IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 10, Issue 3 Ver. I (Mar. 2016), PP 27-40
www.iosrjournals.org

Development of Biscuit Incorporated With Defatted Soya Flour and Carrot Pomace Powder

Sindhu, Hruyia.L, Shweta Saloni, Harshavardhan.K, Mounika.B, Kalyani.D, Pavankumar.N.S, Narayana.M.V.

M.Tech(2nd year), Food Technology & Management, NIFTEM, Sonipat, Haryana.
Under the Guidance of: Ms. B.Sunitha(Teaching associate)
College Of Food Science and Technology (Acharya N.G. RangaAgriculturalUniversity),Bapatla – 522101 (A.P)2012-2013.

Abstract : *The purpose of this paper is to develop biscuit incorporated with defatted soya flour and carrot pomace powder to enhance the nutritional value of it and also helps by-product utilization.The proportion of refined wheat flour and defatted soya flour were 95:5, 89:8, 83:11, 77:14, 71:17 and with these flour blends, the level of carrot pomace powder (CPP) used for making biscuit samples were 0, 3,6,9,12% respectively.The biscuits were evaluated for its quality on the basis of proximate analysis and sensory test.On the basis of analysis moisture content,fibre content and β-carotene level increased with increasing the amount of carrot pomace powder from 3 to 12% respectively in flour blends. Similarly the protein content increased linearly with the increase in the content of defatted soya flour in biscuits.*

I. 1.Introduction

In the present era the consumers are becoming very conscious about the food they take and about its final impact on the health of an individual. Keeping in view the needs of present day consumer there is a great advancement in the field of food processing sector to meet the needs of consumer. The use of healthy ingredients in the food can lead to its success in the nutraceutical world where the component has two function i.e. as a food commodity and also act as medicine.

Biscuit is an unleavened crisp, sweet pastry made from wheat flour, shortening (hydrogenated fat) & sugar, and is usually made light by the addition of baking powder (a mixture of sodium carbonate, sodium bi-phosphate & cereal flour) (Saghir Ahmad et al, 2014).It is a product that is usually consumed by the people of all sections due to its convenient size and reasonable price; so if it can be made nutritionally good by the use of functional ingredients and will provide nutrients that is good for health.The use of carrot pomace powder as an ingredient in the biscuit manufacturing not only increases its nutritional value but also helps in by-product utilization.

Soyabean falls into Leguminosae family and is the best source of vegetarian protein that can be consumed by every sections of the society. The world soybean production is currently 219.8 million metric tons out of which India produced 9.3 million metric tons constituting about 4% of the total world production. Out of this production, less than 10% is directly used for human consumption (Gandhi, 2006). Defatted soya flour is made entirely from defatted soy meal and is currently used worldwide by commercial processors.

The carrot (Daucuscarota) is a root vegetable, usually orange, purple, red, white or yellow in color, with a crisp texture when fresh. It is a rich source of β-carotene and contains other vitamins, like thiamine, riboflavin, vitamin B-complex and minerals. Kaur et al. (2009) reported the consumption of carrot mainly as raw, juice, salads, cooked vegetable, sweet dishes etc. Fruit and vegetable juices have become important in recent years due to overall increase in natural juice consumption as an alternative to the traditional caffeine containing beverages such as coffee, tea, or carbonated soft drinks.

Carrot pomace is a by-product obtained during carrot juice processing. It has good residual amount of all the vitamins, minerals and dietary fibre. The use of carrot pomace powder as an ingredient in the biscuit manufacturing not only increases its nutritional value but also helps in by-product utilization.

II. Materials And Methodology

It includes the details of materials used, methodology of product development and the methods employed for microbial, organoleptic, proximate and physical analysis of the formulated product. Five flour blends, prepared with refined wheat flour and defatted soy flour (DSF) were 95:5, 89:8, 83:11, 77:14, 71:17 and the level of carrot pomace powder (CPP) used for making biscuit samples were 0, 3,6,9,12.

2.1 RAW MATERIALS REQUIRED

2.1.1 Refined wheat flour

Flour should have protein content of 7-9% which is of high extensibility and low elasticity which are very much essential for good baking potential. Dough pieces should retain their shape and size after being stamped out.

2.1.2 Defatted soya flour

It improves water holding capacity and have only 1% oil content and is rich in high-quality protein and other nutrients, defatted soy flour also adds a pleasant texture and flavour to a variety of products.

2.1.3 Carrot pomace powder

Preparation of carrot pomace powder:-

Carrots were washed in running tap water two times to remove extraneous material. Trashes wereremoved with a plane stainless steel knife and trimming was also done. A juice mixer grinder cum food processor was used to extract carrot juice. A hot air ovenwas used for drying carrot pomace, which could regulate drying air temperature upto 250°C with ± 2°C accuracy.

The dryer consisted of a preheating and heating chamber withthermostat based control unit, an electrical fan, and measurementsensors. The samples were spread over the trays and the temperature of the dryer was set at 60°C for 6-8 hours. The grinding was performed using the same food processor with grinder attachment. The material was ground to pass through the sieve of 2 mm size. The pomace was stored in sealed polythene bag for further use.It is a source of dietary fibre and also has β carotene and in the range of 9.87 to 11.57 mg per 100 g respectively.it contains about 88 ± 2%of moisture.

2.1.4 Sugar

it is mainly used as a sweetener. It helps in the development of flavour and taste and it also has a capability to retain the moisture(acts as a humectant) and improves the shelf life.

2.1.5 Shortening

In bakery foods, fat provides energy, flavour, act as tenderizer and aid in the development of texture of baked foods.

2.1.6 Milk powder

It also adds sweetness to the product .it improves the smoothness and texture of the biscuits.

2.1.7 Sodium chloride

It is mainly used for flavour enhancement.

2.1.8 vanilla essence

2.2 Procurement of raw materials

All the raw materials except defatted soya flour were procured from the local market of Bapatla and the defatted soya flour was procured from Bihar.

2.3 Equipments required

- Hot air oven
- Sieves
- Grinders
- Weighing machine
- Creaming machine
- Baking plates
- Baking oven

2.4 Product development

2.4.1 Preparation of control

The following formulation was used for the preparation of control biscuits:

Table 2.1 Ingredients used in control biscuit:-

Ingredients	**Quantity**
Refined wheat flour	100gm
Sugar	40gm
Shortening	20gm
Milk powder	10 gm
Vanilla essence	0.5 ml
Salt	1 gm

Procedure:-

Preheat the oven for 10 minutes at 150°C.Then the shortening and sugar powder is creamed until light and fluffy.The weighed quantity of refined wheat flour, and baking powder is sieved and then is mixed properly with above mix with two drops of vanilla essence.

