

Preparation, nutrient density and acceptance of supplemented nutritional beverages

JYOTI CHAUDHARY AND KARUNA SINGH

New product development is a gamble as very few new products survive. The process of development of new product is one that involves like developing and implementing. To prevent and control the various chronic disease, supplementation for beverage was done which provide a good supply of vitamins and essential nutrients by incorporating milk, whey protein and coconut milk. The value addition by milk, whey protein and coconut milk was done to various beverages and drink. Organoleptic evaluation and sensory evaluation of prepared beverages were done on 10 panel members for the overall acceptability of the beverages. Result showed that all the beverages were well accepted, were most preferred beverages supplemented with milk and coconut milk beverages and were extremely liked by all the panel members. When statistically tested using (ANOVA) apple juice, apple drink, grapes juice, pineapple juice and orange juice show that there was a non-significant difference in characteristics like colour, odour, flavour, texture, appearance and palatability of all three samples was exhibited. Result of nutritive value shows that supplementation increased vitamins and essential nutrient content of prepared beverages, which is present in less amount in original beverages, this supplementation can help to prevent and control the chronic diseases.

Key Words : Supplementation, Nutrient dense beverages, New product development

How to cite this article : Chaudhary, Jyoti and Singh, Karuna (2014). Preparation, nutrient density and acceptance of supplemented nutritional beverages. *Food Sci. Res. J.*, 5(1): 15-21.

INTRODUCTION

The beverage is often part of a meal. Since the nutritional content of beverages can differ significantly, the choice of beverages can differ significantly and the choice of beverages affects the composition of the total meal. Since beverages with meal may increase overall energy intake and potentially leading to weight gain. In individuals where positive energy balance is important to avoid, water or more satiating high protein beverages are preferable. In groups of individuals such as elderly and children, nutrient dense drinks are preferable. The increasing consumption of sweetend caloric beverages has been linked to weight gain among adolescents and adults. However, continuing studies on long term consumption and

health outcomes are still needed.

Nutrient dense beverages are those beverages that contain substantial amounts of vitamins and minerals and relatively few calories. Nutrient dense beverages address both calorie and nutrient concerns. Nutrient dense beverages can also significantly improve the nutritional value in substantial amount.

Criteria for nutrient dense beverages:

Taste:

Children will not consume what they don't like, beverages must be palatable.

Moderation:

Relatively few calories a reasonable amount of calories for palatability, keeping in mind that some nutrients also provides calorie.

Nutrition:

Substantial amounts of vitamins and minerals enough to

MEMBERS OF RESEARCH FORUM

Author for correspondence :

JYOTI CHAUDHARY, Department of Food and Nutrition, Ginni Devi Modi Girls P.G. College, MODINAGAR (U.P.) INDIA

Associate Authors' :

KARUNA SINGH, Department of Food and Nutrition, Ginni Devi Modi Girls P.G. College, MODINAGAR (U.P.) INDIA

offset the calories (nutritional density).

When people use diet nutrition supplements to help their bodies overcome deficiencies in vitamins and nutrients, this is referred to as supplementation. Vitamin supplementation plays an important role in preventing common chronic diseases such as cancer, stroke, heart disease and osteoporosis.

Objectives:

- To develop beverages through supplementation of various nutrient rich food stuffs (milk, whey protein and coconut milk).
- To estimate the nutrient content and nutrient density of prepared supplemented beverages.
- To perform sensory evaluation/organoleptic test of prepared supplemented beverages.

METHODOLOGY

The study has two parts:

- Supplementation of various fruit juices like apple, apple drink, grapes, pineapple, orange juice.
- Organoleptic evaluation of the prepared beverages.

The investigation period of study was 40 days. Beverages were prepared in food laboratory of G.D.M.G (P.G) College Modinagar, Distt. Ghaziabad. Evaluation was done by a group on 10 panel members. They tested these beverages on various attributes.

