© 2015 IJSRSET | Volume 1 | Issue 6 | Print ISSN : 2395-1990 | Online ISSN : 2394-4099
Themed Section: Science and Technology

Development and Quality Evaluation of Value Added Food Products using Dehydrated Black Kokum *(Garcinia indica)*

Pardeep Kaur Grewal
Maharishi Markandeshwar University Mullana, Ambala, Haryana, India

ABSTRACT

The present study was conducted to prepare food products -kokum panna, kokum sherbet, kokum booster and kokum chatpatti balls from dehydrated black kokum extract and pulp and to analyse the Hydroxycitric acid (HCA) content in the products. The kokum (Garcinia) was used for the study and food products because of its higher hydroxycitric acid (HCA) content. The commonly consumed products: kokum panna, kokum sherbet, kokum booster and kokum chatpatti balls were then analysed for their pH and HCA content. The organoleptic evaluation of food products of kokum extract and kokum pulp was found to be highly acceptable ($p<0.8$). The acceptable levels of dehydrated black kokum extract for booster and panna and kokum pulp for kokum sherbet and chatpatti balls ranged 20% & 35%, and 25% & 30% respectively. The HCA content of the food products ranged between 2.1 to 8.6g/100g. Among all these products, the highest pH content was found in kokum booster followed by 3.71, 3.85, 3.94 pH value while kokum chatpatti balls, kokum panna and kokum sherbet 2.60, 2.92 and 2.41, 2.43, 2.45, 2.24, 2.27, 2.28 pH value. For the evaluation of shelf life of the food products, the products were packed in High Density Poly Ethylene (HDPE) covers, heat sealed and stored at ambient conditions. The results of sensory evaluation during shelf life showed that have a longer shelf life but the decline in the all sensory attributes as the days increased.
Keywords: Dehydrated Black Kokum, Food Products, Sensory Attributes, Hydroxycitric Acid

I. INTRODUCTION

Kokum, a plant in the mangosteen (Clusiaceae) family, commonly known as black kokum, cocum and kokam. Kokum is an ornamental fruit tree it is native to India the fruit is considered to be the store house of medicinal benefits. It is also known as 'cool king' of Indian foods. In India it is generally cultivated in tropical forests. Therefore, the present study has been taken up to develop commercially viable value added products incorporating black kokum extract and pulp. The fruit rind usually wasted can be utilized for preparation of various value added products, which are of commercial importance from the industrial as well as health point of view.

Kokum is often used in variety of ways such as fruit small pieces, dried or kokum powder. Dehydrated kokum rind can be processed into powder form which has longer shelf-life.

Kokum rind was being used because of its highly desirable natural flavour and sour or sweet taste. The blackish red colour of kokum rind is due to the presence antioxidant anthocyanins. Black kokum is an excellent source of antioxidants i.e. anthocyanin and hydroxycitric acid (HCA).

Traditionally, black kokum has been used as a hypocholesterolaemic agent, anti-cancer and antioxidant activities. It is also used to treat urticarial and allergic rashes on the skin, constipation, dysentery, heat stroke, pain, tumour, cardiovascular diseases, neurodegenerative chronic inflammatory diseases such as atherosclerosis, asthma, stroke, vasospasms, liver damage, Alzheimer's disease and curb appetite, suppress food intake, increase the rates of hepatic glycogen synthesis, reduce fatty acid synthesis and lipogenesis, and decrease body-weight gain because black kokum rich in phytoconstituents and antioxidants. The rind usually wasted can be utilized for preparation of value

added products so an attempt has been made to develop value added food products.

II. METHODS AND MATERIAL

The dried kokum rinds were collected from Chandigarh, black kokum base value added products was carried out by incorporating different levels of kokum extract and pulp.

Developed products were evaluated using nine points hedonic scale by 8 to 10 semi trained panel of judges from the department of Dietetics and Nutrition, M.M.I.C.T. & B.M (Hotel Management), M.M. University, Mullana (Ambala), Haryana.