After that milk powder, sodium bicarbonate and salt is added to it. It is mixed well with water to a proper consistency like soft dough.Then a spoon full of dough is poured on a greased tray. It is then baked in an electric oven at 150°C for 30 minutes. The baked biscuits were cooled for about 30 minutes, packed into LDPE bags.

2.4.2 Preparation Of Biscuits Incorporated With Defatted Soya Flour And Carrot Pomace Powder:-

The following formulations were used for the preparation of defatted soya flour and carrot pomace powder incorporated biscuits:

Table 2.2 Ingredients used in defatted soya flour and carrot pomace powder incorporated biscuits:-

Ingredients	Quantity				
	Sample A	Sample B	Sample C	Sample D	Sample E
Refined wheat flour	95 gm	89 gm	83 gm	77 gm	71 gm
Defatted soya flour	5 gm	8 gm	11 gm	14 gm	17 gm
Carrot pomace powder	-	3 gm	6 gm	9 gm	12 gm
Sugar	40 gm	40 gm	40 gm	40 gm	40 gm
Shortening	20 gm	20 gm	20 gm	20 gm	20 gm
Milk powder	10 gm	10 gm	10 gm	10 gm	10 gm
Salt	1 gm	1 gm	1 gm	1 gm	1 gm
Vanilla essence	0.5 ml	0.5 ml	0.5 ml	0.5 ml	0.5 ml

Procedure:-

Preheat oven for 15 minutes at 150° C.The shortening and sugar powder is creamed until light and fluffy.The weighed quantity of refined wheat flour, defatted soya flour,carrotpomace powder and baking powder is sieved and is then mixed properly with above mix with two drops of vanilla essence. Then milk powder, sodium bicarbonate and salt is added to it. It is mixed well with to a proper consistency like a soft dough. Then a spoon full of dough is poured on a greased tray. It is then baked in an electric oven at 150°C for 30 minutes. The baked biscuits were cooled for about 30 minutes, packed into LDPE bags.

Samples PREPARED USING DIFFERENT FORMULATIONS

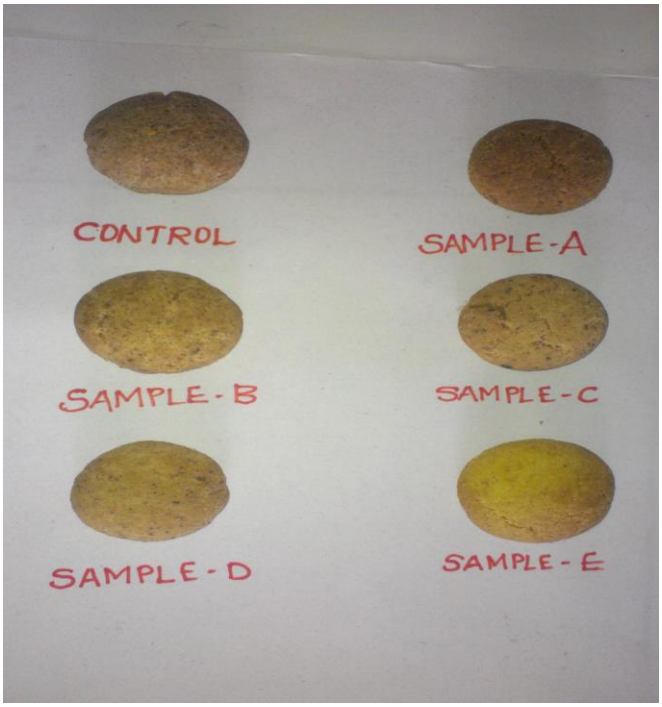

Table 2.3 :- Biscuits prepared using different formulations

SAMPLES	REFINED WHEAT FLOUR(gm)	DSF(gm)	CPP(gm)
Control	100	-	-
Sample A	95	5	-
Sample B	89	8	3
Sample C	83	11	6
Sample D	77	14	9
Sample E	71	17	12

2.5 Evaluation Of Defatted Soya Flour And Carrot Pomace Powder Incorporated Biscuits

The control biscuit and defatted soya flour and carrot pomace powder incorporated biscuit were evaluated for the following parameters:

1. Microbial analysis 2. Sensory evaluation 3.Proximate analysis 4. Physical analysis

2.5.1 Microbial Analysis

Bacterial Limit Test

Principle: The bacteria present in the sample will utilize the nutrient agar medium and multiply to form colonies (CFU) with different shape, size, and color from the individual colonies can be isolated.

Materials Required:

Nutrient agar medium
Peptone water
Test tubes
Pipettes
Distilled water

Technique Adopted: Pour plate technique
Incubation Temperature: 37˚C
Incubation Period: 48 hours
pH adjustment: The pH of the sample is adjusted to 7 (neutral pH) by using 1N NaOH or 1N HCl as required.

Procedure:

1. Preparation of sample: Prepare peptone water diluent and take 10 ml to that add 1ml of sample.
2. 1ml of sample prepared is poured into four sterile petri plates.
3. Then the molten agar nutrient agar was poured in to the plates rotated gently to ensure uniform distribution of cells in the medium.
4. Then the medium was allowed to solidified.
5. After solidification the plates were incubated for 48hours at 37˚C in an inverted position.

Calculation:

Number of colonies(CFU/g), N = A x D
Where, N = number of colonies (CFU/g)
A = average count of colonies in petri plates
D = Dilution Factor (D=10 as 1:10 dilution of sample was taken)

Fungal Limit Test

Principle: The fungi present in the sample will utilize the Sabourand Dextrose Agar Medium and multiply .

Materials Required:

- Sabourand Dextrose Agar Medium
- Peptone water
- Test tubes
- Pipettes
- Distilled water

Technique Adopted: Spread plate technique
Incubation Temperature: 22-25˚C
Incubation Period:upto 5 days
pH adjustment: The pH of the sample is adjusted to 7 (neutral pH) by using 1N NaOH or 1N HCl as required.

Procedure:

1. Preparation of sample: Prepare peptone water diluent and take 10 ml to that add 1ml of sample.
2. Pour SBA medium into four petri plates and then let it to solidify.
3. After complete solidification add 1 ml of sample to the petri plate and spread with the help of spreader.

