%, 79.266 to 81.181% and 3.80 to 6.89 respectively. The insolubility index of powder was observed to be higher due to addition of fibres from millet extract. The optimized spray dried milk-malted foxtail millet powder had better quality, and met the desired physico-chemical properties of the powder.

#### **DFT-O-10**

### **FORMULATION AND STUDY OF PHYSICO-CHEMICAL, TEXTURAL AND SENSORIAL PROPERTIES OF SWEETENED YOGHURT CHEESE**

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Milk is among the leading contributor to India's agricultural GDP due to its growing demand for newer products. The change in lifestyle, diet patterns and eating habits of consumers in recent years stresses the inclusion of fermented dairy products as an essential part of dietary habits that have immense nutritional and therapeutic virtues. Cheese is one of the most popular fermented dairy product owing to its great taste, variety, convenience, nutritional value and versatility of use. Yoghurt cheese is a soft, unripen fresh cheese made by exclusion of yoghurt whey using traditional or mechanized methods. In the present study the process of manufacture of sweetened yoghurt cheese was optimized using a basket centrifuge, operating at a centrifugal speed of 1400 rpm for 4 minutes (yield-50.5%) and the level of sugar was fixed to 40 percent to obtain desired composition and texture in the final product.

The physico-chemical, textural, a rheological and sensorial property of sweetened yoghurt cheese was analyzed. Study on dynamic rheology showed shear thinning behavior and the textural profile analysis depicted the firmness value to be low in comparison to normal yoghurt cheese. The product was packaged in HDPE cups and stored at 4°C.

#### **DFT-O-11**

### **CHARACTERIZATION OF SWEETENED YOGHURT CHEESE SUPPLEMENTED WITH DIFFERENT FRUIT PULPS**

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Yoghurt is a valuable fermented milk product having nutritional benefits beyond those of milk but its limited shelf life overpowers its functional properties. Dewatering of yoghurt reduces the moisture content and acidity in traditional yoghurts to give an extended life product that is thicker, richer, and creamier and more like a pudding cup called yoghurt cheese. In the present study yoghurt cheese was prepared by partial removal of water from yoghurt which was manufactured from buffalo milk standardized to 3% fat and 12% SNF using yoghurt culture at the rate of 2%. The cheese thus formed was mixed with 40% sugar and two different fruit pulps i.e mango and kiwi fruit at the level of 15%. Whey was removed mechanically using a basket centrifuge (1400rpm/5min) fitted with cheese cloth bag. Comparison of the two samples depicted significantly ( $p>0.05$ ) higher values of pH, L\*, protein, total solids and lower values of acidity, water activity, a\*, b\*, ash, firmness, work of adhesion, work of shear and stickiness. Product containing mango pulp was preferred in terms of textural attributes. Both the samples got equal scores for flavour, body & texture, acidity, color & appearance by sensory panelists.

#### **DFT-O-12**

### **FLOW CHARACTERISTICS OF RICE PUDDING SERUM**

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In this paper, flow characteristics of rice pudding serum are presented. Rice pudding was prepared using fresh cow milk. Pre-cleaned Basmati rice grains, 2.5 % by weight of original milk taken, were washed and soaked in water (rice to water ratio 1:2) for 30 minutes. It was cooked at 95±5°C in jacketed steam kettle. Refined granulated sugar (5 % by weight of original milk taken) was added before end of cooking process. Prepared rice pudding was cooled to room temperature. The rice pudding serum was obtained from the

rice pudding by filtration. Anton Paar Rheometer (Model: MCR 52, Anton Paar, Germany, Software Rheoplus 132 v3.6) with cone and plate geometry probe CP-75 (inclination: 1.002°, gap: 0.149 mm) was used to determine flow characteristics of serum (total solids: 25.57% - 45.07%) at different temperatures (25 - 45°C) by applying different rates of shear (0 to 100 rad/s). Flow behaviour index varied between 0.4736 - 0.5340 whereas the consistency coefficient varied from 1.7640 to 2.1661 Pa.s<sup>n</sup>. Apparent viscosity was found to increase with increasing total solids but decreased with increasing temperature. Yield stress ranged from 0.4226 - 0.6709 Pa. Flow characteristics are useful in the development of process equipment.

### **DFT-O-13**

#### **NUTRACEUTICAL AND THERAPEUTIC USE OF MILK AND MILK PRODUCTS IN TRADITIONAL MEDICINAL SYSTEMS: A PROFILE STUDY**

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Milk and milk products have a significant role in our traditional medicinal systems, Ayurveda, Siddha and Unani. A profile study was undertaken to document the role played by milk and milk products in our traditional systems of medicine for further research work in scientific validation. The study revealed that eight types of milk were used in the traditional medicinal systems viz., cow, buffalo, goat, camel, ewe, horse, donkey, dog, monkey and human. The milk products used extensively in the traditional systems under study include curd, buttermilk, butter and ghee. Panchaghavya, in Ayurveda, which includes milk, ghee, curd, cow's urine and dung possesses medicinal properties against many health disorders and is used for medicinal purpose individually or in combination with some herbs. Milk and milk products have an inevitable role in all the three traditional medicinal systems viz, Ayurveda, Unani and Siddha as drug components for therapeutic purposes, nutrient fortifications, preparations meant for external use and medium / carrier for other drugs. The milk and milk products have significant utility in medicinal preparations such as adjuvant, co-factor, medium or carrier (passive role) or rejuvenator, vitaliser, astringent, stimulant, appetizer, aphrodisiac, exhilarant, haemopoietic, laxative, carminative and diuretic (active role).

### **DFT-O-14**

#### **ORGANIC MILK PRODUCTION: SCOPE AND CHALLENGES IN INDIA**

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It is often said that milk is 'nature's most nearly perfect food'. Though our country stands *numero uno* in

milk production, it is often questioned about safe, hygiene and quality milk production. Production quality milk though eliminating sources of contamination of milk from animal, environmental and its subsequent stages of handling is gaining momentum in the present context of greater consumer awareness on food safety issues. In this context, production of organic food commodities including milk has assumed a great importance amongst the farmers, consumers and other stakeholders. The organic movement principle envisages that, *healthy soil-healthy crops-healthy animals-healthy humans and a healthy-planet*. Organic dairy farming means, non usage of synthetic chemicals in all along the process of milk production. It is scientifically well established that organic milk has more health benefits than milk from conventional production. Though organic farming is a native of our country, for producing organic milk, we need to revert back to traditional ways managing dairy animals with low inputs and high returns. Effective strategies need to be formulated to enable our farmers to translate it into the new market opportunity and also to regulate the availability of safe, quality-organic milk to our needy consumers.

### **DFT-O-15**

#### **PRODUCTION OF WHEY PROTEIN ENRICHED PROBIOTIC CONCENTRATED YOGHURT**

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In this study an attempt was made to develop protein enriched probiotic concentrated yoghurt which having higher self-life. Yoghurt was prepared with three different levels of TS viz., 20, 30 and 40% TS, these treatments corresponding fat and SNF were 4.3, 6.4 and 8.6% fat and 15.7, 19.6 and 31.4% SNF, respectively. The sensory scores of concentrated yoghurt up to 30% TS was not significantly different from control (3.0% fat and 14% TS). To enrich yoghurt with protein and to increase the SNF from 11 to 19.6% SMP was replaced with WPC<sub>70</sub> at three levels viz., 30, 40 and 50%. Replacement of 40% SMP with WPC<sub>70</sub> produced a protein enriched concentrated yoghurt which was not significantly different from control, with regard to overall acceptance. Among three different levels of WPC added with probiotics, *Lacidophilus* and *B. bacterium*, at 1.5% level each, secured higher acceptance scores compared to the control.

### **DFT-O-16**

#### **EFFECT OF COOLING ON MILK QUALITY AND ENERGY EFFICIENCY AT THE FARM LEVEL**

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India is the world leader in milk production (137.6

million tonnes NDDDB report, 2014). About 60-70 % of milk produce is by small scale farmers. Cooling of milk plays vital role in maintaining quality of milk and cooling contribute to a major part of energy consumption. Cooling is a very critical step in milk processing. Chilling of milk arrests bacterial growth and provides solution to most of the quality related problems. At the time of milking, temperature of raw milk will be about 37°C, which is ideal for microbial growth. Critical temperature of milk is about 4-5°C to arrest microbial growth. Study is carried on different systems available for milk cooling, their efficiency and suitability for use. Efficiency factor and environmental concern are causing Dairy farmers to modify their practices and adopt modern techniques. Farmers are evaluating the cost inputs and investing in cost effective, reliable and energy efficient measures. Quality and energy efficiency can be improved to a good extent by upgrading older equipment, installing new technologies in cooling.

### **DFT-O-17**

#### **DONKEY MILK: NUTRITIONAL IMPORTANCE AND HEALTH BENEFITS**

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Donkey (*Equus asinus*) is also known as ass or jenny; there are reportedly 185 number breeds of donkey worldwide. In India, Indian wild ass breeds exist in most numbers. Donkey milk has 0.3-1.8% fat, 1.5-1.8% protein, 5.8-7.4% lactose and 0.3-0.5% minerals, and also minor constituents like lysozyme and lactoferrin. Donkey milk possesses a great medicinal value, so it is used in treatment of many diseases like cough, surgical wounds, ulcers, arthritis, chikungunya, haemoptysis, etc. It is considered as a suitable alternative to mother's milk for infants because of easy digestibility and no allergenicity. The donkey milk also helps to make skin soft and moist, so it has a greater scope in cosmetic industry. Hence, it is not surprising that donkey milk costs much more than cow milk because of its value addition. In some countries, donkey milk is used for manufacturing various products like pule cheese and fermented beverages. The donkey milk also has about ten times more lysozyme, an antibacterial compound, than bovine milk. This information may generate great interest among researchers, academicians and entrepreneurs about donkey milk and its importance.

### **DFT-O-18**

#### **DEVELOPMENT OF LOW FAT MASCARPONE CHEESE**

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Attempt was made to partially replace its fat content

with suitable fat mimetics like inulin, N creamer and whey protein concentrate (WPC). Mascarpone cheese containing 16, 20 and 24% fat (corresponding to 60, 50 & 40% reduction) was prepared and whereas control product was with 40% fat. The influence of fat replacers in combination of the Inulin, WPC and N-creamer were studied by adding fat replacer in 3 combinations: 10% (6% inulin, 2% WPC & 2% N-creamer), 15% (6% inulin, 4.5% WPC & 4.5% N-creamer), 20% (6% inulin, 7% WPC & 7% N-creamer) in the cheese on weight basis. In general low fat cheese samples had higher moisture contents. However, as the level of incorporation of combined fat replacer increased, the moisture content in the cheese decreased. The pH of Mascarpone cheese showed a direct relation to the quantity of fat replacer used in the cheese; as the quantity increased pH value of the cheese increased. The mean spread ability of Mascarpone cheese with 60% fat replacement (16% fat) ( $1.839 \text{ N.S}^{-1}$ ) was more than that of cheese made with 40% and 50% fat replacement, which was closer to that of control cheese. Firmness was minimum in the cheese with 60% fat replacement.