The incorporation of black kokum extract and pulp in food products was 30 to 40 per cent in panna, 15 to 25 per cent in sherbet, 15 to 25 per cent in booster and 30 to 35 per cent in chatpatti balls depending upon suitability and tested for acceptance on nine points hedonic scale by semi trained panel of judges.

Four food products (Panna, Sherbet, Booster and Chatpatti balls) were tried out using rind extract and pulp form as a colouring agent products were tried out using black kokum extract at 30, 35 & 40 percent and 15, 20 & 25 per cent levels was added to panna and booster, and black kokum pulp at 15, 20 & 25 per cent and 30 & 35 per cent levels was added to sherbet and chatpatti balls respectively as a colouring agent and also to enhance hydroxycitric acid content (HCA).

All the food products was tested for black kokum pulp recovery, hydroxycitric acid (HCA) content (AOAC, 2000) and pH value was analyzed using (AOAC, 1980) methods.

Cost of the raw ingredients at the time of purchase, material cost and 20 per cent as overhead charges were calculated to get the production cost.

To study the shelf life of the chatpatti balls, the samples were packed in High Density Poly ethylene (HDPE) covers, heat sealed and stored at ambient conditions. Samples were drawn (every 15 day of interval) and were tested for sensory attributes. HDPE covers were selected because of high impact strength and good seal-ability character.

III. RESULTS AND DISCUSSION

Four types of food products were developed and standardized after incorporating black kokum. Black kokum extract at 30, 35 & 40 percent and 15, 20 & 25 per cent levels was added to panna and booster, and black kokum pulp at 15, 20 & 25 per cent and 30 & 35 per cent levels was added to sherbet and chatpatti balls respectively as a colouring agent and also enhance hydroxycitric acid (HCA) content.

The acceptability scores were based on nine point hedonic scale. Panna with 20 per cent of kokum extract (K2) was scored high as well as booster; the variation with 20 per cent (B2) also obtained high score. On the flip side, sherbet with 25 per cent (PK3) of kokum pulp was got high scored whereas; chatpatti balls incorporation of black kokum pulp with 30 per cent (A1) was scored high.

Table 1 : Organoleptic evaluation of panna incorporated with dehydrated black kokum extract (Mean ± S.E)

ANOVA	Product 3 Over all acceptability			
	C	B1	B2	B3
Mean	6.90	7.10	7.30	6.85
Median	7.00	8.00	7.50	7.00
S.D.	1.197	1.197	1.160	1.156
Number	10	10	10	10
Maximum	8	8	9	8
Minimum	4	5	5	5
Range	4	3	4	3

F test	0.305
Table Value at 0.05	2.866
p value	0.822
Result	Not Significant
Tukey's method for Pairwise comparison	C
Result with mean difference of Pair>	B1 0.2 B1 B2 0.4 0.2 B2 B3 0.06 -0.25 0.45

C- Control
B1-Kokum extract (15%) + carrot + beetroot + ginger
B2- Kokum extract (20%) + carrot + beetroot + mint
B3-Kokum extract (25%) + carrot + beetroot + ginger + mint

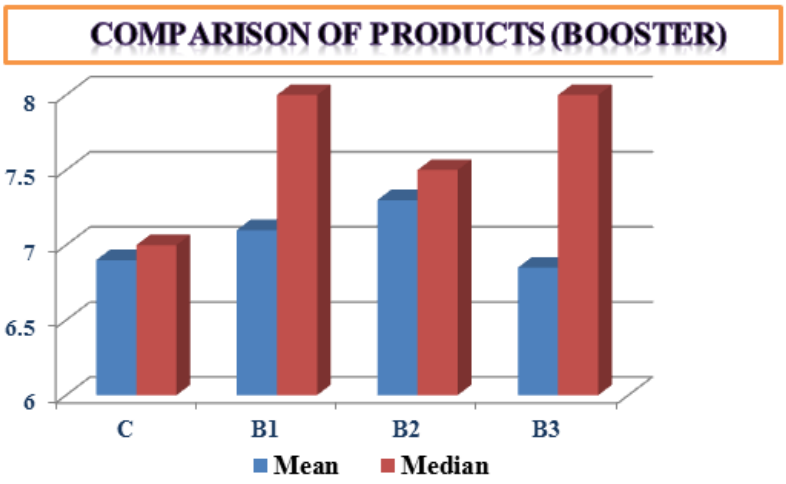

Figure 2 : Organoleptic evaluation of Booster

Table 3: Organoleptic evaluation of sherbet incorporated with dehydrated black kokum pulp (Mean ± S.E)