4. Then the plates were incubated at 22-25˚C for 3-5 days.

Calculation:
Number of colonies(CFU/g), N = A x D
Where, N = number of colonies (CFU/g)
A = average count of colonies in petri plates
D = Dilution Factor (D=10 as 1:10 dilution of sample was taken).

2.5.2 Sensory characteristics evaluated:

- Colour
- Texture
- Crispiness
- Taste
- Overall acceptability

Method of sensory evaluation:
Sensory evaluation were carried out under ambient conditions in sensory evaluation room, department of food technology, CFST, Bapatla. Consumer acceptance was taken using 9 point hedonic scales to rate the organoleptic characteristics of biscuits.

2.5.3 Proximateanalysis

- Estimation of moisture content.
- Estimation of total carbohydrate.
- Estimation of fat.
- Estimation of total ash.
- Estimation of protein.
- Estimation of β-carotene.
- Estimation of crude fiber.
- Estimation of energy.

Estimation of moisture content
Moisture content of biscuit was determined according to oven method (AACC,1969). 5g of sample was accurately weighed into a clean dry petri dish and dried in an oven at 105°C for 3 hours, cooled in desiccators and weighed till constant weights are obtained.
Record the weight of the dish. The loss in weight represents the moisture content of the sample.
% moisture= × 100

Estimation of carbohydrates
Estimation of carbohydrates in the samples was carried out by Anthrone method (AOAC,1990).

Reagents required:

- 2.5 N HCl
- Anthronereagent : Dissolve 200 mg of anthrone in 100 ml ice cold 95% H2SO4
- Stock standard glucose solution: Dissolve 100 mg of glucose in 100 ml of distilled Water(1 mg/ml)
- Working standard solution : Dilute 10 ml of stock standard solution to 100 ml with distilled water

Procedure:

1. Weigh 100 mg of sample and place it in boiling test tube
2. Hydrolyze by keeping it in a boiling water bath for 3 hrs with 5 ml HCl and cool to
3. room temperature
4. Neutralize it with solid Na2CO3 until the effervescence ceases.
5. Make up the volume to 100 ml and then centrifuge
6. Collect the supernatant and take 0.5 ml and 1 ml aliquots
7. Prepare the standards by taking 0.2 ml, 0.4 ml, 0.6 ml, 0.8 ml, 1 ml and run a blank Simultaneously.
8. Make up the volume in all the tubes to 1 ml with distilled water
9. Then add 4 ml of Anthrone reagent
10. Heat for 8 min in a boiling water bath
11. Cool the tubes under tap water and read the green color at wave length 630 nm
12. Draw a standard curve by platting concentration of standard on X-axis and absorbance on Y-axis

11. From the graph calculate the amount of carbohydrates present in the sample

Amount of carbohydrates present = $\frac{mg\ of\ glucose}{volume\ of\ test\ sample}$*100

Estimation of Fat

Fat was determined by soxhletmethod(AOAC,1990) 2 g of the sample were accurately weighed into a dry thimble and extracted using petroleum ether (60 - 800 bop) as solvent for 16 hr. The fat extract was collected in a previously weighted dry flat-bottomed flash and separated from the solvent by evaporating oven a hot water bath. The flask was dried in an oven at 80-1000C and cooled till constant weight was achieved. Fat content of the samples were expressed as g/100 g of sample. The amount of fat present in given food sample.

% fat / 100g sample= $\frac{final\ weight\ of\ beaker - empty\ weight\ of\ beaker}{weight\ of\ sample}$×100

Estimation of Total Ash

The ash content was estimated according to the method described by AOAC. 5 g of samples were accurately weighed into cleaned, dried, weighed, tare silica crucible (W2). The initialashing was carried out over a low flame to char the sample. The crucible was then transferred to a muffle furnace maintained at 500-550˚C to get ash. The crucible was then cooled until a constant weight (W1) was achieved and expressed as g/100 g of sample.

% Ash content= $\frac{w1-w2}{weight\ of\ sample}$*100

W1 = Weight of sample + crucible before ashing (gm)
W2 = Weight of sample + crucible after ashing (gm)

Estimation of protein

Colorimetric determination of protein(kjeldahl)
Equipments:- analytical balance,digestionunit,mechanical blender/mixer-grinder.

Reagents:-

- Salicylate reagent:- dissolve 3.2 gm of sodium salicylate, 4 gm of tri-sodium phosphate and 50 mg of sodium nitroprusside in warm water and make up the volume to 100 ml with distilled water. Store the reagent in an amber coloured bottle.
- Hypochlorite reagent:- take 5 ml of 5%(v/v) sodium hypochlorite solution and make up the volume to 100 ml withdistilled water.
- Sodium hydroxide solution(5N)
- Conc. Sulphuric acid

Digestion mixture:- mix and grind thoroughly,35 gm of potassium sulphate and 0.35 gm of selenium usinga glass mortar and pestle.
Standard ammonium chloride solution:- dissolve 38.2 mg of pure ammonium chloride in distilled water and make up the volume to 100ml in a volumetric flask. This stock solution contains 100 microgram equivalent of N per ml. Dilute the stock solution to obtain 20 microgram per ml of nitrogen.

Procedure:-

- Take 100 mg of the defatted food sample (defat the sample by soxhlet method) in a kjeldhaldigestionflask. Add 2 gmof the digestion mixture (catalyst) along with 2 ml conc. Sulphuric acid and mix. Digest the contents at 380C for 1 hr, in a chemical safety hood. Cool and transfer the contents into a 100 ml volumetric flask and make up the volume with distilled water. Take suitable aliquots to determine the nitrogen content in the sample.
- Run a setoff standards in the range of 4-20 microgram N, according to protocol. Construct a calibrationcurve. Calculate protein content as:

Protein content(%) =N*6.25

Estimation of β-carotene

Reagents:-acetone,anhydrous sodium sulphate,petroleum ether.

Procedure:-

Take 5 gm of fresh sample and crush in 10-15ml acetone, adding a few crystalsof anhydrous sodium sulphate, withthe help of pestle and mortar. Decant the supernatant into a beaker. Repeat the process twice and transfer the combined supernatant to a separatory funnel, add 10-15 ml petroleum ether and mix thoroughly. Two layers

will separate out on standing. Discard the lower layer and collect upper layer in a 100 ml volumetric flask,make up the volume to 100 ml with petroleum ether and record optical density at 452nm using petroleum as blank.