### **DFT-O-19**

#### **ENZYMATIC CROSS-LINKING OF MILK PROTEINS TO IMPROVE THE FUNCTIONALITY OF LOW FAT DAHI**

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In recent years, due to people's greater health concerns, there is an increasing trend for the development of low fat dairy products. Dahi is one of the most popular food items in traditional oriented Indian diet. Development of low fat dahi encounters number of storage defects. This study was conducted in order to evaluate the effect of Transglutaminase (E.C.2.3.2.13., catalyses cross-linking of proteins) addition on rheological and sensory properties of low fat set dahi. Transglutaminase was added to low fat milk after preheat treatment and once desired cross-linkage was obtained, transglutaminase was inactivated by heat before culturing. Transglutaminase treatment improves the rheological and sensory properties of dahi prepared from cow/buffalo skim milk and double toned milk. It improves water holding capacity upto 85 % in skim milk dahi and upto 90% in double toned milk dahi, firmness up to 1.1 N in cow skim milk dahi and up to 1.8 N in cow double toned milk dahi, these values were almost double in low fat buffalo milk dahi. Syneresis, appearance and consistency of the final product were also improved. The high gel strength of cross-linked proteins improved the storage stability of low fat dahi at refrigerated temperature up to two weeks.

**DFT-O-20**

**PREPARATION OF STRAWBERRY LASSI**

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In present study of strawberry fortified *lassi* the chemical composition observed as Fat content ranges from 3.25 to 3.11 , Protein from 3.64 to 3.78, Lactose from 3.73, to 3.82, Total sugar 13.92 to 16.29, ash from 0.73 to 0.8, . Acidity (%LA) from 0.90 to 1.02 and pH from 4.13 per cent, respectively. The fat content of *lassi* samples is decreases as increase in the level of strawberry pulp while lactose content is increases as increase in the level strawberry pulp The overall acceptability for sensory score for *lassi* prepared by using 5% strawberry pulp. The mean lactobacilli count was observed to be  $4.33 \times 10^7$  cfu/ml It was observed that *lassi* samples under study did not show presence of any yeast and mould growth The cost for the sensorial superior combination *lassi* prepared with 8 per cent sugar and 5 percent Strawberry pulp could make a 200 ml serving at Rs. 6.80 which may be sufficiently lower with the value added and nutritionally enriched combination of Strawberry pulp.

Key words:- *dahi*, *lassi*, strawberry pulp.

**DFT-O-21**

**ROLE OF SCC ASSESSMENT TOWARDS HEALTHY MILK PRODUCTION FOR INDUSTRY AS WELL AS CONSUMERS**

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For fulfilling the future requirement of quality milk production in the country, control of mastitis especially subclinical mastitis is important. The most significant abnormality in milk due to subclinical mastitis is the increase in somatic cell count (SCC). SCC can be used as an indicator to detect mastitis in individual cow. In a dairy farm, though SCC, genetic group of animals, stage of lactation, parity, season of sample collection, udder hygiene score, method of milking and test day milk yield of the animals are important, it was found that  $\log_{10}$  SCC, stage of lactation, rainy season, stall hygiene score, udder hygiene score and method of milking contributed significantly ( $p < 0.01$ ) to calculate the difference between the normal and the infected animals. The ROC curve analysis revealed that the somatic cell count cut score of 3, 10,000 cells/ml of milk displayed the sensitivity and specificity levels of 92.6 per cent and 91.5 per cent respectively. Further, milk stored in bulk milk cooler should contain  $\leq 200,000$  SCC, standard plate count  $\leq 5,000$ ; preliminary incubation count  $\leq 10,000$  in nos. The milk should be free from drug residue. Further, hygienic milk should show the sediment count  $\leq 1.0$  and cryoscope reading

$\leq -530^\circ$  H. Hence, for declaration of healthy milk, SCC both at cow side and storage tank play an important role and probably it will influence future dairy industry.

**DFT-O-22**

**DAIRY WASTE MANAGEMENT**

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The different types of dairy waste are in the form of solid, liquid, gaseous and utilities and the sources of dairy waste are like animal waste, washing of milk can, cleaning and sanitizing of equipment, spoiled milk and milk products. The need of the hour is to manage the dairy waste as it is a statutory legislation and also the moral duty of the society to reduce the increasing hazards on the environment. Managing the dairy waste leads to improving the economic efficiency of the dairy industry, this in turn assists in achieving higher and clean milk production. Certain dairy wastes like animal waste contain many beneficial constituents that if recycled effectively, can be used as fertilizer for crops, fodder for animals and to produce energy which is not being practiced effectively. The dairy industry generates on an average 2.5-3.0 litres of wastewater per litre of milk processed. The most effective way to manage dairy waste are to eliminate dairy waste followed by other management practices like reduction at source, recovery and recycling while the least effective ways are treating and disposal of the dairy waste.

**DFT-O-23**

**CRISIS MANAGEMENT OF PRESENT MILK PRODUCTION TREND**

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India stands at the top position as world's largest milk producing country with 137.6 million tonnes during 2013-14, wherein only about 18 per cent of the total milk is handled by organized dairy sector. Dairy farming is generally a part of the overall agricultural operation. India's share in world milk production is 18 per cent. World milk production is also increasing at a steady pace which is leading to a drastic fall in the prices for milk powder in the world market. The gap between flush and lean seasons has narrowed. This has resulted in huge surplus milk and lots of powder bags stacked in store resulting in a crisis. Current milk production trend needs great attention to prevent the possible losses by proper crisis management. It is required to introduce new trends and follow quality measures in all areas of milk

production and management. Some key measures in relation to managing the present milk production trends are indicated to overcome the situation.

#### **DFT-O-24**

### **DEVELOPMENT OF PROBIOTIC CHEDDAR CHEESE WITH ADDITIVES**

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Incorporation of probiotic organism and additives in cheddar cheese acquiesce functional food. Cheddar cheese was manufactured with 0.5% cheese culture and 1% probiotic organism of *Lactobacillus plantarum*. Probiotic cheeses were prepared and mixed with 2 % additives of inulin, whey protein concentrate (WPC) and lactose separately in milled cheese curd in triplicate. All four batches including control were ripened at  $7\pm 2^\circ\text{C}$  for 6 months and analysed at 2 months intervals. There was no noticeable difference observed on yield among probiotic cheddar cheeses due to additives; however cheese mixed with lactose showed lowest yield which is 0.25% less than control. Lactose incorporated cheese showed lowest moisture content ( $38.85 \pm 0.81\%$ ) which was dropped by 7.05% till end of ripening. Maximum pH of 5.03 and 5.04 were observed in control and cheese made with WPC respectively followed by cheese made with inulin (4.93) and lactose (4.83). Acidity increased in all cheese irrespective of additives addition during ripening. The maximum acidity increase was in cheese made with lactose from  $0.95 \pm 0.12$  to  $1.90 \pm 0.27\%$ , whereas it was least in case of control from  $0.79 \pm 0.18$  to  $1.49 \pm 0.17\%$ . After 6 months of ripening, free fatty acid content increased maximum in cheese made with inulin from  $1.46 \pm 0.21$  to  $3.70 \pm 0.23$  followed by WPC  $1.32 \pm 0.11$  to  $3.40 \pm 0.44$ , control  $1.37 \pm 0.20$  to  $3.33 \pm 0.12$  and lactose  $1.33 \pm 0.18$  to  $3.24 \pm 0.27$  meq.KOH/100 gm fat. *Lactobacillus plantarum* along with inulin or WPC is suitable for probiotic cheddar cheese preparation.

#### **DFT-P-01**

### **QUALITY OF GHEE BASED LOW-FAT SPREAD UNDER VARIOUS PROCESSING CONDITION**

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In the present study the effect of processing conditions on quality of low fat spread using ghee was assessed in terms of sensorial and textural parameters. The sensory attributes studied were colour and appearance, spreadability, body and texture, flavour and overall acceptability whereas, instrumental parameters such as hardness, work of shear, stickiness and work of adhesion of LFS were also examined with the help of a Texture

Analyzer. Initially rheological properties of ghee influenced by the cooling method was studied and it was observed that when ghee melted at  $70^\circ\text{C}$  was first cooled rapidly to  $10-30^\circ\text{C}$  before further cooling to  $5^\circ\text{C}$  by quiescent storage under refrigeration, the sensorily perceived graininess was increased significantly ( $P<0.05$ ) with increasing temperature to which it was rapidly cooled. In rapidly pre-cooled fat the consistency appeared to be a solid mass (score 90.9) whereas the slowly pre-cooled ghee had less solidity when graded on 100 point scale. It was also observed that larger crystals with more yellowish liquid fat per unit surface area causing the product to appear more yellow (score 71.8) as compared to when smaller crystals were formed (score 49.0). Statistically the products obtained from ghee cooled to  $10^\circ\text{C}$  and  $20^\circ\text{C}$  were similar in respect of overall acceptability, while the spread obtained from ghee cooled to  $30^\circ\text{C}$  was significantly less acceptable ( $p<0.05$ ). The acceptability score for slowly cooled LFS was lower (6.76) compared to rapidly cooled ( $10^\circ\text{C}$ ) ghee spread (7.05). Hardness increased from 1732 to 1856g and work of shear from 5018 to 5404 g.s of low-fat spread using ghee as the pre-cooling temperature was raised from  $10$  to  $30^\circ\text{C}$ .

#### **DFT-P-02**

### **A STUDY ON MODIFIED PRODUCT-MINI SOYA PANEER PANCAKES**

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CVD's are group of disorders of the heart and blood vessels and the most important behavioural risk factor are unhealthy diet, physical inactivity, use of tobacco and alcohol. A sensory evaluation was undertaken to an standardized modified nutritious product for CVD patients. The product mini soya paneer pancake was designed for cvd patient which contains jowar flour, urad dal flour, soy flour, tofu, cucumber, coriander, tomatoes, red chillies, ginger and garlic. Evaluation is done on sensory attributes like appearance, color, mouth feel, texture and taste. Soyabean flour being hypocholestermic is beneficial for cvd patients  
Key words: Mini soya paneer pancakes, unhealthy diet, sensory evaluation.

#### **DFT-P-03**

### **STUDIES ON EFFECT OF DIFFERENT COAGULANTS ON PANEER PREPARED FROM COW MILK**

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Study was taken to evaluate the effect of different

coagulants on chemical and sensory quality of *paneer*. Four acid coagulants- citric acid (T<sub>1</sub>), malic acid (T<sub>2</sub>), lactic acid (T<sub>3</sub>) and ascorbic acid (T<sub>4</sub>) @ 2% were used. *Paneer* samples were chemically analyzed for moisture, protein, lactose, ash, total solids, acidity and pH. Treatment T<sub>1</sub> showed the maximum fat content (24.84%). While, it was 23.24%, 24.27% and 24.68% for T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> respectively. Treatment T<sub>1</sub> showed the minimum moisture content (52.66%). Treatment T<sub>1</sub> showed maximum protein content (18.19%) as compare to other treatments. The lactose content was ranged between 2.39 to 2.46%. Treatment T<sub>1</sub> showed the maximum ash content (2.01%). The TS content was ranged from 42.83 to 47.53%. The acidity of *paneer* ranged from 0.29 to 0.38% with minimum acidity for T<sub>1</sub> (0.29%). pH content ranged from 5.45 to 5.92. Treatment T<sub>1</sub> showed maximum score for colour and appearance (7.66), body and texture (7.73) and flavor (7.70). Treatment T<sub>1</sub> has showed maximum score (7.77) for overall acceptability. The yield of *paneer* was 18.00%, 17.20%, 17.47% and 17.72% for treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> respectively. The cost of production of 1 Kg *paneer* for T<sub>1</sub> was Rs.176.20.