ANOVA	Product 2 Over all acceptability			
	C	PK1	PK2	PK3
Mean	7.10	6.95	7.15	7.40
Median	8.00	7.00	7.75	8.00
S.D.	1.595	1.012	1.203	1.430
Number	10	10	10	10
Maximum	9	8	8	9
Minimum	4	5	5	4
Range	5	3	3	5
F test	0.198			
Table Value at 0.05	2.866			
p value	0.897			
Result	Not Significant			
Tukey's method for Pairwise	C			

comparison				
Result with mean difference of Pair>	PK1	0.15	PK1	
	PK2	0.06	0.2	PK2
	PK3	0.31	0.45	0.25

C- Control
PK1-Kokum pulp (15%) + cardamom
PK2- Kokum pulp (20%) + tulsi
PK3-Kokum pulp (25%) + tulsi + cardamom

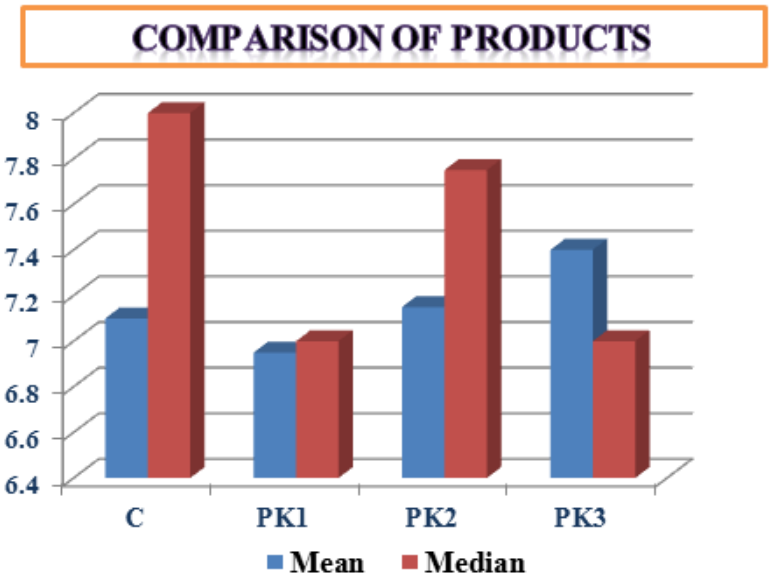

Figure 3 : Organoleptic evaluation of Sherbet

Table 4 : Organoleptic evaluation of chatpatti balls incorporated with dehydrated black kokum extract (Mean ± S.E)

ANOVA	Product 4 Over all acceptability		
	C	A1	A2
Mean	6.70	7.10	6.90
Median	7.00	7.00	7.00
S.D.	1.059	0.876	0.738
Number	10	10	10
Maximum	8	8	8
Minimum	5	5	6
Range	3	3	2
F test	0.493		
Table Value at 0.05	3.354		
p value	0.616		
Result	Not Significant		
Tukey's method for Pairwise comparison			
Result with mean difference of Pair>		C	
	A1	0.4	A1
	A2	0.2	0.2