Calculations:

B-carotene= $\frac{OD*13.9*10^4*100}{weight\ of\ sample*560*1000}$

Vitamin-A= $\frac{beta-carotene(\mu g/100)}{0.6}$

Estimation of crude fibre

2 g of fat free sample was weighed in triplicate and digested with 200 ml of 1.25% sulphuric acid by gently boiling in a water bath for half an hour. The contents were filtered through a filter paper and then transferred to the same beaker. To this 200 ml of sodium hydroxide was added. The contents were then digested again for half an hour, filtered and washed free of alkali using hot distilled water. The residue obtained was dried in a hot air oven over night at 130±20C. The dried residue was then weighed and placed in a muffle furnace at 600±15°C for 30 minutes. The loss in weight after ignition represented the crude fiber content of the sample in the sample.

% Crude Fiber = $\frac{w2-w1}{w0}$ **× 100**

Where,
W0 = weight of the sample (g).
W1 = weight of empty crucible (g).
W2 = weight of crucible +residue (g).

Estimation of Energy

1) 0.5g of sample (pellet) is taken in metal crucible and placed in crucible stand of bomb .Platinum wire of 10cm is taken and is tied to the crucible touching the sample.

2)10ml distilled water is added in bomb.
3) Control value is closed and filling connection value is opened slowly . The guage is monitored and pressure is allowed to rise slowly until 30 atm.
4)2lt of distilled water is added in calorimeter bucket.
5)bomb is placed with help of handle in bucket cover is placed on the jacket.
6) Thermometer reading is adjusted to 1 to 2°c immersed in water bucket. Vibrator is started to achieve homogenous temperature of water bucket inside. Motor is run for 5min.
7)Initial temperature is noted when thermometer reading is constant. The button on ignition unit is pressed to fire the change. After firing mercury starts raising.
8)Final temperature is noted when temperature reading is again constant. Residual pressure inside the bomb is released.
9)Examine the wire left un burnt.

Calculation:

Gross heat of combustion(cal/g)=$t*w-(c1+c2+c3)/M$
Where c1 and c2 = correction of HNO3, H2SO4 present in the sample.
C3= amount of wire (10cm)remaining after ignition.
t= Rise in temperature
w= water equivalent,2000cal/gm
M= weight of substance.

2.5.4 Physical properties of biscuits:-

2.5.4 Spread ratio

The thickness,weight,diameter and spread ratio were calculated from the values of six biscuits.
Spread ratio=width/thickness

III. Results And Discussion

3.1 Microbial Analysis:The formulated product is evaluated for the presence of microbial count. Here, we analyzed sample E and the results obtained is given in table below which shows that the colony count for both bacterial and fungal is below the permissible count.

Table 3.1:- Microbial analysis

GROUP	CONTROL	SAMPLE B	PERMISSIBLE
Bacterial count (CFU/g)	0	9	50
Fungal count (CFU/g)	2	10	30

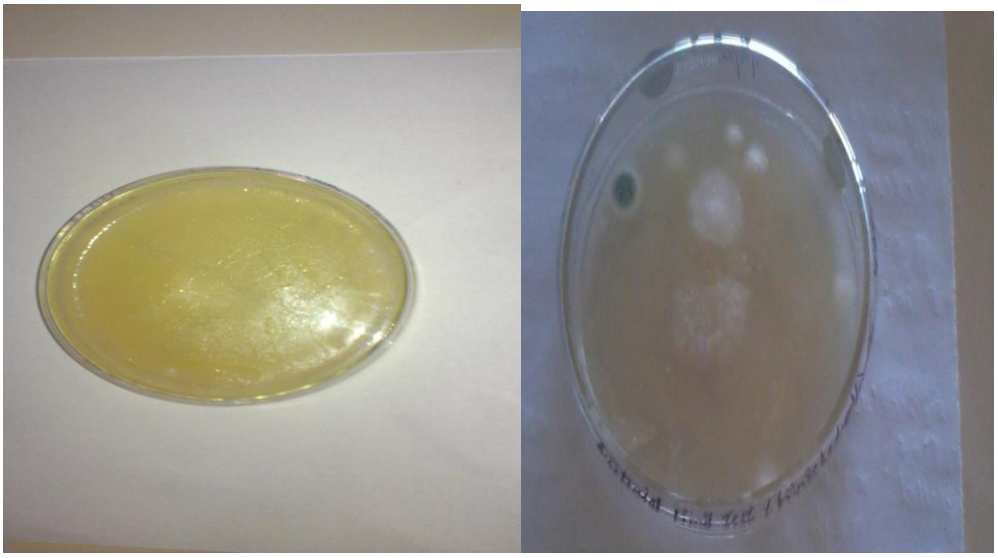

Plate 3.1:- Bacterial count for control and test sample(sample B)

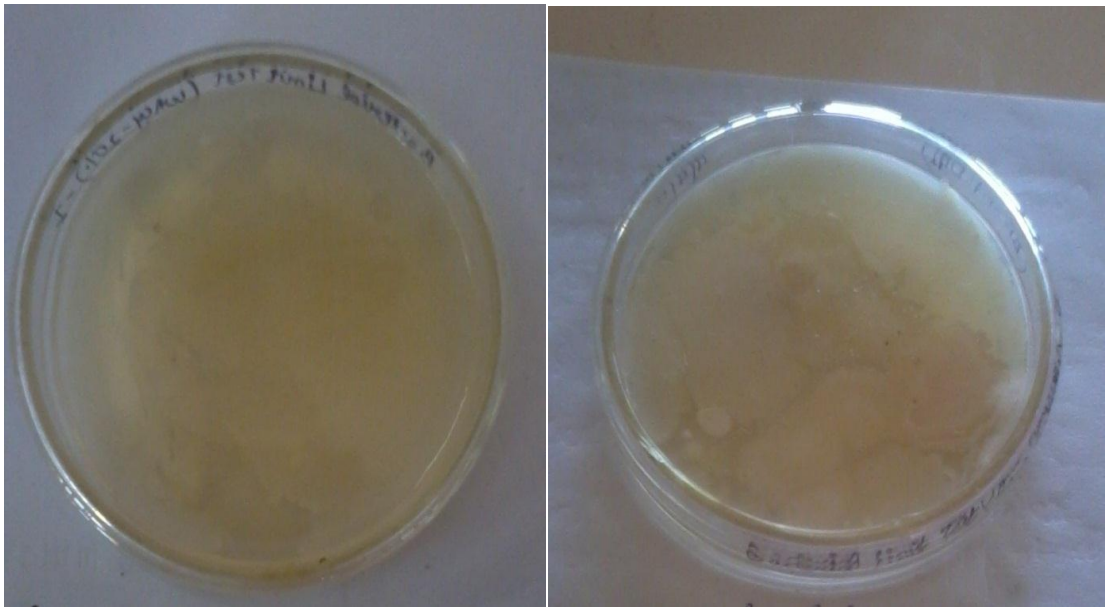

Plate 3.2:- Fungal count for control and taste sample(sample B)

3.2 Sensory Evaluation of biscuits:-

Sensory evaluation for the biscuits were conducted using 6 test samples having different ratios of defatted soya flour and carrot pomace powder. These samples were tested with the help of a 9 member panel.