#### **DFT-P-04**

### **EFFECT OF PRILLED FAT SUPPLEMENTATION ON MILK YIELD AND QUALITY IN CROSSBRED KARAN FRIES CATTLE**

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A study was carried out to investigate the effect of prilled fat supplementation on milk yield and composition in cross bred Karan Fries (KF) Cows. Ten crossbred KF cows were selected from NDRI cattle yard. The cows were divided into two groups and were housed in a well maintained animal shed. Both the control and treatment group of animals were fed as per the NRC standard. The treatment cows were fed with prilled fat @75g/day/animal upto 7th fortnight. The milk yield from both the group was recorded daily throughout the lactation period and milk samples were analyzed fortnightly. Feeding of prilled fat significantly increased (P<0.05) milk production by 0.9 kg/day/animal. It could be observed that there was no significant change on milk components like protein, lactose, SNF and milk cholesterol in treatment group as that of control but Milk fat percentage in treatment group increased (P<0.01) significantly. From this study it could be concluded that post partum supplementation of prilled fat in the early lactation significantly increased the milk yield throughout the lactation period. Since the milk fat percentage is increased in the treatment group, it would fetch more earnings to the farmer as the pricing of milk is based on fat. As the cholesterol level in the milk of prilled fat supplemented animal was not increased significantly, it would be safe and healthy for human consumption.

Keywords: Prilled fat, Lactation, milk yield

#### **DFT-P-05**

### **EFFECT OF MOLASSES BASED MULTI-NUTRIENT LIQUID SUPPLEMENT ON MILK YIELD AND MILK COMPOSITION OF DAIRY COW**

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This study was conducted to examine the effect of feeding molasses based multi-nutrient liquid supplement (MMLS) on milk yield and milk composition of cross-bred dairy cows in the early lactation phase. Recently delivered eighteen cows were randomly allocated to three dietary treatments viz. MMLS-0, MMLS-15 and MMLS-30 containing concentrate replaced by MMLS at the rate of 0, 15 and 30% based on crude protein. MMLS is composed of 64% molasses, 9% urea, 10% de-oiled mahua seed cake, 10% guar meal, 4% mineral mixture, 1% salt, 2% water and 7500mg/100kg vitamin E. Cows were offered a basal diet of green maize (30 kg), concentrate and *ad libitum* wheat straw to meet their requirement for maintenance and production for a period of 100 days. No significant difference were observed between the three groups with respect to milk production and milk parameters like milk fat, protein, lactose, total solids and SNF. The results indicated no difference in the milk yield and milk composition in cows on diets supplemented with multi-nutrient molasses based liquid supplement, while replacing concentrate mixture up to 30%.

#### **DFT-P-06**

### **APPLICATION OF ELECTRONIC NOSE IN DAIRY INDUSTRY**

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Aroma is an extreme important indicator of quality and product conformity. Electronic nose (E-nose), a state-of-the-art development for complex aroma analysis by using sensor analyser offers some significant advantages over traditional measurements. E-nose are having high reliability, repeatability and free of significant error. Expensive trained panellist and measuring instruments like GC-MS, GC-FID and HPLC have been replaced by this low cost, rapid and much more amenable for routine test analyser. New promising and reproducible sensor e.g. metal oxides (MOS), conducting organic polymers (CP), and metal oxide field effect transistor (MOSFET) are introduced and responses are analysed by different graphical, multivariate and networking analysing techniques. In the area of milk and other dairy products E-nose has been wide researched

in assessing and monitoring the quality. It provides freshness evaluation, shelf life prediction, new product development, determination of ageing of milk, classification of off flavours, bacterial cultures, cheese variety, geographical origin of dairy product, repining stages, adulteration etc. Advanced uses of E-nose like continuous use in dairy plant and automation is still in research.

### **DFT-P-07**

#### **APPLICATION OF HIGH PRESSURE PROCESSING FOR FERMENTED DAIRY PRODUCTS**

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High Pressure Technology (HPP) is an actively growing non-thermal, chemical free, area of research and development. It provides high quality and convenient products but in case of fermented dairy products pressure treatments are performed in such a way that culture survives while, the growth of spoilage micro flora is reduced, delayed, prevented or eliminated. In cheese and yogurt HPP produces desirable protein structure and mineral equilibrium. HPP prolongs the shelf life of fermented dairy products by complete elimination of LAB, prevention of excessive accumulation of flavours, over-ripening, retention of sensory characteristics, controlling outgrowth of spoilage yeast and mould. HPP also induces inactivation of dairy bacteriophage assuring food safety. Further research can be done to evaluate the potential applicability of HP in accelerated ripening.

### **DFT-P-08**

#### **COCONUT MILK SUBSTITUTED DAHI PREPARATION AND ITS ANALYSIS FOR SENSORY AND MICROBIAL ATTRIBUTES**

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A research study was conducted to prepare coconut milk substituted dahi in order to bring about the beneficial attributes of dahi and coconut milk together in a novel dairy product. Different levels of coconut milk (25, 50, 75 and 100 per cent) were substituted with skim milk or a mixture of whole milk and skim milk (1:1) in dahi preparation and analysed for sensory attributes and microbiological

parameters. Substitution of coconut milk up to 50 per cent in developed product was similar to the control sample (prepared only with milk) and was readily accepted by the consumers. Regarding sensory evaluation, the score ranged from  $7.10 \pm 0.35$  to  $8.9 \pm 0.15$  in dahi substituted up to 25 and 50 per cent when compared to the control ( $9.0 \pm 0.00$ ). Whereas, regarding microbial analysis, there were no coliform bacteria in control as well as other samples. The total viable bacterial count and yeast and mould count in control and 25, 50 per cent coconut milk substituted dahi samples were  $4.130 \pm 0.96$ ,  $5.0 \pm 0.57$ ,  $5.176 \pm 0.05$  and  $0.20 \pm 0.44$ ,  $0.46 \pm 0.37$ ,  $0.89 \pm 0.73$  respectively.

### **DFT-P-09**

#### **NUTRITIONAL BENEFITS OF CUSTARD APPLE YOGHURT**

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The popularity of yoghurt has been increased significantly in the last few years because of the incorporation of the probiotic organisms (*L.acidophilus*, *L.casei*, *L.rhamnosus* and *B.bifidum*) into the product that gives an extra nutritional-physiological value. The global probiotics market is US\$ 31.2 billion in 2014 and growing at a rate of 11.7% every year. It was found that the addition of 10% custard apple pulp in yoghurt gives highest score of acceptance with additional nutritive benefits. Custard apples contain anti-oxidants like Vitamin C, which helps to fight free radicals in our body. These are also rich in potassium and magnesium that protect us from cardiac diseases as well as maintain the water balance in our body. Apart from that, these also control our blood pressure. It contain Vitamin A, which keeps your skin and hair healthy. This fruit is also known to be great for the eyes, and cures indigestion. It's important to include this fruit in your diet, as the copper content helps to cure constipation. Natural sugar of custard apple makes a great nutritious dessert. Custard apple grown in different agro-climatic regions of India: Red Sitaphal, Balanagar, Hybrid, Washington, Purandhar, Pink Mammoth and African Pride are commonly used varieties of custard apple.

### **DFT-P-10**

#### **PREBIOTICS IN DAIRY INDUSTRY**

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Prebiotics are the non-digestible carbohydrate. It is beneficially host by selectively stimulating the growth of one or limited number of bacteria already resident in the colon.

Prebiotic are plant origin fructo-oligosaccharides (FOS), polyols, disaccharides, oligosaccharides and inulin. Prebiotics has discernible health effect recommended as a functional ingredient mainly to manage Gut microbiota. The health benefits of prebiotics are bifidogenic activity, stimulation of mineral absorption, hypolipidemic activity, and prevention of colon cancer. According to FSSAI the recommended use of prebiotic in food industry is 0.5%. The prebiotics are mostly use in dairy products like soya yoghurt, Symbiotic yoghurt, ice cream, dairy beverages, vifit, frozen desserts and cheese like petit Suisse. Now a day's innovative health based fermented products can be prepared by using efficient strains of probiotic bacteria along with highly bioactive prebiotic substances.

#### **DFT-P-11**

### **PLANT PHYTOCHEMICALS IN FORMULATION OF NOVEL FOOD PRODUCTS**

**Kirti Goel**

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Plant foods are a rich source of bioactive phytochemicals endowed with several health benefits. The major classes of phytochemicals are plant oestrogens, glucosinolates, polyphenols, organo sulphur compounds and carotenoids. Nowadays, focus is on designing of novel food products by incorporating phytochemicals. Anti-oxidant rich functional beverages and herbal drinks based on neem formulations containing limonoid phytochemicals are rising in market. Public interest in soy protein based extruded products is evolving rapidly. A lot of research has been done on carotenoids fortified foods and their *in-vitro* bioavailability. It has been reported that daily intake of formulated tomato drinks improves cellular antioxidant protection. Recently in Nigeria, nutritious snacks for urban diabetics have been formulated from phytochemical rich *Azelia Africana* and *Detarium microcapium* seed flour. Research carried out in the past decade has shown that breads formulated using rye flours and gluten free breads containing pseudocereal buckwheat has high phenolic content. But many factors affect the functionality of phytochemicals such as method of incorporation, amount and form of compound added, and processing and storage conditions. The issues relating with this subject are: isolation and efficacy of compound, bioavailability and stability of compound in new product system, safety, economy, mechanism of action, and risk factor.

#### **DFT-P-12**

### **SOLAR ENERGY UTILIZATION IN DAIRY INDUSTRY**

**Darshan GB<sup>1</sup>, Nalla Vivekananda<sup>2</sup>, M.**

**Manjunatha<sup>1</sup>, Arun Kumar P<sup>1</sup> and Brunda.S<sup>2</sup>**

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Demand for the dairy and food products is increasing day by day. With increase in product demand,

well commercial energy consumption increasing at ~6 % in last two decades. In India 49% of total energy is consumed in Industry. Import dependency at present, is 9 % for coal, 77 % for crude oil and petroleum product and 31 % for natural gas. Today, major electricity comes from coal, oil, water, gas or fossil nuclear materials as primary fuel sources. They are not renewable-limited-like every one earth has limitation to regenerate, less efficient (65-75%) and expensive. Renewable energy is also termed as “green energy”, “clean energy”, “sustainable energy” and “alternative energy”. For production of energy we are using Petroleum (39%), Natural gas (23%), Coal (23%), Nuclear (8%), Renewable energy sources (8%) in different proportion. We can use solar energy in dairy operation like cooling, heating, lighting, pumping, drying, electrifying, steam generation, etc to have a load served by efficient end-use equipment with a high-value service. India is procuring most of the milk from villages which are still not well equipped with power facilities and small farmers from 7 lakhs villages has to meet quality requisites of milk for 130 crores consumers.