Preparation and standardization of supplemented beverages:

Preparation of various beverages using apple juice, apple drink, grapes juice, pineapple juice, orange juice was done in laboratory. Supplementation of these juices was done with milk, whey protein and coconut milk.

Samples prepared were:-

- Sample 1 - Supplementation with milk.
- Sample 2 - Supplementation with whey protein.
- Sample 3 - Supplementation with coconut milk.

OBSERVATIONS AND ASSESSMENT

The results of the present study as well as relevant discussions have been presented under following sub heads:

Apple juice:

For characteristics such as colour, odour and texture sample 1 and sample 3 were graded as very good and for characteristics flavour and appearance sample 2, 3 and 4 were graded as good and for characteristics palatability sample 1 was graded as very good.

Statistically tested using analysis of variance (ANOVA) shows that there was a non-significant difference in

Apple juice		
Sample-1		
Ingredients	I Trail	II Trail
Apple	170g	150g
Milk	80ml	50ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-2		
Ingredients	I Trail	II Trail
Apple	150g	160g
Whey protein	60ml	40ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-3		
Ingredients	I Trail	II Trail
Apple	180g	170g
Coconut milk	70ml	30ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-3		
Ingredients	I Trail	II Trail
Apple	60g	100g
Carrot	80g	50g
Beetroot	80g	50g
Sugar	10g	5g
Result	Less accepted	More accepted
Appy drink		
Sample-1		
Ingredients	I Trail	II Trail
Appy	170g	150g
Milk	80ml	50 ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-2		
Ingredients	I Trail	II Trail
Appy	150g	160g
Whey protein	60m	40ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-3		
Ingredients	I Trail	II Trail
Appy	180g	170g
Coconut milk	70ml	30ml
Sugar	10g	5g
Result	Less accepted	More accepted

Grapes juice		
Sample-1		
Ingredients	I Trail	II Trail
Grapes	170g	150g
Milk	80ml	50ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-2		
Ingredients	I Trail	II Trail
Grapes	150g	160g
Whey protein	60ml	40ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-3		
Ingredients	I Trail	II Trail
Grapes	180g	170g
Coconut milk	70ml	30ml
Sugar	10g	5g
Result	Less accepted	More accepted
Pineapple juice		
Sample-1		
Ingredients	I Trail	II Trail
Pineapple	170g	150g
Milk	80ml	50ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-2		
Ingredients	I Trail	II Trail
Pineapple	150g	160g
Whey protein	60ml	40ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-3		
Ingredients	I Trail	II Trail
Pineapple	180g	170g
Coconut milk	70ml	30ml
Sugar	10g	5g
Result	Less accepted	More accepted
Orange juice		
Sample-1		
Ingredients	I Trail	II Trail
Orange	170g	150g
Milk	80ml	50ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-2		
Ingredients	I Trail	II Trail
Orange	150g	160g
Whey protein	60ml	40ml
Sugar	10g	5g
Result	Less accepted	More accepted
Sample-3		
Ingredients	I Trail	II Trail
Orange	180g	170g
Coconut milk	70ml	30ml
Sugar	10g	5g
Result	Less accepted	More accepted

characteristics like colour, odour, flavour, texture, appearance and palatability of all 4 samples. This shows that the changes that occur due to supplementation were not to a great extent.

Majority of the panel members *i.e.* 40 per cent liked sample 2 and 3 very much and 40 per cent liked sample 1 and 4 moderately.

Appy drink:

For characteristics such as colour, odour, texture appearance and palatability sample 3 was graded as very good and for characteristic flavour sample 2 was graded as very good.

Statistically tested using (ANOVA) shows that characteristic flavour exhibited non-significant difference and colour, odour, texture, appearance and palatability exhibited significant difference.

Majority of the panel members *i.e.* 60 per cent liked sample 3 extremely, 50 per cent of the panel members liked sample 2 very much and 60 per cent of the panel members liked sample 1 moderately.

Grapes juice:

In grapes juice sample 1 was graded as very good for the characteristics of colour, odour, flavour, texture, appearance and palatability as compared to sample 2 and 3.