C- Control
A1-Kokum pulp (30%) + amla
A2- Kokum pulp (35%) + amla + ginger

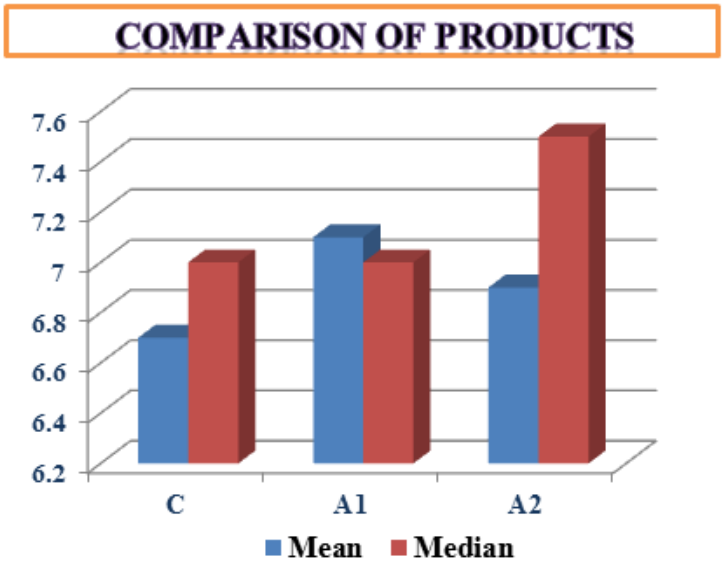

Figure 4 : Organoleptic evaluation of Chatpatti balls

It is evident from table 5 that hydroxycitric acid content of all food products (panna, booster and sherbet) grew gradually with increased volume of kokum except chatpatti balls. . However, the volume of kokum pulp was increased in chatpatti balls, at first the content of HCA decreases and then raised because of microwave effect like it would take a longer time for making products. It results decreased in the quantity of HCA content.

Table 5: HCA of different proportions of food products

Product	**Sample**	**HCA**
	Kokum extract	**20.8**
	Kokum pulp	**21.9**
1 (Panna)	C	2
	K1	2.1
	K2	2.2
	K3	2.2
2 (Booster)	C	8
	B1	8.2
	B2	8.4
	B3	8.6
3 (Sherbet)	C	5.6
	PK1	5.8
	PK2	5.8
	PK3	5.9
4 (Chatpatti balls)	C	8.3
	A1	6.84
	A2	7.98

The pH value of kokum products varies with the use of kokum extract and kokum pulp in the products and pH value increased in the kokum booster because there was used of combination of acidic juices. On the flip side the baked chatpatti balls decreased pH content (Table 6).

Table 6: pH value of different proportions of food products

Product	**Sample**	**pH value**
	Kokum extract	**2.25**
	Kokum paste	**2.27**
1 (Panna)	C	2.39
	K1	2.41
	K2	2.43
	K3	2.45
2 (Booster)	C	3.63
	B1	3.71
	B2	3.85
	B3	3.94
3 (sherbet)	C	2.22
	PK1	2.24
	PK2	2.27
	PK3	2.28
4 (Chatpatti balls)	C	3.20
	A1	2.60
	A2	2.92

The of production for food products (panna, booster, sherbet and chatpatti balls) were Rs. 9.26/-per 100g, Rs13.46/-per 100g, Rs 15.36/-per 100g and Rs 30.72/-per 100g respectively (Table 7 to 10). The cost of the kokum chatpatti balls was higher because of more kokum pulp and amla paste. It is not usual practice of selling of fruit, so the information about price of dehydrated black kokum has been taken from Chandigarh.

Table 7: Production cost of Panna/100g (Round Off to Rs 9.26)

Ingredients	Amount(Rs.)/kg or Litre	Quantity (g/ml)	Price (Rs/-)
KOKUM	350	30gm	10.5
SALT	17	1.25gm	0.02
SUGAR	32	10gm	0.32
CUMIN SEED POWDER	10	1gm	2.0
CARDOMOM	10	1gm	1.4
GINGER JUICE	80	15gm	1.2
Total	-	100	15.44
Overhead charges (20% of the cost)	-	-	3.08
Cost of the product	-	100	18.5
			9.26

Table 8: Production cost of Booster/100g (Round Off to Rs. 15.36)