#### **DFT-P-13**

### **REGIONAL POPULAR MILK SWEETS IN INDIA**

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In India, sweets are indispensable part of wedding ceremonies, feasts, festivals and social & religious occasions. These products have been passed on to us from several generations and basic varieties remained the same through these years, though modifications have been made from time to time depending on the situations and people's expectations. The aim is was to utilise milk solids to the maximum extent through tiny scale household level processes and technologies that are adequate and appropriate to local situations, resources and food habits. Indian mithais (sweets) have been developed to preserve the nutritional goodness of milk and to extend its shelf life under high ambient temperatures. India is the sub-continent having 29 states, from Kashmir to Kerala and from Bengal to Gujarat; we have large variety of indigenous products, depends upon culture, climatic conditions and availability of ingredients. Some regions have their own products with trademark artistry. Here, we will classify milk sweets on basis of state and base material focusing on products which are not known all over India but popular only in particular regions. For examples: Singori, Parwal-ki Mithai, Bal Mithai, Mohandas Chhana Gaja, Rasabali, Langcha, Sourpuriya, Soubhaja Sitabhog, Doodh Pak, Thabadia and Halwasan.

### **DFT-P-14**

#### **EFFECT OF PRESSURE AND TIME OF PRESSING ON PHYSICO-CHEMICAL CHARACTERISTICS OF PANEER**

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Paneer is a traditional heat-acid coagulated milk product and one the most popular dairy products in India. Paneer manufacture essentially involves heat-acid coagulation of standardized milk followed by pressing of the coagulum. Since no sufficient data available on how the machine parameters would affect the characteristics of paneer so the investigation on effect of pressure and time of pressing on physico-chemical characteristics of paneer was carried out. Six samples of paneer were prepared by the standard heat-coagulation method. The textural profile, moisture content, bulk density and the porosity of the paneer prepared were evaluated using the standard methods and TPA. The average values of fat and SNF were found to be 3.8% and 9.2% respectively for the raw cow milk procured. Various experiments were conducted on the prepared paneer and the salient observations were made as described below. The results of the porosity show that, highest value of porosity (24.07%) was observed in P<sub>3</sub>T<sub>2</sub> combination (i.e. 13kg pressure and 30 minutes pressing), whereas the lowest value of porosity (12.76%) was observed in P<sub>2</sub>T<sub>2</sub> (i.e. 10 kg pressure was applied for 30 min. duration). A nine-point hedonic scale sensory evaluation has got the highest score for overall acceptability for P<sub>2</sub>T<sub>1</sub>.

### **DFT-P-15**

#### **TRENDS IN TACKLING MILK PRODUCTION FOR QUALITY AND ECONOMIC SUSTAINABILITY**

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Education and knowledge about health and quality aspects are some of the key factors influencing the lifestyle, responsible for societal changes, living standards, changing food habits. There are about 1.22 billion people in India, with around 120million cows & buffalos. About 70 per cent of population resides in small towns and villages, 30 per cent in cities. Indian dairy market is segmented and milk quality, health safety will play a vital role in the market. India stands at the top position as world's largest milk producing country with 137.6 million tonnes during 2013-14, wherein only about 18 per cent of total milk is handled by organized dairy

sector. From the point of quality India stands at lower level in the International market. In the present situation, quality is the prime requirement. Proper measures should be followed to meet the quality standards. Product quality has significant dependence on the raw material quality. Quality has an effect on the export levels of the product, thus affecting the economy. Hence it is a key requirement to achieve the set standards and thereby maintaining the quality aspects from production stage till it reaches the consumer.

### **DFT-P-16**

#### **EFFECT OF ANTIBIOTICS ON MILK QUALITY**

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Antibiotics are the compounds used to control bacterial infections in both human and animals. In India, antibiotics are extensively used in dairy cattle management for preventing and curing diseases like mastitis, brucellosis etc. The administered drugs will leave behind the residues to milk for certain period. The presence of these residues in milk causes a major problem to human health and to the dairy industry. As far as the health risk is concerned, these residues have many human and animal health manifestations. With regard to milk processing, antibiotics residue will affect the process by altering the end product. Presence of residue of antibiotics affects growth of desired microorganisms. Moreover, presence of residues hinders the milk and milk products for export purpose. Proper care and attention has to be taken to improve milk quality by adopting Clean Milk Production (CMP) practices and good manufacturing practices.

**TECHNICAL SESSION –III**

**PUBLIC HEALTH MANAGEMENT (PHM)**

**PHM-O-01**

**EVALUATION OF KNOWLEDGE ON COOKING METHODS AND FOOD SAFETY AMONG WOMEN POPULATION AGED AROUND 40YEARS**

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Education and knowledge of the women always play a pivotal role in gaining knowledge, awareness and attitude towards personnel care as well as family health. Health education and development of family always depends on woman in home. The present study reports the attitude and knowledge acquired by the middle aged (below 40 yrs) and elder women (above 40yrs) regarding cooking methods and food nutrition loss due to preparation of vegetable and use of stored fruits. The survey was conducted in Tiruchengode, which comprises of urban, semi urban and rural areas of Namakkal Dt. in Tamil Nadu, India. The study was conducted among 74 women by questionnaire method, of whom 47.3% were elders and 52.7% were middle aged. They were categorized based on working status, educational status and living status which is then further classified based on cooking methods, shopping practices and awareness of nutritional losses. The overall study revealed highest deep frying practice in vegetarian and non vegetarian food by 22% and 34.3% of semi urban elders respectively. On analyzing the educational and working status of the same population revealed that the deep frying was highly practiced by illiterate elders and graduated middle aged in vegetarian (13.5%) and non vegetarian (37.8%) foods. Based on working status, non working women of middle age groups were high in practicing deep frying of both vegetarian (15.9%) and non vegetarian foods (43.6%). In regards to vegetable cutting and fruits storage, non working middle aged group were more aware in terms of 35.9%, who preferred vegetable cutting before cooking and non working elders (11.4%) preferred daily purchase and usage of fruits freshly. Least importance was given to food preparation, vegetable purchase and storage of foods by graduates and working women. The result revealed significant lack of awareness among middle aged in cooking methods and food preparation, especially among educated and working population. Whereas educated non working population were good in practice of cooking methods, preparation of foods before cooking and fresh food usage.

**PHM-O-02**

**STUDIES ON MULBERRY NUTRITIONAL FACTS AND ITS BENIFITS FOR HUMAN HEALTH MANAGEMENT**

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People's dependence of plants for their existence dates back to the beginning of the human race. In the early days, they had only limited needs like food, shelter and clothing but with the advancement of civilization, their requirement also grew up. The present day human depends heavily on a large number of plants and animal produce to meet their daily needs. As health becomes a great concern of people now a day, many natural ways to take care of one's health are gaining momentum. Traditional medicines are used about 60% of the world population these are not only used for primary health cure not just in rural areas in developing countries, but also in developed countries as well as where modern medicines are predominantly used. Western Ghats in Kerala and some part of Chattisgarh are a remarkable places , not only because of the tribal population and dense forest, but also having a lot of rare and useful natural resources including some rare species of medicinal plants which are used for curing different kind of diseases. Mulberry is a deep-rooted perennial plant with highly branching shoot and root system. In India at CSGRC, Hosur there are about 1269 mulberry varieties of which 999 are indigenous, 270 are exotic origin and CSR&TI, Mysore there are about 62 mulberry varieties. Some of the important Nutritional facts of mulberry plants are very useful and beneficial to human health. This paper explained about mulberry leaf and fruit extract are contain the composition of health promoting Phyto-nutrient compounds like poly-phenol pigment, antioxidants, minerals and vitamins that are essential for maintenance of optimum health of an individuals.

Keywords: Traditional medicines, Mulberry, Nutritional facts, Perennial plant, phyto-nutrient poly-phenol pigment, antioxidants, minerals and vitamins.

**PHM-O-03**

**OIL USAGE PRACTICES AMONG SMALL AND MEDIUM SIZED SNACK VENDORS IN SOUTH DELHI, INDIA**

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The increasing burdens of chronic disease have

spurred multi-pronged strategic efforts at policy and advocacy levels to minimize trans fatty acid consumption in India. This study aimed to investigate cooking and oil usage practices and oil quality among 50 small and medium sized vendors in South Delhi, India. Information on vendor practices was collected through a survey and oil quality was analysed by gas chromatography. Soy bean oil (86%) was the most frequently reported frying medium used. Availability (34%) was the commonest reason cited for choice of oils followed by taste and health factors. The commonly sold deep fried snacks included *bread pakora* (n= 32), *samosa* (n= 30) and *alootikki* (n= 21). Cast iron utensils (*karahis*) were most commonly used by vendors for deep frying. 42/50 vendors reported intermittent and re- heating of oils; 20 vendors were reusing the leftover oil/ fat. Only 10% of vendors surveyed were aware of the term “trans fatty acid” and its possible health impacts. The fatty acid profile analysis showed high levels of saturated fats. Intervention strategies should target both oil production and import policies and promote awareness among food vendors for a beneficial impact on population health.

Keywords: Oil usage, vendors, fatty acid profile, deep frying.

### **PHM-O-04**

#### **CARBON FOOT-PRINT OF THE DAIRY INDUSTRY**

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The overall contribution of global milk production, processing and transportation to total anthropogenic greenhouse gas (GHG) emissions is estimated at 2.7 percent. This figure includes emissions associated with milk production, processing and transportation of milk and milk products only. The mean global emission from milk production, processing and transport is estimated to be 2.4 CO<sub>2</sub>-eq. per kg of fat and protein-corrected milk (FPCM-4% fat and 3.3% protein) at farm gate. However, the emissions were found to range from 1.3 to 7.5 kg CO<sub>2</sub>-eq. per kg of FPCM. In comparing the mean life cycle emissions across different regions of the world, the highest emissions per kg of FPCM is from developing regions such as sub-Saharan Africa, South Asia, North Africa and the Near East with an average of 7.5, 4.6 and 3.7 kg CO<sub>2</sub>-eq. per kg of FPCM, respectively. The industrialized countries in North America and Europe, on the other hand, are found to produce the lowest emissions per kg of FPCM. In the wake of the current global crisis, there is a need to re-examine the global livestock food chain emissions based on Life Cycle Assessment. The FAO aims to identify low carbon low carbon development pathways for the livestock sector by identifying the major hotspot along the dairy food chain. The major sources of emission from farm-gate to retail point include transportation of milk, processing, production of packaging, refrigeration and transport of processed products and dairy wastes. India, being the largest producer of milk,

releases about 212.10 million tons of CO<sub>2</sub>-eq (10.1 million tons of methane), which accounts for about 63.4% of total GHG emissions from agriculture sector in India. The demand for dairy products in India is expected to double by 2050, which calls for an organized production, supply chain and with energy savings in the processing and manufacture of different products. Process re-engineering, use of renewable energy and optimization of various dairy plant operations are key to reduce the carbon foot print. These challenges can be well addressed by involving effective policy making, R&D work and management at national and international levels.