Statistically tested using (ANOVA) shows that characteristics colour, odour and flavour exhibited non-significant difference and characteristics texture, appearance and palatability exhibited significant difference.

Majority of the panel members *i.e.* 50 per cent liked sample 1 very much, 40 per cent of the panel member liked sample 2 and 3 moderately.

Pineapple:

For characteristics such as colour, odour, texture and palatability sample 1 was graded as excellent and very good and for characteristics flavour and appearance sample 3 was graded as very good.

Statistically tested using (ANOVA) shows that there was a non-significant difference in characteristics like colour, odour, flavour, texture, appearance and palatability of all 3 samples.

Majority of the panel members *i.e.* 40 per cent liked sample 2 and 3 extremely and very much, 30 per cent of the panel members liked sample 1 very much and slightly.

Orange juice:

For characteristics such as colour, odour, flavour, appearance and palatability sample 3 was graded as very much and for characteristic texture sample 2 was graded as very good.

Statistically tested using (ANOVA) shows that

characteristic texture exhibited non-significant difference and colour, flavour, appearance and palatability exhibited significant differences. Majority of the panel members *i.e.* 50 per cent liked sample 2 very much, 40 per cent of the panel members liked sample 2 and 3 very much and moderately, respectively.

Nutritive value of supplemented beverages:

Apple juice:

Results show that total energy for 200ml original apple juice was 118kcal. After supplemented apple juice energy increased by +23kcal in sample 1, +20.3kcal in sample 2, +131.2kcal in sample 3 and +6.4kcal in sample 4. Total carbohydrate for 200ml original apple juice was 26.8g. After supplemented apple juice carbohydrate increased by +0.9g in sample 1, +.81g in sample 2, +4.4g in sample 3 and +1.27g in sample 4. Total fat for 200ml original apple juice was 1g. After supplemented apple juice fat increased by +1.8g in

sample 1, +1.4g in sample 2, +12.15g in sample 3 and -3.5g in sample 4. Total protein for 200ml original apple juice was 0.4g. After supplemented apple juice protein increased by +1.5g in sample 1, +1.16g in sample 2, +0.96g in sample 3 and +0.1g in sample 4. Total calcium for 200ml original apple juice was 20mg. After supplemented apple juice calcium increased by +55.6mg in sample 1, +56.2mg in sample 2, +2.21mg in sample 3 and +39.75mg in sample 4. Total iron for 200ml original apple juice was 1.32mg. After supplemented apple juice iron decreased by -0.23mg in sample 1, -18mg in sample 2, increased by +0.26mg in sample 3 and +0.44mg in sample 4. Total vitamin C for 200ml original apple juice was 2 mg. After supplemented apple juice vitamin C increased by +0.5 mg in sample 1, 0 mg in sample 2, +0.6mg in sample 3 and +5.5 mg in sample 4. Total vitamin A for 200 ml original apple juice was 0 mg. After supplemented apple juice vitamin A increased by +26.5µg in sample 1, +12.4 µg in sample 2, 0 µg in sample 3 and + 945 µg in sample 4. Total phosphorus for 200ml original apple juice was 28mg. After

Table 1: Sensary characteristic through rating scale (Apple juice)

Characteristics	Sample 1		Sample 2		Sample 3		Sample 4		ANOVA
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Color	3.7	0.78	3.6	0.91	3.5	1.0	4.4	0.6	2.02 S
Odour	3.7	0.78	3.2	0.87	3.4	0.8	3.7	0.78	0.81 S
Flavour	3.6	1.2	3.7	1.1	3.7	0.9	3.7	0.78	.09 S
Texture	3.6	0.8	3.2	0.7	3.6	0.9	3.7	0.9	.64 S
Appearance	3.4	0.91	3.6	1.0	3.9	0.5	3.8	0.8	.69 S
Palatability	4.1	0.5	3.3	1.0	3.8	0.7	3.4	0.91	1.86 S

S at 0.05 level of significant, \$ At 0.05 level of not significant, S1=Milk, S2=Whey protein, S3=Coconut milk, S4=Beet root and carrot