TABLE 3.2 Sensory analysis data

Attributes	Control	Sample A	Sample B	Sample C	Sample D	Sample E
Appearance	7.0	7.0	7.3	7.0	7.6	7.8
Colour	6.6	6.7	7.1	7.1	7.6	7.7
Flavour	6.8	6.6	7.0	6.9	7.4	7.1
Taste	7.1	7.2	7.3	7.1	7.4	7.2

Texture	6.7	7.0	7.1	7.8	7.2	7.9
Overall acceptability	6.8	6.9	7.1	7.2	7.4	7.5

Sensory analysis:-

Appearance

The score for appearance was found highest in sample E with a score of 7.8 as compared to other biscuits.

Colour

The colour of the biscuit was highest for the one with high proportion of defatted soya flour and carrot pomace powder.

Flavour

The flavour for sample D was highest with a score of 7.4 due to optimum content of both defatted soya flour and carrot pomace powder.

Taste

The taste of sample D was highest with a score of 7.4 as compared to other biscuits.

Texture

The score for texture was highest for the sample E with a score of 7.9 due to high proportion of defatted soya flour.

Overall acceptability

The overall acceptability of sample E was highest as compared to other biscuits with a score of 7.5. The increased acceptability was due to high content of defatted soya flour and carrot pomace powder.

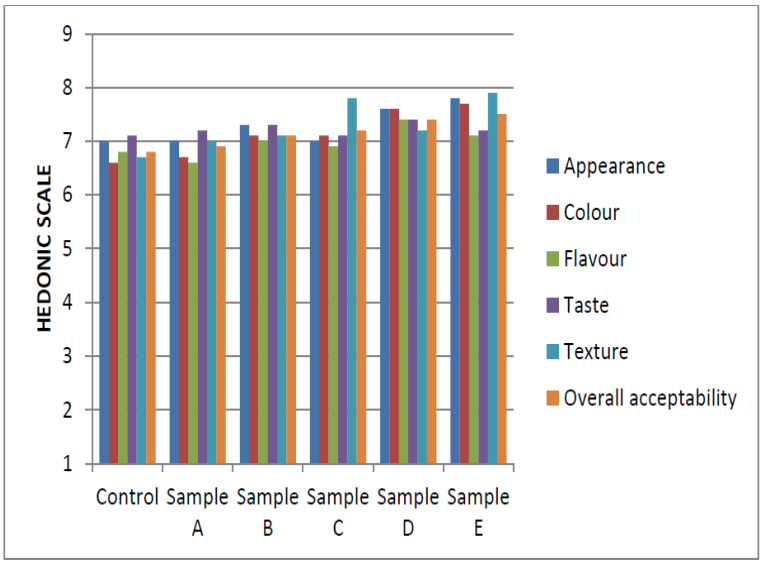

Fig. 3.1 sensory analysis of different formulations

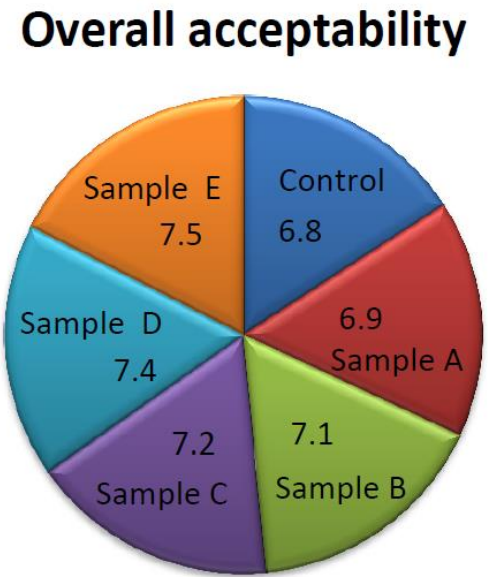

Figure 3.2 Sensory analysis chart

3.3 Proximate Analysis:

Results obtained after proximate analysis of different samples of product are following:

2.3.1 Estimation of moisture content:

The moisture content of prepared sample is found to be higher in sample E (3.01%) followed by other, in control (2.73%), sample B (2.76%), sample C (2.86%), sample D (2.90%) and sample E(2.96%) as shown in table 4.3. Moisture content is higher in sample E as compared to other samples.

Table 3.3. Analysis of moisture content(%)

Parameter	Control	Sample A	Sample B	Sample C	Sample D	Sample E
M.C.(%)	2.73	2.76	2.86	2.90	2.96	3.01

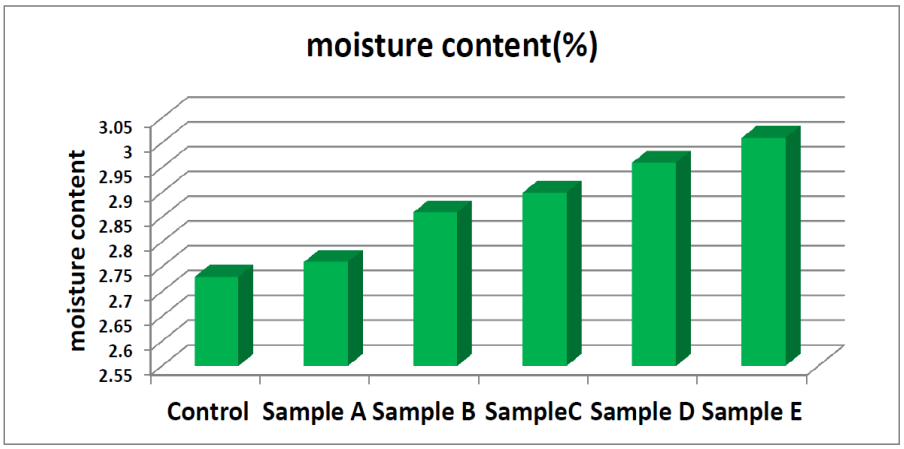

Fig 3.3 Analysis of moisture content

3.3.2 Estimation of carbohydrate:

As shown in the fig and table below the carbohydrate of prepared sample is found to be higher in control (67.52%) followed by other, in sample B (65.27%), sample C (65.58%), sample D (63.88%), sample E (63.05%) and sample F(62.75%). Carbohydrate is higher in control as compared to other samples**.**

Table 3.4 Analysis of carbohydrate(%).