### **PHM-O-05**

#### **RAGI UTTAPA OBESITY-A MODIFIED FOOD PRODUCT**

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Ragi uttapa can be had as a quick snack to silence a hunger pang any time which was developed for obesity. It is traditionally made from white rice & udad dal. The recipe was modified in aspects to improve the nutrient density. Ragi uttapa was served with mint dip to enhance the taste with addition of nutrient powerhouse. The ragi uttapa was made from ragi flour wheat flour, onion, carrot which is rich in fiber, antioxidants and proteins. Fiber increases the satiety level that in turn helps in weight loss and also prevents other disorders like CVD, DM, & other risk factors. Mint & coriander chutney which contain garlic & ginger has an antioxidant property it scavenges the free radical & prevents cancer. It also lowers the LDL & increases HDL. Also low fat curd was added to give smooth texture & make it protein rich. After designing the product, sensory evaluation was conducted by 23 naive panel members & 4 expert panel members using 5 point likert scale. The product was standardized. The review of literature was searched to prove the effect of foods incorporated in the modified recipe to show their effects on obese individuals.

Keywords: Onion uttapa (rice flour based), Ragi uttapa, Obesity.

### **PHM-O-06**

#### **GREEN CHIPS OBESITY-A MODIFIED FOOD PRODUCT**

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A green chip was developed as delightful snacks for obesity. The recipe was modified in aspect to decrease the fat and increase fiber content. It is traditionally made as palak puri which is deep fried recipe. Green chips contain wheat flour, spinach, coriander leaves, garlic, and green chili. These ingredients are rich in fibres which increase the satiety level and help in weight loss. They are also rich in antioxidant

which helps in avoiding cancer, vitamins and minerals for normal functioning and regulation of body thus prevents risk of cancer, CVD, DM. And carom seeds are also added to improve the taste and aroma of the recipe which regulates digestion. It is served with tomato imli salsa (chutney) which is rich in antioxidants & minerals, fiber. After designing the product, sensory evaluation was conducted by 23 naive panel members & 4 expert panel members using 5 point likert scale. The product was standardized. The review of literature was searched to prove the effect of foods incorporated in the modified recipe to show their effects on obese individuals.

Keywords: Palak puri, Green chips, Obesity.

### **PHM-O-07**

#### **A STUDY ON ASSOCIATION BETWEEN ADJUSTMENT LEVELS AND ACADEMIC ACHIEVEMENT OF ADOLESCENTS IN RELATION TO THEIR LOCALITY**

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This article investigated the correlation between adjustment and academic achievement of adolescent in mathematics of 10<sup>th</sup> standard adolescent boys and girls of block Belha. A sample of 400 students of rural and urban locality was chosen using random sampling technique. Findings reveals that the correlation between adjustment and academic achievement of urban and rural male and female adolescents was traced positive at medium levels. On the basis of locality association between adjustment and academic achievement of rural and urban male adolescents was found to be positive and having a medium degree. Among the females adolescents residing in both the locality have shown higher degree of association between the two variables.

Keyword: Academic Achievement, Adolescent, Correlation; MAT, HSAI.

### **PHM-O-08**

#### **EFFECT OF REPLACING GROUNDNUT CAKE WITH RAW OR WATER SOAKED RAPESEED-MUSTARD CAKE ON THE PERFORMANCE OF LACTATING COWS AND MILK QUALITY**

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This study was undertaken to assess the relative effect of replacing groundnut cake with raw or water soaked rapeseed-mustard cake (RMC) as dietary protein supplement on the performance of lactating cows and milk quality. Eighteen crossbred lactating cows (Average milk yield of

9.41 ± 0.27 kg/day) were randomly allocated to 3 dietary treatments of 6 each; GNC, cows fed concentrate containing groundnut cake; RMC-dry, cows fed concentrate containing RMC replaced for groundnut cake and RMC-sani, cows fed water soaked RMC concentrate (in fresh drinking water at 1:3 w/v ratio for 12 h at room temperature) as mixed ration (*sani*) with known amount of part of daily allowance of wheat straw. The cows were individually offered a basal diet of green oats *ad libitum* along with required amount of iso-nitrogenous (23% CP) concentrate and wheat straw for 90 days with monitoring of daily milk yield, fortnight live body weight changes, fortnight milk sampling and blood sampling at 45 days intervals. After 60 days of experimental feeding, a digestion trial of 6 days duration was conducted to assess the intake and utilization of nutrients by cows. Total glucosinolates (GLS) content of RMC-dry concentrate was 64.28 µmol/g DM while it was reduced by 31.96 % to 43.74 µmol/g DM in RMC-sani and nil in GNC concentrate. The DM intake and digestibility of nutrients by cows were comparable (P>0.05) among dietary treatments. The GLS intake by cows was significantly (P<0.05) reduced in RMC-sani as compared to RMC-dry. Blood biochemical profile including thyroid hormones, milk yield and its basic quality parameters were comparable (P>0.05) among dietary treatments. Mean thiocyanate (SCN<sup>-</sup>) concentration in the body fluids including blood serum SCN<sup>-</sup> (8.65 - 12.65 µg/ml) and milk SCN<sup>-</sup> (24.77 - 39.84 µg/ml) was significantly (P<0.01) reduced by dose dependent effect of dietary GLS intake among RMC treatments. Groundnut cake may be replaced by raw or water soaked RMC in the diet fed to lactating cows without significant impact on performance of animals, and SCN<sup>-</sup> excretion in the body fluids was reduced by dose dependent effect of dietary GLS intake.

Keywords: Rapeseed-mustard cake, Water soaking, lactating cows, Milk quality

### **PHM-O-09**

#### **A CLINICAL STUDY ON THE EFFICACY OF BARELY WITH DRIED GOOSEBERRY DIET ON OBESITY**

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Obesity is defined as excess of body fat that poses a health risks. Obesity has reached epidemic proportions in India in the 21<sup>st</sup> century affecting about 120 million of country's urban population. It is the need of hour to work and find out the proper solution to tackle the obesity. By this background in the present study barley powder with gooseberry was supplemented to obese participants with an aim to find out economic, easily accessibility & effectiveness of the diet. 100 patients of either sex between 20-50yrs with obesity signs and complications with BMI above 25Kg/m<sup>2</sup> were randomly selected for the study. Participants

were randomly classified into two groups. For Group A patients barley with gooseberry diet was administered at breakfast. For Group B patient's diet modification was done for three months. Majority of the participants had less physical activity and more coffee and tea intake. A marked 2kg weight reduction and hip circumference improvement was observed among 40% group A patients than group B. Statistically a marked improvement was seen in BMI among group A (Pvalue 0.043) than group B. By this clinical study it is recommended that barley with dried gooseberry diet helps out in combating complications and obesity risks.

Key words: Obesity, BMI, waist and hip ratio, physical activity, barley and gooseberry diet

### **PHM-O-10**

#### **EFFECT OF DRY SOLANUM TORVUM TO PREVENT ANEMIA AMONG WORKING STAFF NURSES BELONGING TO AGE GROUPS (20-40 YEARS)**

**Rajiny.Ch**

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Anaemia is a public health problem that affects populations in both rich and poor countries. Its primary cause is iron deficiency, but a number of other conditions, such as malaria, parasitic infection, other nutritional deficiencies, and haemoglobinopathies are also responsible, often in combination. Anemia is a disorder of the blood. It is caused by very low levels of red blood cells and haemoglobin. Anemia is a decrease in the number of Red Blood Cells or less than the normal quantity of hemoglobin in the blood. The normal hemoglobin values for male are range from 13-17gm/dl and among females are range from 12-15gm/dl. Hemoglobin is vital in oxygen transport for respiration and gaining energy, which explains many of the symptoms like dyspnoea, lethargy, pallor, fatigue, low exercise tolerance, palpitations, cardiac problems, angina, claudication etc. Globally, anaemia affects 1.62 billion people (95% CI: 1.50–1.74 billion), which corresponds to 24.8% of the population (95% CI: 22.9–26.7%). The highest prevalence is in preschool-age children (47.4%, 95% CI: 45.7–49.1), and the lowest prevalence is in men (12.7%, 95% CI: 8.6–16.9%). However, the population group with the greatest number of individuals affected is non-pregnant women (468.4 million, 95% CI: 446.2–490.6).-de Benoist B et al., eds. Worldwide prevalence of anaemia 1993-2005. WHO Global Database on Anaemia Geneva, World Health Organization, 2008. Objectives 1. To study the prevalence of anemia among working staff nurses in multispeciality hospital. 2. To identify anaemic staff nurses. 3. To study the health profile of anaemic staff nurses. Haemoglobin test was taken among 30 samples. Blood was collected to the subjects by a lab technician in the well investigated laboratory. Incorporation: Sundakkai is turkey berry. It is incorporated into the diet either as raw and dry form. Sundakkai is used

for cooking and form various types of recipes. The recipes are mentioned in the followings. Turkey berry & tamarind soup (eat it as starter course before lunch). Sundakkai is soaked in salted buttermilk and sun-dried until shrunken crisp, similar to salted sun-dried green chillies. The final product is fried in oil serve as a crispy vattral with curd rice. Results: From the selected 30 samples, it was found that nearly, 84% were mild anemic, 13% were moderate anemic and 3% were severe anemic. Before supplementation the percentage for underweight is 33%, after supplementation the percentage for underweight was decreased to 27%. Because the underweight subjects were improve their food intake. They were avoided skipping the meals. So before supplementation 54% of normal weight was increased to 60% of normal weight after supplementation. There were no changes for the percentage of overweight subjects. After the supplementation of dry solanum torvum powder the haemoglobin test was taken to 15 subjects. After supplementation of dry solanum torvum powder, there were no severe anemic subjects. The percentage was zero. The 26% percentage of moderate anemic was decreased to 13% after supplementation. The 67% percentage of mild anemic was increased to 87% after supplementation.

### **PHM-O-11**

#### **DIETARY COENZYME Q10 LEVELS ON MUSCLE CoQ10 CONTENT IN BROILERS**

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A study was carried out to evaluate the effect of coenzyme Q10 (CoQ10) supplementation on serum and muscle lipid metabolism in broiler chicken fed with three energy levels. The birds were fed with normal energy (NE) as per breeder specifications, low energy (LE) (NE-100 kcal) and high energy (HE) (NE+100 kcal) along with three levels of CoQ10 at 0, 20 and 40 ppm of diet. Feeding of experimental diets was carried out for 42 days. At the end of 42 days, nine birds per treatment were slaughtered and breast muscle was collected for CoQ10 content estimation. When compared to respective unsupplemented birds (8.70, 7.57, 9.30), CoQ10 at 20 ppm (10.63, 9.77, 10.84), the level of CoQ10 in muscle was found significantly higher across all three energy levels (NE, LE, HE respectively) but the increase was not appreciated at 40 ppm (9.20, 8.03, 9.13). The CoQ10 from non-vegetarian source is more bio-available due to its lipid solubility. Hence, CoQ10 at 20 ppm could be exploited for producing value added chicken.