Table 2: Sensary characteristic through rating scale

(Appy drink)

Characteristics	Sample 1		Sample 2		Sample 3		ANOVA
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Colour	2.7	0.9	3.7	0.45	4.3	0.78	10.6 S
Odour	2.8	0.6	3.5	0.8	3.9	1.04	4.02 S
Flavour	3.2	1.0	4.2	0.87	3.3	0.78	2.67 S
Texture	2.3	0.9	3.5	0.67	4.4	0.48	20.18 S
Appearance	2.8	0.6	3.4	0.66	4.1	0.7	9.04 S
Palatability	3.1	0.3	4.0	0.89	4.3	1.0	5.57 S

S at 0.05 level of significant, \$ At 0.05 level of not significant

Table 3: Sensary characteristic through rating scale

(Grapes juice)

Characteristics	Sample 1		Sample 2		Sample 3		ANOVA
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Colour	4.0	0.63	3.4	0.91	3.3	1.1	1.66 S
Odour	4.0	0.63	3.0	1	3.1	1.1	3.13 S
Flavour	3.7	1.1	3.0	1.26	3.3	0.78	0 S
Texture	4.1	0.7	3.1	0.83	3.5	0.80	3.42 S
Appearance	4.0	0.44	2.8	0.87	3.4	0.16	6.6 S
Palatability	3.8	0.74	2.7	0.9	3.1	0.83	3.94 S

S at 0.05 level of significant, \$ At 0.05 level of not significant

supplemented apple juice phosphorus increased by +38.05mg in sample 1, +31.66mg in sample 2, +37.85mg in sample 3 and +278.55mg in sample 4.

Thus, it can be concluded that supplemented apple juice is more nutritious as compared to original apple juice except iron for sample 1 and sample 2 which is higher in original apple juice. Supplementation increased the vitamin a contents of all 4 samples of apple juice which was not present in original apple juice.

Appy drink:

Result shows that total energy for 200ml original appy drink was 134kcal. After supplemented appy drink energy increased by +19.9kcal in sample 1, +17.5kcal in sample 2, +128.8kcal in sample 3. Total carbohydrate for 200ml original appy drink was 32g. After supplemented appy drink carbohydrate decreased by -0.83g in sample 1, -0.23g in sample 2 and increased by +3.74g in sample 3. Total fat for 200ml original appy drink was 0.4g. After supplemented appy drink fat increased by +2.75g in sample 1, +1.52g in sample 2 and +12.64g in sample 3. Total protein for 200ml original appy drink was 1 g. After supplemented appy drink protein increased by +1.35g in sample 1, +1.04g in sample 2 and +0.87g in sample 3. Total calcium for 200ml original appy drink was 58mg. After supplemented appy drink calcium increased by +46.1mg in sample 1, +48.6mg in sample 2 and decreased by -3.6mg in sample 3. Total iron for 200ml original appy drink was 0mg. After supplemented appy drink iron increased by +0.1mg in sample 1, +.08mg in sample 2 and +0.48mg in sample 3. Total vitamin C for 200ml original appy

drink was 11.8mg. After supplemented appy drink vitamin C decreased by -1.95mg in sample 1, -1.96mg in sample 2 and -.87mg in sample 3. Total vitamin A for 200ml original appy drink was 0mg. After supplemented appy drink vitamin A increased by 26.5µg in sample 1, +12.4µg in sample 2 and 0µg in sample 3. Total phosphorus for 200ml original appy drink was 0mg. After supplemented appy drink phosphorus increased by +45.05mg in sample 1, +37.2mg in sample 2 and +42.05mg in sample 3. Thus, it can be concluded that supplemented appy drink has higher nutrient content as compared to original appy drink. Supplementation increased iron, vitamin C, vitamin A and phosphorus content of all 3 samples of appy drink which is not present in original appy drink.