Parameter	control	Sample A	Sample B	Sample C	Sample D	Sample E
Carbohydrate(%)	68.0	66.51	65.97	64.38	63.34	61.28

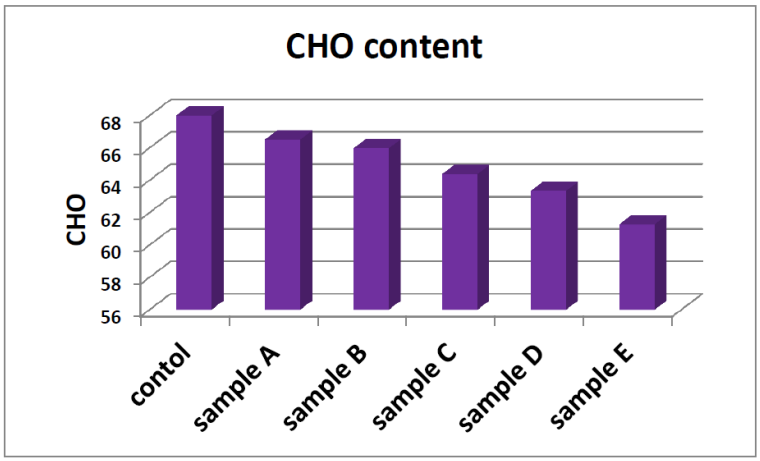

Fig 3.4 Analysis of Carbohydrate

3.3.3 Estimation of fat:

The fat of prepared sample is found to be higher in sample A (21.54%) followed by other, in control(21.13%), sample B (21.15%), sample C (21.53%) and sample D (21.32%),sample E(21.40%)

Table 3.5 Analysis of fat (%)

Parameter	Control	Sample A	Sample B	Sample C	Sample D	Sample E
Fat(%)	21.61	21.59	21.54	21.53	21.42	21.40

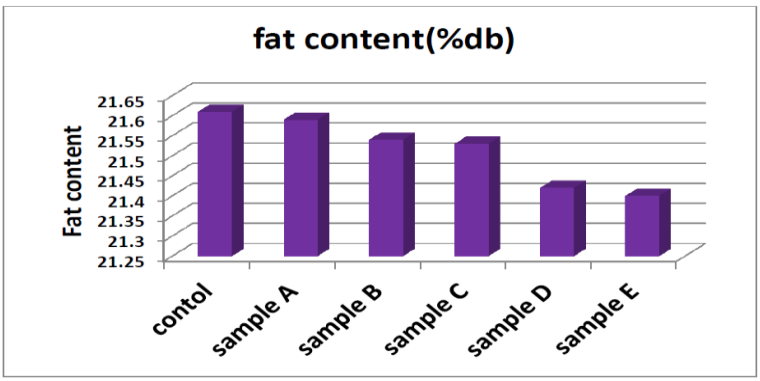

Fig 3.5 Analysis of Fat

3.3.4 Estimation of total ash:

The total ash of prepared sample is found to be higher in sample E (1.96%) followed by other, in control (0.64%), sample A (1.9%), sample B (1.8%) and sample C (1.7%), sample D and sample E. So, the results shows that ash is higher in sample E as compare to other samples.

Table 3.6. Analysis of total ash(%)

Parameter	control	Sample A	Sample B	Sample C	Sample D	Sample E
Ash(%)	0.64	0.70	0.76	0.92	1.02	1.96

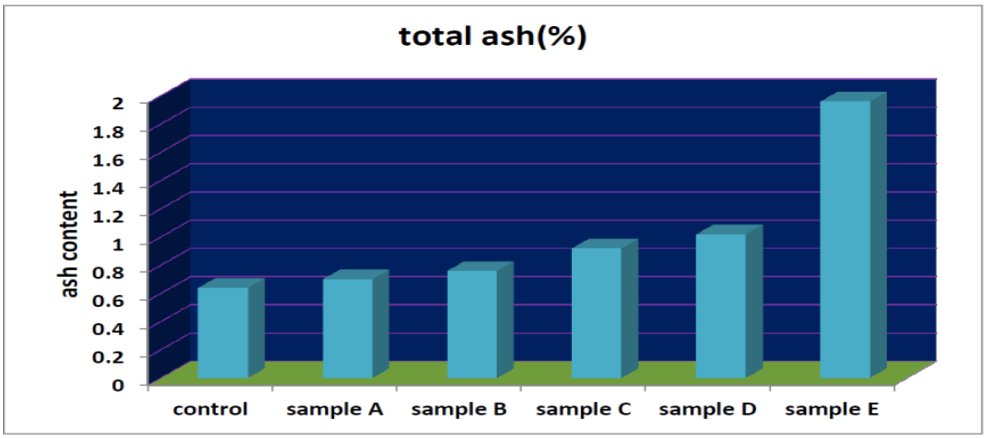

Fig 3.6 Analysis of Ash

3.3.5 Estimation of protein

The protein content was found to be highest in sample E due to large amount of defatted soya flour incorporation.

Table 3.7. Analysis of protein(%)

Parameter	Control	Sample A	Sample B	Sample C	Sample D	Sample E
Protein(%)	7.86	8.06	9.01	9.25	9.34	9.53

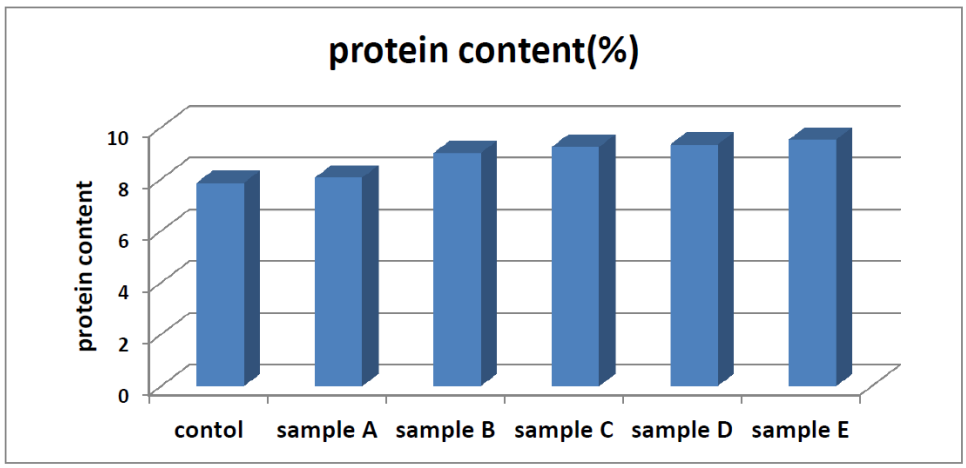

Fig. 3.7:- Analysis of protein

3.3.6Estimation of beta-carotene

The beta-carotene content was found to be higher in sample E.