Ingredients	Amount(Rs.) /kg or Litre	Quantity (g/ml)	Price (Rs/-)
KOKUM	350	30g	10.5
Carrot	20	250g	5.0
Beetroot	30	150	4.5
Mint leaves	20	20	0.4
Ginger	80	20	1.6
Total	-	250	25.6
Overhead charges (20% of the cost)	-	-	5.12
Cost of the product	-	250	30.72
			15.36

Table 9: Production cost of Kokum sherbet/100g (Round Off to Rs. 13.46)

Ingredients	Amount(Rs.) /kg or Litre	Quantity (g/ml)	Price (Rs/-)
KOKUM	350	50g	17.5
SALT	17	1.25gm	0.02
SUGAR	32	10gm	0.32
CUMIN SEED POWDER	10	1gm	2.0
CARDOMOM	10	1gm	1.4
Tulsi leaves	20	10gm	1.0
Total	-	100	22.44
Overhead charges (20% of the cost)	-	-	4.48
Cost of the product	-	100	26.92
			13.46

Table 10: Production cost of Chatpatti balls/100g (Round off to Rs. 24.18)

Ingredients	Amount (Rs.)/kg or Litre	Quantity (g/ml)	Price (Rs/-)
KOKUM	350	100g	35
Amla	40	75g	3.0
SALT	17	1.5gm	0.02
SUGAR	32	15gm	0.48
CUMIN SEED POWDER	10	2gm	0.4
Ginger	80	10	0.8
Ajwain	10	2g	0.4
Black pepper	100	2g	0.2
Total	-	200	40.3
Overhead charges (20% of the cost)	-	-	8.06
Cost of the product	-	200	48.36
			24.18

The sensory characteristics of chatpatti balls were observed for sixty days and evaluation was done at 15 days interval. The score varied as the days increased. On initial day the appearance, texture and taste of control sample of chatpatti balls was slightly good but as the days increased all the sensory attributes also increased. The kokum pulp incorporated chatpatti balls on 15 day the taste was slightly reduce but there was no change in texture. On 30th day texture wise slightly harder. On 60th day the results of sensory evaluation showed the decline in all the sensory attributes (Table 11 to 13) as the days increased.

Table 11: Mean Sensory Score during Shelf life study of chatpatti balls (Control)

ANOVA	CONTROL				
Mean	6.70	7.40	7.40	7.90	7.40
S.D.	1.059	0.568	0.699	0.568	0.699
F test	3.334				
Table Value at 0.05	2.579				
p value	0.018				
Result	Significant				