Grapes juice:

Result shows that total energy for 200ml original grapes juice was 142kcal. After supplemented grapes juice energy increased by +17.9kcal in sample 1, +15.5kcal in sample 2 and +127.6kcal in sample 3. Total carbohydrate for 200ml original grapes juice was 33g. After supplemented grapes juice carbohydrate decreased by -1.08g in sample 1, -0.43g in sample 2 and increased by +3.59g in sample 3. Total fat for 200 ml original grapes juice was 0.6 g. After supplemented grapes juice fat increased by +1.9g in sample 1, +1.48g in sample 2 and +12.21g in sample 3. Total protein for 200 ml original grapes juice was 1g. After supplemented grapes juice protein increased by +1.35g in sample 1, +1.04g in sample 2 and +0.8g in sample 3. Total calcium for 200 ml original grapes juice was 40 mg. After supplemented grapes juice calcium increased by +50.6mg in sample 1, +52.2mg in sample 2

Table 4: Sensary characteristic through rating scale

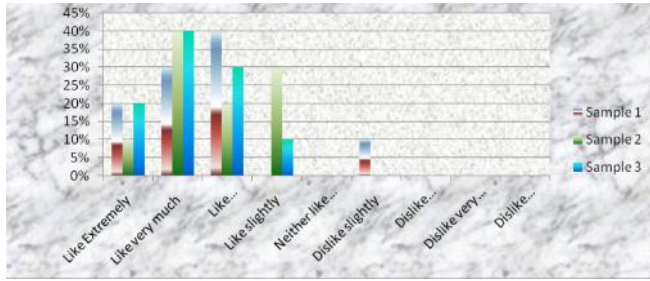
Characteristics							(Pineapple juice)	
	Sample 1		Sample 2		Sample 3		ANOVA	
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Colour	4.5	0.67	4.3	1.0	4.3	0.78	2.6	S
Odour	4.0	0.89	3.6	0.8	3.7	0.78	0.6	S
Flavour	3.6	1.1	3.3	1.0	4.2	0.74	2.1	S
Texture	4.0	0.77	3.9	0.7	3.9	0.53	0.1	S
Appearance	3.9	1.0	3.8	0.97	4.2	0.87	0.5	S
Palatability	5.8	0.97	3.7	0.64	4.0	0.63	0.38	S

S at 0.05 level of significant, \$ At 0.05 level of not significant

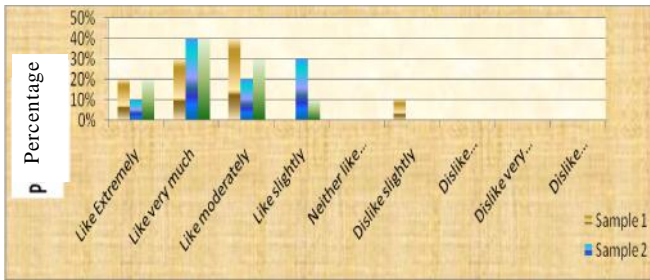
Table 5: Sensary characteristic through rating scale

Characteristics							(Orange juice)	
	Sample 1		Sample 2		Sample 3		ANOVA	
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Colour	3.1	0.3	4.0	0.89	4.3	1.0	5.57	S
Odour	2.8	0.6	3.4	0.66	4.1	0.7	9.04	S
Flavour	2.3	0.9	3.5	0.67	4.4	0.48	20.18	S
Texture	3.2	1.0	4.2	0.87	3.3	0.78	2.67	S
Appearance	2.8	0.6	3.5	0.8	3.9	1.04	4.02	S
Palatability	2.7	0.9	3.7	0.45	4.3	0.78	10.6	S

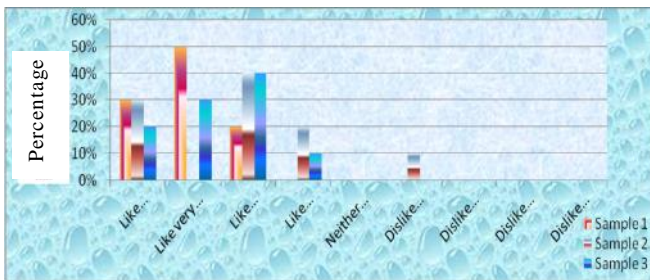
. S at 0.05 level of significant, \$ At 0.05 level of not significant