Table 3.8:- Analysis of beta-carptene

Parameter	Control	Sample A	Sample B	Sample C	Sample D	Sample E
Beta-carotene(µg/100 gm)	0.496	0.547	0.645	1.29	2.23	2.58

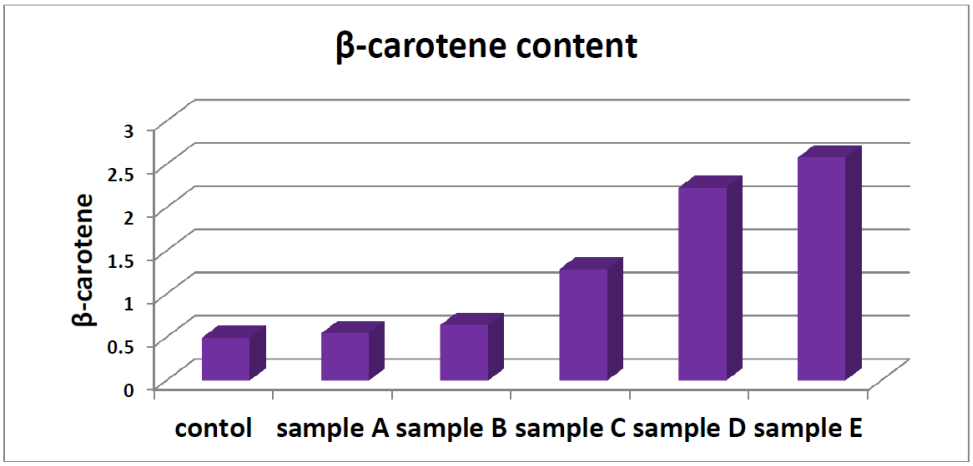

Fig. 3.8 :- Analysis of β-carotene

3.3.7 Estimation of crude fibre

The crude fibre content of sample E is found to be higher in sample E (2.82%) followed by others, in control (0.12%), sample A (0.48%), sample B (0.64%) and sample C (1.02%) and sample D(2.12). So, the results shows that ash is higher in sample E as compare to other samples.

Table 3.9:- analysis of crude fibre

Parameter	Control	Sample A	Sample B	Sample C	Sample D	Sample E
Crude fibre(%)	0.12	0.48	0.64	1.02	2.12	2.82

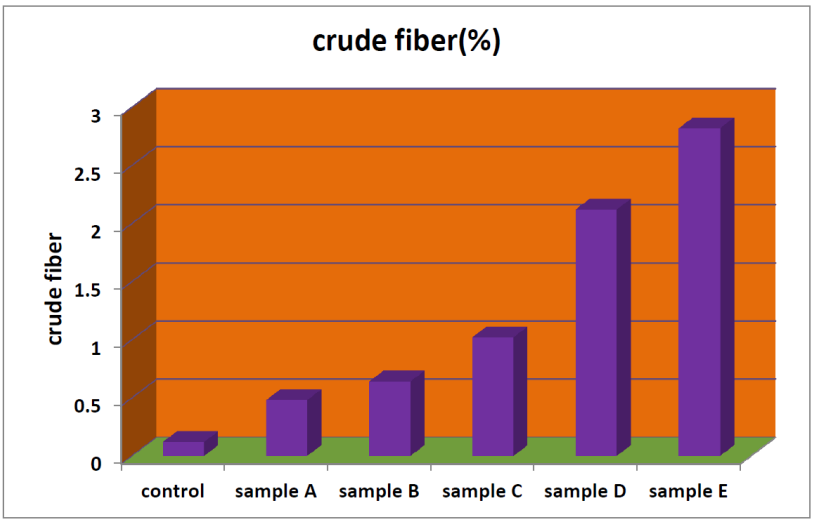

Figure 3.9:- analysis of crude fibre

3.3.8 Estimation of total energy

Table 3.10:- analysis of total energy

Parameter	Control	Sample A	Sample B	Sample C	Sample D	Sample E
Total energy(kcal/100 gm)	492.41	489.61	481.70	460.25	423.5	411.9

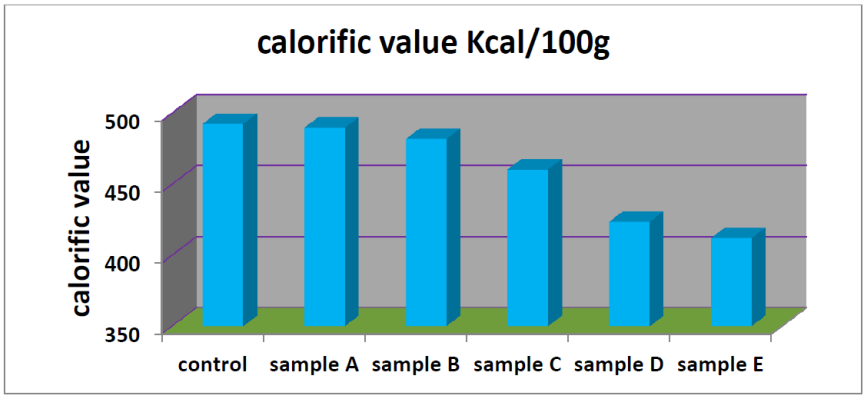

Fig. 3.10:- analysis of total energy

3.4 PHYSICAL PROPERTIES OF BISCUITS:-

The spread ratio of biscuits is the manifestation of the viscous properties of the biscuit dough under the influence of heat & is affected by the factors such as formulation, nature of the ingredients processing method and baking conditions. When the biscuit dough enters the oven and gets heated, the shortening melts giving the dough more fluidity. At the same time the sugar dissolve and thereby increase the solution content in the dough. It also increases the fluidity and allows the dough to spread as a function of gravity.