### **PHM-O-12**

#### **IMPACT OF DARK CHOCOLATE INCORPORATED WITH RADISH LEAVES POWDER AMONG SELECTED HYPERTENSIVE**

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Hypertension is reported to be the fourth contributor to premature death in developed countries and the seventh in developing countries. Dark green leafy vegetables are perhaps the most potent super food on the planet strongly associated with lowering blood pressure. Leaves of radish are more nutritious than radish helps in maintaining the blood pressure under control. Numerous epidemiologic studies support that regular consumption of dark chocolate exert a protective action on the vascular endothelium. Hence the present study was undertaken to combine both the antihypertensive foods and to find its effect on selected hypertensive. Twelve subsamples were selected based on inclusion criteria and divided equally into experimental 1 and 2 comprising of both sexes. Experimental group E1 were in the age group of 31 to 35 years with systolic blood pressure between 130-150 mmHg and the diastolic blood pressure between 95-106 mmHg and E2 in the age group of 51 to 55 years with systolic blood pressure between 145-160 mmHg and diastolic between 95-110 mmHg. The experimental groups were supplemented with a 50 g dark chocolate incorporated with oven dried radish leaves powder for a period of 10 days. The impact of supplementation was studied in terms of blood pressure and biochemical parameters. A mean reduction in systolic value was observed after supplementation from 140.2 mmHg to 128.3 mmHg with a mean difference of 11.9 mmHg in experimental group 1. And the diastolic values were reduced from 97.8 mmHg to 89.2 mmHg after supplementation. Both the systolic and diastolic was significant at  $p < 0.05$  level. Creatinine and urea level was not statistically significant in E 2 showing that there was no adverse effect due to dark chocolate incorporated with radish leaves powder supplementation. Hence utilization of wild GLV may enable to control hypertension which is rightly termed as a silent killer.

### **PHM-P-01**

#### **CAROTENOIDS: APPLICATION IN FOOD AND NUTRACEUTICAL INDUSTRY**

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Colour of a food substance is important to indicate its freshness and safety that are also indices of good aesthetic

and sensorial values. In the recent years, colouring of food with pigments produced from natural sources is of worldwide interest and is gaining importance. In last few decades, there has been an increasing trend towards replacement of synthetic colorants with natural pigments because of the strong consumer demand for more natural products. Naturally derived pigments are represented by carotenoids, flavonoids, and some tetrapyrroles. Carotenoids are a group of bioactive compounds and nearly 600 different carotenoids have been found in natural sources. These compounds are normal constituents in microorganisms, algae, and higher plants as well as a number of animal species. Among the pigment family, carotenoids gain special interest as they are the basic source of yellow, orange, and red plant pigments, which are widely distributed in nature and with some health properties such as pro-vitamin A, antioxidant, anticancer, antiobesity effect and anabolic effect on bone components. Currently, carotenoids are used commercially as feed additives, animal feed supplements, natural food colorants, nutrient supplement and, more recently, as nutraceuticals for cosmetic and pharmaceutical purposes. These compounds can be produced commercially by chemical synthesis, fermentation or isolation from the small number of abundant natural sources.

### **PHM-P-02**

#### **OVERVIEW OF THERAPEUTIC AND FUNCTIONAL PROPERTIES OF PUMPKIN: A REVIEW**

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Pumpkin is extensively grown in tropical and sub-tropical countries. They are traditionally consumed as freshly boiled and steamed or as processed food items such as soup and curry. Pumpkin is high in  $\beta$ -carotene, which gives it yellow or orange colour. Pumpkins are regarded as valuable vegetables primarily because of the high carotenoid content, and the low energetic value. It is also believed to protect against occurrence of cancer. It is also high in carbohydrates and minerals. Beta-carotene in plants that have a pleasant yellow-orange color is a major source of vitamin A. The yellow-orange characteristic colour of pumpkin is due to the presence of carotenoid. Carotenoids, which are natural pigments responsible for the yellow, orange and red colour of many foods, are intensely investigated mainly because of their health promoting effects. Consumption of foods containing carotene helps prevent skin diseases, eye disorders and cancer. Beta-carotene may help in reducing cell damage in the body and improve immune function. Pumpkin contains biologically active components that include polysaccharides, para-aminobenzoic acid, fixed oils, sterol, proteins and peptides. Its popular medicinal uses are antidiabetic, antihypertension, antitumor,

immunomodulation, antibacterial, anti hypercholesterolemia, intestinal anti parasitia and anti inflammation as reported by different researchers. The Pumpkin seed is an excellent source of protein and also has pharmacological activities such as anti-diabetic, antifungal, antibacterial, anti-inflammation activities and antioxidant effects. It has received considerable attention in recent years because of the nutritional and health protective values of the seeds. pumpkin seeds and its oil have been used as an anthelmintic agent that kills or aids in the expulsion of parasitic intestinal worms. It is also used for the treatment of bladder disorders (Suphakaran *et al.*, 1987) and also for vermifuge and diuretic seeds. Pumpkin having di-hydro-epi-androstenedione blocking actions which helps against ovarian and prostate cancer. The antimicrobial activity of pumpkin has many applications, including preservation, pharmaceuticals, alternative medicine and natural therapies.

### **PHM-P-03**

#### **CANAPE FOR LIFESTYLE DISORDER (OBESITY) A MODIFIED FOOD PRODUCT**

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Canapés are small thin piece of Bread or cracker usually spread with cheese, meat or and served as an appetizer. They are also served the purpose of binge eating. It is traditionally made of Refined all purpose flour or bread as the base and deep fried. Keeping this, the recipe has been modified in aspects to improve the fibre, fat and carbohydrate content. The traditional canapés which are made of refined wheat flour has been modified by using multi-grain flour, Instead of deep frying the canapés are baked, the filling was substituted with sprouted green gram pulse, onion, chickpeas, cucumbers, tomatoes which are fibre rich and giving it a taste of Indian chats. It has been served with green chutney made of corianders, mint along with cumin powder and lemon Juice to enhance the taste. As the modified food is rich in fibre they help in satiety level that in turn helps in weight loss and in binge on unhealthy snacks. When Obesity in control many others disorder like CVD, diabetes mellitus can be control. After designing the products, sensory evaluations was conducted panel by 30 panel members and 10 expert members to analysis and assess the shelf life of the products.

Keywords: Canapé, Multigrain Canapé, Obesity, CVD, Sprouts.

### **PHM-P-04**

#### **A MODIFIED FOOD PRODUCT- LITTLE HEARTS FOR DIABETES MELLITUS**

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Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Hyperglycemia is a condition in which there is an elevated blood glucose level. The modified food product –Little Hearts is flax seed and fenugreek seed based food product. This product also contains walnuts, fenugreek seeds which are rich in omega 3 fatty acid and also contains dink which is a functional food. A fenugreek seed also improves insulin sensitivity and hence has anti diabetic properties. Other ingredients used in this modified food product also have low glycemic index contains fiber, and antioxidants which show beneficial effects in diabetes. In sensory evaluation the attributes like taste, texture, mouth feel, color and appearance based on a five point scale was evaluated. Microbial analysis was carried out to see the shelf life.

Keywords: Little hearts, diabetes mellitus, hyperglycemia, flax seeds, fenugreek seeds, dink, walnut.

### **PHM-P-05**

#### **MUTIYAFOR DIABETES – A MODIFIED FOOD PRODUCT**

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A modified product Mutiya was developed for diabetic patients. Mutiya is a traditional Gujrati recipe made with bottle gourd, chana dal flour, wheat flour, rawa, sugar. The modified recipe is made with keeping main ingredients intact i.e bottle gourd, substituting chana dal flour and wheat flour with broken wheat (Dalia).Research have shown Bottle gourd reduces thirst, also its rich in fiber which helps in slow release of glucose in blood which is a beneficial property for diabetics. Flaxseeds have beneficiary effect to improve serum triglycerides, cholesterol levels and Alchemoglobinlevels. Soaked Fenugreek seeds have shown anti diabetic properties by increasing insulin sensitivity in hyperglycemic states and helps in weight loss with good fiber content. Broken wheat is rich in fiber helping diabetics, reduce hyperglycemia. Sesame seeds have anti glycemic effect and also reduce B.P.A sensory evaluation was conducted on live samples as well as panel members. Thus this product was developed.

**PHM-P-06**

**BLOOD BIOCHEMICAL PROFILE OF LARGE WHITE YORKSHIRE PIGS FED DIETS INCORPORATED WITH DRIED TUNA WASTE SILAGE**

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An investigation was carried out for a period of 104 days on thirty six weaned Large White Yorkshire piglets to find out the effect of dietary incorporation of dried tuna waste silage on blood biochemical parameters. Dried tuna waste silage was used to replace dried fish on protein basis at 0, 50 and 100 per cent, in iso-caloric and iso-nitrogenous grower and finisher rations as dietary treatments T1, T2 and T3, respectively. All the animals were maintained on their respective dietary regimen from weaning to an average slaughter weight of 70 kg. Blood samples were collected at the beginning and end of the experiment and analysed for different blood parameters. Plasma mineral concentration of Ca, P, Mg, Mn and Zn were similar while the plasma Cu concentration of pigs maintained under rations T2 and T3 were significantly lower ( $P<0.05$ ) than that of T1. Total protein and blood urea nitrogen of pigs maintained under the three dietary treatments were similar.

**PHM-P-07**

**MINERAL AVAILABILITY OF LARGE WHITE YORKSHIRE PIGS FED DIETS INCORPORATED WITH DRIED TUNA WASTE SILAGE**

**Anuraj K.S<sup>1</sup> and Shyama K<sup>2</sup>**

<sup>1</sup>Animal Nutrition Division, Indian Veterinary Research Institute, Uttar Pradesh, <sup>2</sup>College of Veterinary & Animal Sciences, Mannuthy

A feeding experiment was carried out for a period of 104 days on thirty six weaned Large White Yorkshire piglets to find out the effect of dietary incorporation of dried tuna waste silage on mineral availability. Dried tuna waste silage was used to replace dried fish on protein basis at 0, 50 and 100 per cent, in iso-caloric and iso-nitrogenic grower and finisher rations as dietary treatments T1, T2 and T3, respectively. All the animals were maintained on their respective dietary regimen from weaning to an average slaughter weight of 70 kg. A digestibility trial was conducted at the end of the experiment to determine the digestibility of nutrients and percentage availability of minerals of the experimental rations by total collection method. There was no significant difference in availability of phosphorus, magnesium, and copper where as availability of calcium, manganese and zinc was lower in T2 and T3. But it did not have any adverse effect on the growth of the animals.

**PHM-P-08**

**CANDIDIASIS: CAUSES, DIETARY FACTORS AND CURATIVE MEASURES**

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*Candida albicans* is opportunistic yeast that usually exists harmlessly as a part of our gut flora. The combination of a stressful lifestyle, poor diet and pharmaceutical drugs causes *C.albicans* to become pathogenic and outgrow the normal microflora in the gut. This condition is called Candidiasis. A stressful lifestyle can lower immunity and therefore lead to a decrease in beneficial gut flora. A sugar and starch loaded diet provides fuel for *C.albicans* to thrive and multiply. Antibiotics and other drugs like the birth control pill eliminate beneficial flora creating the ideal environment to allow harmful pathogens to overgrow. *C.albicans* is capable of forming a biofilm that prevents the immune system from attacking it. This makes it challenging to attack the yeast as most anti-fungal agents cannot get through the Extracellular Polymeric Substances (EPS) associated with biofilm. Therefore it is important to understand the events leading to the formation of the biofilm & in turn understand the biofilm architecture. Alternative measures to control biofilm need to be developed which can include use of natural antimicrobial agents. Most of the household spices, herbs and condiments used in India possess antimicrobial properties. Some of the commonly used plant materials with antimicrobial activity are: Garlic, Neem, Turmeric, Tulsi, Mint, Clove, Mustard, Cumin, Cinnamon, Pepper etc.