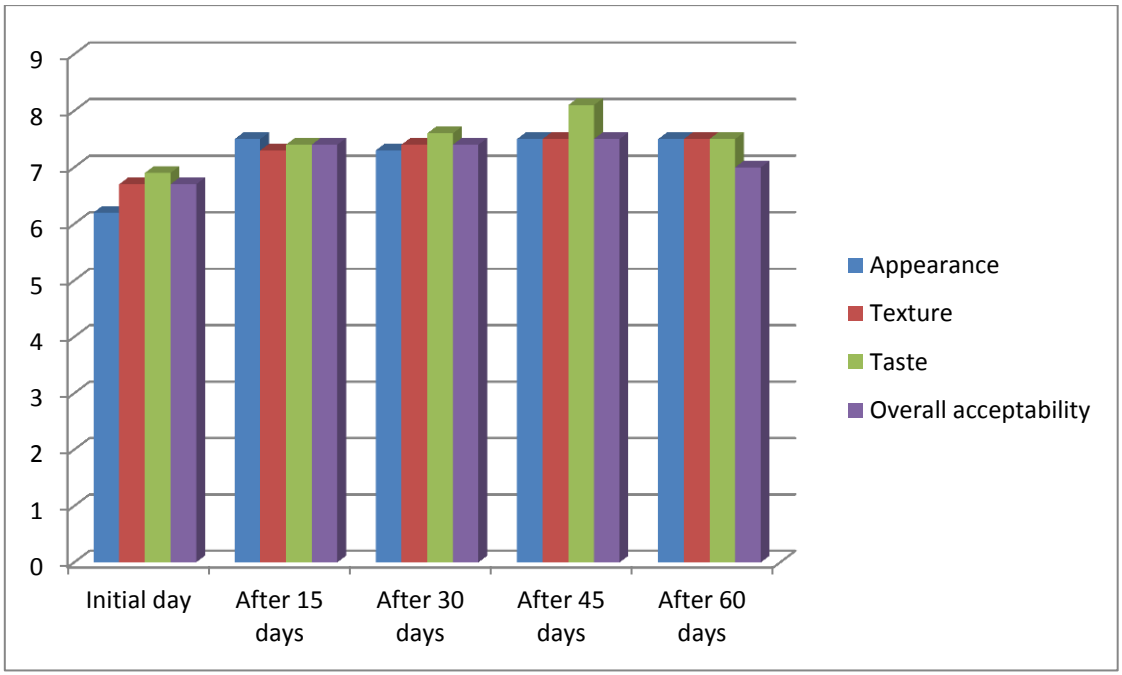

Figure 5: Mean sensory scores during shelf life study of chatpatti balls (Control)

Table 12: Mean Sensory Score during Shelf life study of kokum chatpatti balls (Sample A1)

ANOVA	SAMPLE A1				
Mean	7.10	7.15	6.90	7.30	7.00
S.D.	0.876	1.156	0.568	0.675	0.471
F test	0.371				
Table Value at 0.05	2.579				
p value	0.828				
Result	Not Significant				

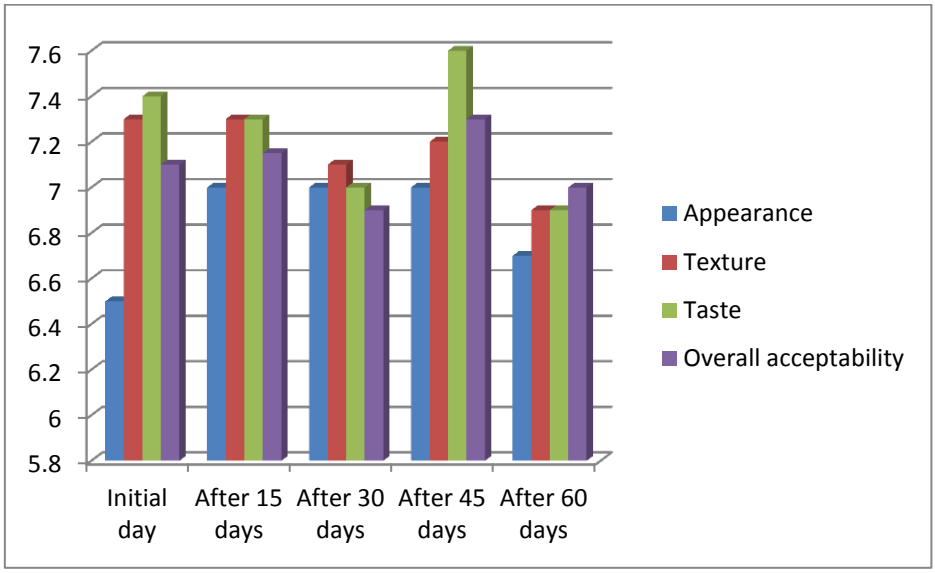

Figure 6 : Mean sensory scores during shelf life study of kokum chatpatti balls (Sample A1)

Table 13: Mean Sensory Score during Shelf life study of kokum chatpatti balls (Sample A2)

ANOVA	SAMPLE A2				
Mean	6.90	6.30	7.20	7.00	6.70
S.D.	0.738	1.947	1.033	0.943	0.483
F test	0.897				
Table Value at 0.05	2.579				
p value	0.474				
Result	Not Significant				