Table 3.11:- physical parameters

Sample	Weight(gm)	Thickness(cm)	Diameter(cm)	Spread ratio
Control	15.7	2.0	3.4	1.7
Sample A	13.4	1.7	3.3	1.9
Sample B	14.9	1.9	3.5	1.8
Sample C	12.8	1.8	3.35	1.9
Sample D	14.6	1.8	3.4	1.8
Sample E	15.2	1.4	3.2	2.1

From the above table it can be concluded that there is no significant difference in the weight of the biscuits.There was a little variation in the thickness and diameter of the control and the DSF and CPP incorporated biscuits.

IV. Conclusion

This research finally lead to the formulation of healthy biscuits incorporated with carrot pomace powder and defatted soya flour as functional ingredients .The fibre content and beta-carotene level significantly improved in the biscuits with the increase in the proportion of DSF and CPP.

On the basis of nutritional and sensory quality, biscuit when incorporated with blends 17% defatted soya flour and 12% carrot pomace powder resulted in better quality. This functional biscuit is nutritionally more superior to that of whole wheat flour biscuit. It can be use as a vehicle for protein fortification and other nutritional improvement as biscuit is widely accepted bakery product in India.

References

[1]. Yamazaki WT, Greenwood C (1981). Soft wheat: Production, breeding, milling and uses. *American Association of Cereal Chemists, ST, Paul, Minnesota, USA, pp. 45-49.*
[2]. Fayemi PO (1981). Home Economics Teacher Guide.*IbadanMacmillian Nigeria Publisher Ltd., P. 201*
[3]. Yzoneet., al (1982) reported that enrichment of bread with defatted soy flour at 0 to 12% with 2% intervals of wheat flour improved the nutritional quality with an increase in protein content from 13.4% to 18.0% percent.
[4]. Kent, N.L. 1983. Technology of cereals.*ThirdEdition.Pergamon Press, Oxford* LIU, K. (2000). Expanding soybean food utilization. *J. Food Technol. 54(7): 46-47.*
[5]. ACC/SCN (1987).First Report on the World Nutrition Situation.*Food and Policy Division, FAO, Rome.*
[6]. AOAC.1990.Official methods of analysis.Association of Official Analytical Chemists, Washington D.C.
[7]. Awan JA, Salim-ur-Rehman, Ullah E, Siddique Ml, Aziz T (1991).*Nutrition of wheat flour in Islamic perspective. JAPS, 1(2): 1-7.*
[8]. Walde et al. 1992, carrot is a rich source of β-carotene and contains other vitamins, like thiamine, riboflavin, vitamin B-complex and minerals.
[9]. Walde SG, Math RG, Chakkarvarthi A, Rao DG (1992) Preservation of carrots by dehydration techniques—A Review. Indian Food Packer 46:37–42
[10]. Addo et al,1993, in the study found that as DFS usually undergoes processing, the active lipoxygenase-2 might have added undesirable aroma compounds at higher replacement resulting in less acceptabilityof DFS supplemented products.
[11]. AOAC.1995.Official methods of analysis 16thedition Vol-2.Association of Official Analytical Chemists, Verginia, USA.
[12]. Bin-Lim, S. and M. Kyung-Jwa. 1996. Effect of blanching conditions on the quality of carrot juice. *Journal of the Korean Society of Food Science and Nutrition* 25: 680-686.

[13]. Bohm, V., Otto, K. &Weissleder, F. (1999). Yield of juice and carotenoids of the carrot juice production, *In: Symposium Jena-Thuringen, Germany*. 115-119.
[14]. Francis, F.J., 1999, Wiley Encylopedia of Food Science and Technology *2ed 1-4 John Wiley and Sons*
[15]. Grigelmo-Miguel N, Martín-Belloso O (1999). Comparison of dietary fibre from by-products of processing fruits and greens and from cereals. LWT – Food Sci. Technol., pp. 503-508
[16]. Mishra, Dhingra and Jood et al,(2002), in a study found that breads incorporated with defatted soy flour at 2-10% level had higher content of protein, total ash, calcium and phosphorous.
[17]. Pablo et al.,2005, in the study found that soya and wheat protein interact by covalent and non covalent bonds producing more soluble protein aggregates yielding better sensory profile.
[18]. Bahadur Singh, P.S. Panesar and Vikas Nanda et al,(2006), studied on carrot pomace and its storage life.
[19]. Nawirska A, Kwasniewska M (2005). Dietary fibre fractions from fruit and vegetable processing waste, Food Chem., 91(2): 221-225.
[20]. Sharma *et al*., 2006 found that carrot pomace can be stored even at room temperature for longer periods.
[21]. Sharma, H.K., J. Kaur, B.C. Sarkar, C. Singh, B. Singh, and A.A. Shitandi. 2006. Optimization of pretreatment conditions of carrots to maximize juice recovery by response surface methodology. *Journal of Engineering Science and Technology* 1(2):158 -165.
[22]. Sharma, H.K., J. Kaur, B.C. Sarkar, C. Singh, and B. Singh. 2007. Effect of pretreatment conditions on physico-chemical parameters of carrot juice. *Int. Journal of Food Science and Technology (In Press).*
[23]. Kumara S.Grewal RB et al.,(2007) prepared carrot pomace powder(cpp) and analysed for proximate composition and total dietary fibre.
[24]. Roberts et al. (2008), prepared carrot pomace by utilising the by-product of carrot juice extraction unit.
[25]. AshutoshUpadhyay, Sharma. H.K, and Sarkar. B.C, ―Characterization and Dehydration Kinetics of Carrot Pomace‖.*Agricultural Engineering International: The CIGR Ejournal. Manuscript FP 07 35. Vol. X. February, 2008.*
[26]. Roberts, J. S., Kidd, D. R. &Zakour, O. P. (2008).Drying kinetics of grapes seeds, *Journal of Food Engineering*, 89, 480-465.
[27]. Upadhyay et al. 2008 studied on dried pomace and rehas β carotene and ascorbic acid in the range of 9.87 to 11.57 mg and 13.53 to 22.95 mg per 100 g respectively.
[28]. Bahadur Singh, P.S. Panesar and Vikas Nanda et al,(2011), developed cookies incorporated with carrot pomace and reported that the incorporation of carrot pomace in ready-to-eat bakery cookies up to the level of 6% acts as a source of vitamins and dietary fiber.
[29]. Neha Mishra, Ramesh Chandra et al,(2012), developed functional biscuit from soy flour & rice bran and reported that the supplementation of soy flour and rice bran at 15% level each, would improve the nutritional quality without adversely affecting the sensory parameters.
[30]. BazillaGayas et al(2012) studied Physico - Chemical and Sensory Characteristics of Carrot Pomace Powder Enriched Defatted Soyflour Fortified Biscuits