Keywords: *Candida albicans*, Candidiasis, Biofilm, Extracellular Polymeric Substances, antimicrobial agents.

**TECHNICAL SESSION – IV**

**FOOD ENGINEERING AND BIOTECHNOLOGY**  
**(FEB)**

**FEB-O-01**

**THERMAL INACTIVATION OF *SALMONELLA*  
TYPHIMURIUM ON DRESSED CHICKEN SKIN  
SURFACE USING ACIDIFIED SODIUM CHLORITE**

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*Salmonella* Typhimurium (ST), a pathogen of great public health concern. Foodborne salmonellosis is most often associated with consumption of undercooked poultry meat and eggs. Globally, most of the countries prefer to use chicken with intact skin which acts as the most crucial factor for microbial safety due to attachment of bacterial pathogens like *Salmonella*, which may lead to cross-contamination of pathogens during handling, poultry processing, and transportation. This emphasizes the need to decontaminate the poultry carcass from ST with some techniques preserving the organoleptic quality of the meat. This present study was carried out to assess the efficacy of acidified sodium chlorite (ASC) followed by thermal treatment as a sequential hurdle approach for decontamination of *S. Typhimurium*. Data obtained in these experiments were used to calculate D-values of ST on dressed chicken skin surface. Primary modeling of data revealed that D-values of ST on dressed chicken skin without antimicrobials were 6.17, 3.30, 1.32min at 56, 60, 64°C, respectively. Pre-dipping in 100, 200 and 300ppm ASC resulted in decreased D-values as 4.14, 3.45 and 1.92min, 1.98, 1.62 and 0.83 min, 0.89, 0.57 and 0.34 min at 56, 60, 64°C, respectively. Results obtained in this study suggested that ASC can be used for pre-dipping of chicken carcasses to enhance the effect of thermal inactivation of ST as an active antimicrobial.

**FEB-O-02**

**INFLUENCE OF DRINKING STRUCTURED WATER  
ON CARCASS CHARACTERISTICS OF  
COMMERCIAL BROILER CHICKEN**

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Water from open and bore well are commonly used in majority of the poultry farms in India. When the drinking water is passed through specially designed apparatus in which tuned geometry creates an energy environment for the water to structure itself, it gives the water a lower surface tension and better hydrating properties. This geometric technology breaks up large low energy water molecule

clusters into smaller high energy clusters and results in high solubility of minerals and vitamins. In order to study the influence of structured water on the production performance and carcass characteristics of commercial broiler chicken, an experiment was conducted using 216 numbers of Vencobb broiler chicks up to 42 days of age. The birds were assigned to two groups comprising of nine replicates per group with 12 birds per replicate. The control group (n=108) was offered tap water whereas the treatment group was offered structured water for drinking purpose. At the end of the experimental period of 42 days, a total of 48 birds at the rate of 24 birds from each group (@ two birds from each replicate) were slaughtered to study the carcass quality and the weights of vital organs. The weights of skin plus feather, blood, liver, gizzard, thymus, bursa, feet and head (expressed as percent body weight) did not vary significantly between the two groups. The heart ( $10.12^b \pm 0.34$  Vs  $9.16^a \pm 0.20$ ) and spleen weights ( $2.73^b \pm 0.012$  Vs  $1.817^a \pm 0.005$ ) were significantly ( $P < 0.05$ ) high and abdominal fat content was low ( $1.021^a \pm 0.055$  Vs  $1.204^b \pm 0.061$ ) in structured water group as compared to tap water offered group. Though statistically not significant, the intestinal length (cm per kg body weight) was relatively more ( $101.66 \pm 1.587$  Vs  $96.42 \pm 1.879$ ) and litter moisture content (%) was less ( $10.92 \pm 0.96$  Vs  $11.51 \pm 0.94$ ) in structured water group. From this study, it can be inferred that structured water offered to commercial broiler chicken for drinking purpose results in reduced deposition fat in the body.

**FEB-O-03**

**EFFECT OF *PLEUROTUS OSTREATUS* ON 7,  
12- DIMETHYLBENZ (A) ANTHRACENE  
INDUCED MAMMARY CARCINOMA IN  
SPRAGUE DAWLEY RATS BY MODULATING  
XENOBIOTIC METABOLIZING ENZYMES  
AND HORMONAL STATUS**

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Neoplastic growth of the breast is the most common malignancy in women worldwide and its incidence has increased in most countries. Recently, researchers have shown considerable interest to identify the specific foods that may have anticancer properties. Mushrooms are an important natural source represents a major and untrapped potent pharmaceutical product. *Pleurotus ostreatus* (*P. ostreatus*) is an edible mushroom rich in bioactive compounds used for various ailments than other edible mushrooms. In this study, we have evaluated the efficacy of *P. ostreatus* on 7, 12-dimethylbenza (a) anthracene (DMBA) induced mammary carcinogenesis using a rat model. DMBA was induced by single subcutaneous injection at a dosage of 25 mg in 1mL vehicle. The ethanolic extract of *P. ostreatus* (POEet) was administered orally at a concentration of 600mg/kg bwt as pre and post-initiation stage of treatment throughout the experimental period. At the end of 16 weeks, our results showed the elevated phase I and depleted phase II

metabolizing enzymes, over expression of (ER/PR) and increased COX-2 expression in DMBA-induced *Sprague dawley* rats, which were significantly reversed on *P. ostreatus* administration. Moreover, pre-treatment with *P. ostreatus* showed improved response when compared to that of post treatment. Based on scientific appraisal, we conclude that the dietary consumption of *P. ostreatus* inhibit mammary cancer and improving human health if used as a regular basis.

Keywords: Mammary cancer; *Pleurotus ostreatus*; Phase I and Phase II detoxification enzymes; ER/PR status; COX-2.

### **FEB-O-04**

#### **CALIBRATIONS BETWEEN AN ENZYME SUBSTRATE TIME TEMPERATURE INTEGRATOR (TTI) RESPONSE AND FROZEN BUFFALO MEAT QUALITY**

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The aim of the study was to develop an enzyme substrate TTI and to compare the TTI response with frozen buffalo meat quality. TTI based on  $\alpha$ -amylase and iodine-starch complex was standardized and given convenient shape for easy use. Buffalo meat samples were packed and frozen stored (-18±1°C) with TTI attached. A simulated temperature abuse model was developed for two higher temperatures namely T1 and T2 and the meat samples were abused for predetermined durations. TTI holds the original bluish black color for 6 h, turns to brown at 12 h and to yellow at 18 h at T1 and Similarly at T2, no color change was observed in TTI for 4h, a brown color was observed at 8 h and yellow color at 12 h. A colour chart was developed to calibrate TTI response with buffalo meat quality. To check the accuracy of TTI, a frozen buffalo meat containing TTI was thawed at 4±1°C, and no colour change was observed. TTI color changing response was found to be corroborated well with change in meat quality parameters like pH, TVBN, FAA, FDA hydrolysis, ERV, D-glucose, instrumental color scores, WBSF and microbial counts such as total plate count, yeast-mold count, psychrophilic count and pseudomonas count and sensory attributes. The investigation shows that the response of this TTI is well correlated with buffalo meat quality and can be used in supply chain to monitor meat safety.

### **FEB-O-05**

#### **DIETETIC FROZEN PROBIOTIC YOGHURT - PREPARATION AND ITS EVALUATION**

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Frozen bifido yoghurt is a novel way of combining the characteristics of ice cream with the therapeutic property of yoghurt. Frozen yoghurt is considered as a healthy alternative to ice cream for the people suffering from obesity, cardiovascular diseases and lactose intolerance. Different types of frozen yoghurt mixes were prepared by incorporating a probiotic bacteria - *Bifidobacterium bifidum* (NCDC-232) obtained from NDRI, Karnal and freeze dried traditional DVS yoghurt cultures (*Lactobacillus delbrueckii* ssp. *bulgaricus* and *Streptococcus salivarius* ssp. *thermophilus*) obtained from *Chr. Hansen*, Denmark at one and two percent levels respectively with artificial sweeteners. The product was evaluated for physicochemical properties, organoleptic characteristics and survivability of yoghurt cultures and *Bifidobacterium bifidum* during storage period. There was no significant difference in physicochemical properties between different yoghurt mixes even with varying levels of substitution of sweeteners. When the level of substitution of sucralose increased, pH and titratable acidity of frozen yoghurt also increased. There was a highly significant (P < 0.01) difference in sweetness, flavor, overall acceptability scores and no significant (P>0.05) difference in appearance and sourness scores between different frozen yoghurt mixes. The count of both yoghurt bacteria and *Bifidobacterium bifidum* did not differ significantly between different frozen yoghurt mixes. The frozen probiotic yoghurt mix with 50% sucralose seems to be the ideal for dietetic frozen probiotic yoghurt preparation, owing to its lower calorific value, low cost of production and acceptable quality.

Keywords: Dietetic frozen yoghurt –probiotic – sucralose – evaluation

### **FEB-O-06**

#### **ISOLATION AND IDENTIFICATION OF ENTEROBACTER SAKAZAKII FROM FOOD AND ENVIRONMENTAL SAMPLES AND THEIR VIRULENCE**

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*Enterobacter sakazakii* (formerly known as *Cronobacter sakazakii* is opportunistic pathogen that can cause necrotizing enterocolitis, bacteremia and meningitis, predominantly in neonates. It constitutes a potential health hazard particularly for the neonates and is now attracting considerable attention because of its varied clinical manifestations. The present project was an attempt (1) to isolate *E. sakazakii* from different food and environmental sources (2) to detect the presence of this potential pathogen in wide range of selected samples. Accordingly, for the purpose of isolation, 93 samples in all, 37 from dairy and 56 from environmental sources were taken. Out of these 45 isolates (14 from dairy and 31 from other samples) were selected on the basis of growth on tryptic soy agar. All these samples were further screened on the basis of gram's staining, catalase and oxidase test and 27 isolates were

observed to be positive. The positive isolates were further confirmed by molecular identification with PCR using species specific primers by optimizing reaction conditions. Eleven isolates were confirmed as *E. sakazakii*. Confirmed isolates were further tested for virulent characteristics such as hemolysis activity, haemagglutination and DNase production and all the isolates showed positive reactions for these tests.

### **FEB-O-07**

#### **EFFECT OF INCORPORATION OF STABILIZERS ON THE GROWTH BEHAVIOUR OF LACTIC ACID BACTERIA IN YOGHURT**

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Yoghurt is a fermented dairy product which is widely consumed. Attempts have been made to incorporate stabilizers (pectin and gums) to the yoghurt to improve its texture and taste of yoghurt and to study the lactic acid bacterial growth. The sensory, textural and microbiological studies have been carried out. The sensory analysis studies indicated that the pectin added at 0.5% level was found to enhance the appearance and colour, body & texture, flavour, overall acceptability compared to the control. The growth curve analysis showed that the growth of lactic acid bacteria in the experimental samples was  $35 \times 10^{13}$  which is higher compared to control sample in which the growth is  $24 \times 10^{13}$  after 5 hours of storage. To conclude, the stabilizers added during yoghurt preparation not only add to the texture of the product as well increase the growth of lactic acid bacteria.