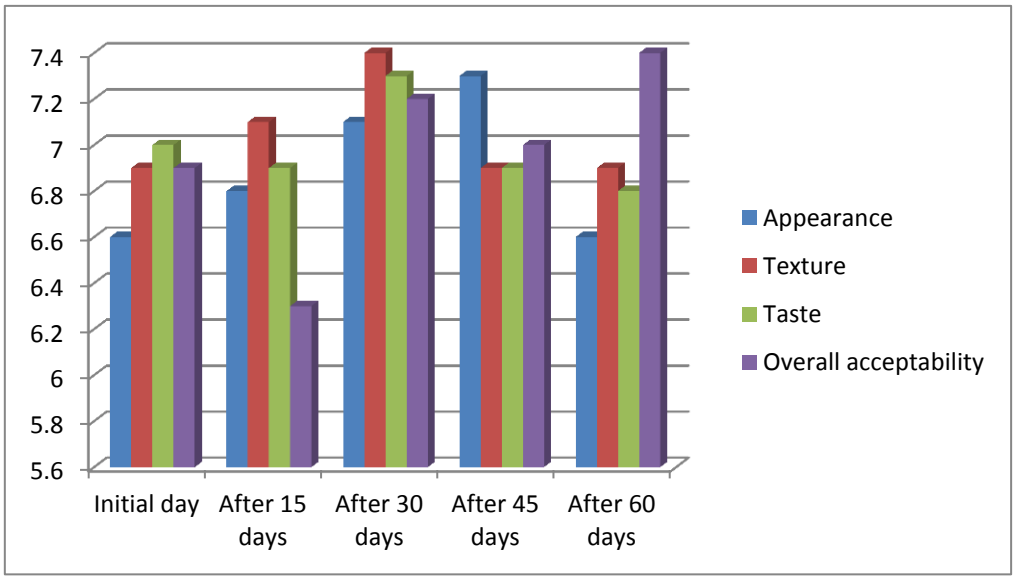

Figure 7: Mean sensory scores during shelf life study of kokum chatpatti balls (Sample A2)

IV. CONCLUSION

In Indian diets Hydroxycitric acid component is generally low and hence such herbal supplements could be an important source. Black kokum extract and pulp, rich in HCA (Hydroxycitric acid), could be considered as a potential source for production of natural radish black food colourant. The value added food products prepared by kokum extract and pulp are not available in the Indian market and hence there is a huge potential for commercialisation. At present, food industries are recommended to incorporate them into their products so that they can be made more popular among the people because of these food products show health benefits. So, people should use them in their diet as a herb medicine for the treatment of ailments like heart stroke, infection, edema and it also have a cardioprotection, hypocholesterolemic, antiobesity activity and antioxidant behavior.

V. REFERENCES

[1] AOAC (1980) Official Methods of Analysis. Association of Official Analytical Chemists. Washington D.C.

[2] AOAC (2000) Official Methods of Analysis. Association of Official Analytical Chemists. Washington D.C.

[3] Hande AR, Swami SB, Thakor NJ (2014) Effect of drying methods and packaging materials on quality parameters of stored kokum rind. Int J Agric & Biol Eng 7(4): 114-126.

[4] Flora SJ (2007) Role of free radicals and antioxidants in health and disease. Cell Mol Biol 53(1): 1-2.

[5] Shrikant BS, Thakor NJ and Patil SC (2014) Kokum (Garcinia Indica) and it's Many Functional Components as Related to the Human Health. Journal of food research and technology Department of Agricultural Process Engineering, College of Agricultural Engineering and Technology, India; 415-712.

[6] Pritam G. Bafna (2014) The best use of kokum (Garcinia indica) fruit as RTS beverage and fruit bar. International Journal of Nutrition and Agriculture Research 1(1): 1 - 9.

[7] Valko M, Leibfritz D, Moncol J, Cronin MT, Mazur M, Telser J (2007) Free radicals and antioxidants in normal physiological functions and human disease. Int J Biochem Cell Biol 39(1): 44-84.

[8] Sutar, R. L., Mane, S. P. and *Ghosh, J.S 92012) Antimicrobial activity of extracts of dried kokum (Garcinia indica C). International Food Research Journal 19(3): 1207-1210.

[9] Panda V, Ashar, R, Srinath S (2012) antioxidant and hepatoprotective effect of Garcinia indica fruit rind in ethanol induced hepatic damage in rodent, Interdscip Toxical 5(4): 207-213.