### **FEB-O-08**

#### **ENZYMATIC LIQUEFACTION OF SAPOTA PULP USING COMMERCIAL PECTINASE ENYMES**

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Fruit juices are generally cloudy due to the presence of a wide range of colloidal, dissolved natural polysaccharides and other small particles like protein fragments or polyphenols. These kinds of pulp/juices are not very attractive and difficult to concentrate. These cloudy substances can be dissolved using pectinase enzymes to get clear and sparkling type of juices. Standardization of best enzyme formulation and optimum concentration for liquefaction of sapota pulp was carried out using 2 Pectinase based enzyme formulations-Pectinex 3XL and Pectinex Ultra of Novo enzymes South Asia pvt. Ltd., at varying concentrations of 0 to 1.0%. The results revealed that enzymatic liquefaction of sapota pulp by the addition of pectolytic enzymes significantly influenced juice yield, pomace yield, clarity of juice, PH, acidity, TSS and

viscosity. Maximum juice yield was recorded in enzyme formulation Pectinex Ultra at maximum concentration tried (0.1% enzyme - 62.25% juice yield) followed by 0.08 % enzyme with 61.25% juice yield and lowest was in untreated pulp/juice (40.00%). Also enzymatically liquefied juice recorded higher TSS, sugars and lower viscosity. Among the enzyme formulations, Maximum TSS was recorded in Enzyme Pectinex Ultra (21.56°B) and among the concentrations, 1.0% that is the highest concentration tried was more effective. Due to interaction effects, Maximum TSS was recorded at highest concentration of 1.0%, in both the enzymes, enzyme Pectinex 3XL and Pectinex Ultra (22.12° B), Followed by 0.8% concentration (21.52° B) and lowest TSS was recorded in untreated samples (19.50° B). The viscosity of the unliquefied juice (control) was 2.94 cps and it was reduced to least (1.24 cps) at the highest concentration (1.0%) of enzymes. Due to the interaction effects, least viscosity was observed in Enzyme Pectinex Ultra at 1.0% (1.20 cps). It is Evident from the present studies that cloudiness of the juices can be completely eliminated by enzymatic liquefaction.

Key words: Fruit Pulp, Liquefaction, Pectinase enzymes, pulp yield, TSS, viscosity.

### **FEB-P-01**

#### **UREA FEEDING IN RUMINANTS**

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Urea is widely used in fertilizers. It is also used as a component of animal feed in ruminants, providing a relatively cheap source of nitrogen to promote growth. It is a non-protein nitrogenous compound with 46% nitrogen. Deficient in all minerals and has no energy. When urea is consumed by ruminants, the urease enzyme from the rumen microbes hydrolyzes it to carbon dioxide and ammonia. Microbial fermentation of carbohydrates yields volatile fatty acids and keto acids. Rumen microbes use ammonia and keto acids to synthesize amino acids which are linked through peptide bonds and thus proteins are synthesized. Addition of sulphur to urea supplemented diets to make the N:S ratio as 10:1 improves urea utilization. The rumen bacteria must have a readily available energy source synchronizing the release of ammonia for urea hydrolysis. Low levels of urea are better. Rumen microbes become adapted to dietary urea for a period of 2-4 weeks. Urea if fed in larger amounts, results in toxicity mainly due to rapid formation of excess ammonia. The common treatment is drenching with cold water which inhibits ureolytic activity in rumen. Another approach is drenching of 10% acetic acid to neutralize the releasing ammonia.

### **FEB-P-02**

#### **DEVELOPMENT OF PEARL MILLET (*PENNISETUM GLAUCUM*) BASED PROBIOTIC BEVERAGE BY FERMENTATION WITH *SACCHAROMYCES BOULARDII* AND *LACTOBACILLUS ACIDOPHILUS***

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The study was carried out for the survivability of probiotic yeast and lactic acid bacteria and chemical properties of pearl millet malt slurry. The pearl millet malt slurry was inoculated with *Saccharomyces boulardii* and *Lactobacillus acidophilus* at 5% containing 10<sup>6</sup> cells/ml and kept fermentation for 48 hours at 27<sup>0</sup>—28<sup>0</sup>C. After 48 hours of fermentation the highest reduction of pH (3.80) was observed by the fermentation with *S. boulardii* followed by combined inoculation of *S. boulardii* and *L. acidophilus* (4.10). Lowest TSS was recorded in *S. boulardii* (10.3<sup>0</sup> brix) fermentation followed by combined fermentation of *S. boulardii* and *Lactobacillus acidophilus* (10.5<sup>0</sup> brix) where as the highest titrable acidity (2.24%) was recorded in the fermentation with *S. boulardii* followed by combined inoculation *S. boulardii* and *L. acidophilus* (2.19%). Highest microbial population was recorded fermentation with *L. acidophilus* (7.91×10<sup>8</sup> cfu/ml) and in combined inoculation the results indicated that high population of *L. acidophilus* (3.67×10<sup>8</sup> cfu/ml) was observed compared to *S. boulardii* population (2.30×10<sup>5</sup> cfu/ml). The pearl millet malt slurry fermented by *L. acidophilus* showed highest score (8.5/9.0) with respect to overall acceptability. After 30 days of storage at 4<sup>0</sup>c microbial population was slightly decreased and chemical properties was slightly changed.

### **FEB-P-03**

#### **NUTRITIONAL IMPROVEMENT AND PHYTIC ACID REDUCTION IN PEARL MILLET (*PENNISETUM GLAUCUM*) THROUGH SOLID STATE FERMENTATION BY PROBIOTIC YEAST AND LACTIC ACID BACTERIA**

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The study was carried out for nutritional improvement of pearl millets through solid state fermentation. The germinated pearl millets was inoculated with *Saccharomyces boulardii* and *Lactobacillus acidophilus* at 5% containing 10<sup>6</sup> cells/ml and kept for fermentation for 5 days at 27<sup>0</sup>-28<sup>0</sup>C. After 5 days of fermentation nutritional content was analyzed. The results indicated that the

fermentation of pearl millet by combined inoculation with *S. boulardii* and *L. acidophilus* was increased protein content (14.77%) followed by single inoculation with *S. boulardii* (13.23%) over uninoculation treatment (control) (12.52%). Fat, fibre and carbohydrates content was decreased from 5.18 to 3.53, 1.31 to 1.12 and 80.07 to 78.24 per cent respectively in combined inoculation with *S. boulardii* and *L. acidophilus*, ash content was also decreased from 2.61 to 2.34 per cent in single inoculation with *S. boulardii*. Pearl millet fermented by *L. acidophilus* was showed increased in mineral contents like calcium (44.44 mg/100g), magnesium (153.42 mg/100g), phosphorous (298.43 mg/100g), iron (9.14 mg/100g) and zinc (3.97 mg/100g) over uninoculated treatment (control). Germinated pearl millet grains was showed highest phytic acid content (436.21mg/100g) when fermentation of pearl millet by *L. acidophilus* was showed decreases in phytic acid content to 299.74mg/100g.

### **FEB-P-04**

#### **PRODUCTION OF PROBIOTIC TOMATO (*SOLANUM LYCOPERSICUM*) BEVERAGE USING PROBIOTIC YEAST AND LAB FERMENTATION**

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This study was aimed to evaluate the chemical as well as biological properties of probiotic tomato juice fermented by Yeasts and Lactic acid bacteria. There is a genuine interest in the development of probiotic tomato juice based beverages because they are a good-vehicle to deliver probiotic microorganisms to consumers. Tomato juice fermented by *Saccharomyces boulardii* showed highest pH reduction from 4.46 to 3.06 followed by Tomato juice fermented by *L. acidophilus* from 4.45 to 3.56. Total Soluble Solids was recorded the lowest in *S. boulardii* fermentation (8.7<sup>0</sup> brix) followed by *L. acidophilus* fermentation (12.6<sup>0</sup> brix) where as the lowest titrable acidity (0.23%) was obtained in tomato juice (control) and the highest titrable acidity (0.78%) was recorded in tomato juice fermented by *S. boulardii* followed by *L. plantarum* (0.70%). Highest microbial population was recorded fermentation with *L. plantarum* (8.12 X 10<sup>9</sup> cfu/ml) followed by a combination fermentation with *L. acidophilus* and *L. plantarum* (7.58 x10<sup>9</sup> cfu/ml). Finally *L. plantarum* and combination of *L. acidophilus* and *L. plantarum* were recorded maximum score (8.5 /9.0) with respect to overall acceptability.

**FEB-P-05**

**POLYMICROBIAL BIOFILM: FORMATION AND CONTROL STRATEGIES**

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Microorganisms have the ability to aggregate and grow into microcolonies on solid surfaces in contact with a liquid thus forming biofilms. Microbial biofilms consists of assemblage of multilayered cells embedded in a self-produced EPS that plays an important role in the attachment and colonization of microorganisms. Biofilms consists predominantly of multi species housing more than one type of organism where intercellular interactions and communication are key to survival. Growth of biofilms in food processing environments leads to increased opportunity for microbial contamination of the processed product. This increases the risk of reduced shelf life and disease transmission. Polymicrobial biofilm represent an understudied and clinically relevant health problem, with the potential to serve as an infectious reservoir for a variety of microorganisms, including bacteria and fungi. Foodborne pathogens and spoilage organisms can attach to and produce biofilms on many food contact and environmental surfaces under suitable conditions. Biofilms virtually hide the organism within EPS protecting them from the harsh external environment. Biofilm formation also helps the organism to maintain virulence by acting as a barrier to antimycotic agents thereby conferring resistance to them. Some of the methods currently used to control biofilm formation include mechanical and manual cleaning, chemical cleaning and sanitation, and application of hot water. However organisms within the biofilms are protected from these treatment methods because the Extracellular Polymeric Substances (EPS) associated with biofilm are not removed by cleaning and sanitation. Biofilm control strategy is not only limited to the implementation of effective cleaning and sanitizing procedures but also on the study of the interactions between organisms and the surfaces in a specific food processing environment. Therefore understanding the factors contributing to biofilm formation, determining the multiple species present and their relative contributions to biofilms will be vital for their control. This understanding will help to develop strategies to prevent or significantly reduce biofilm infections

Key Words: Microbial Biofilm, Polymicrobial Biofilm, Foodborne pathogens, EPS, Biofilm control.

**FEB-P-06**

**CONTROL OF *CANDIDA ALBICANS* BIOFILM USING NATURAL ANTIMICROBIAL AGENTS WHICH ARE DIETARY MATERIALS**

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*Candida* species are polymorphic fungi that develop antimicrobial resistant biofilm. It colonizes on a wide variety of implanted medical devices and biomaterials to form biofilm. These biofilms consists of mono or multilayered cells embedded in self-produced extracellular polymeric matrix, being difficult to eradicate by host immune defenses and antibiotic therapy. There are four distinct community structure types like 'domed', 'layer cake', 'flat', and 'mycelial'. *Candida* biofilm populations may respond to metal ions to form cell-cell and solid –surface attached assemblages with distinct patterns of cellular differentiation. Plant derived products have been used for medicinal purposes for centuries. In traditional Indian medicine or ayurveda, herbs have been used as medicine. Traditional uses of plants have led to investigating their bioactive compounds, which have resulted in the detection of a significant number of therapeutic properties. The dietary materials are used to inhibit the biofilm produced by *candida* species.

Keywords: Antimicrobial, *Candida* species.