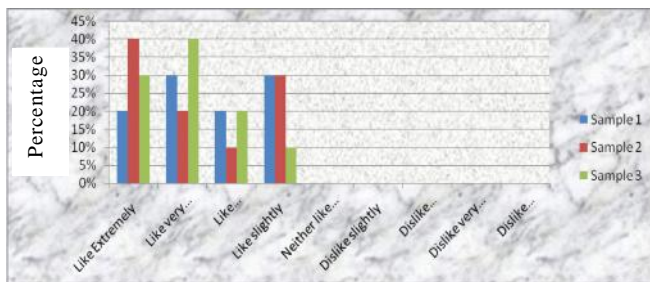
Apple juice



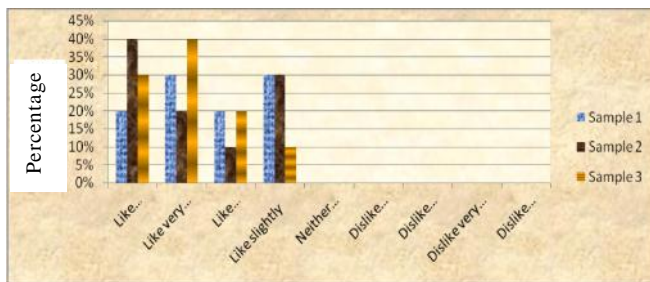
Appy drink



Grapes juice



Pineapple juice



Orange juice

Fig. 1: Likes and dislikes of the panel members through henonic scale (n=10)

and decreased by -0.9mg in sample 3. Total iron for 200 ml original grapes juice was 1.04 mg. After supplemented grapes juice iron decreased by -0.16mg in sample 1, -13mg in sample 2 and increased by +0.32mg in sample 3. Total vitamin C for 200 ml original grapes juice was 2 mg. After supplemented grapes juice vitamin C increased by +0.5mg in sample 1, 0mg in sample 2 and +0.6mg in sample 3. Total vitamin A for 200 ml original grapes juice was 0 µg. After supplemented grapes juice vitamin A increased by +26.5µg in sample 1, +12.4µg in sample 2 and 0µg in sample 3. Total phosphorus for 200 ml original grapes juice was 60 mg. After supplemented grapes juice phosphorus increased by +30.05mg in sample 1, 25.25mg in sample 2 and +33.05mg in sample 3.

Thus, it can be concluded that supplemented grapes juice except carbohydrate for sample 1 and sample 2. Supplementation increased vitamin A and phosphorus content of all 3 samples of grapes juice

Pineapple juice:

Result shows that total energy for 200ml original pineapple juice was 92 kcal. After supplemented pineapple juice energy increased by +30.4kcal in sample 1, +25.5kcal in sample 2 and +135.1kcal in sample 3. Total carbohydrate for 200ml original pineapple juice was 21.6 g. After supplemented pineapple juice carbohydrate increased by +1.77g in sample 1, +1.85g in sample 2 and +5.3g in sample 3. Total fat for 200ml original pineapple juice was 0.2 g. After supplemented pineapple juice fat increased by +2.0g in sample 1, +1.56g in sample 2 and +12.27g in sample 3. Total protein for 200ml original pineapple juice was 0.8 g. After supplemented pineapple juice protein increased by +1.4g in sample 1, +1.08g in sample 2 and +0.90g in sample 3. Total calcium for 200ml original pineapple juice was 40mg. After supplemented pineapple juice calcium increased by +50.6mg in sample 1, +52.2mg in sample 2 and decreased by -0.9mg in sample 3. Total iron for 200ml original pineapple juice was 4.84mg. After supplemented pineapple juice iron decreased by -1.1mg in sample 1, -.86mg in sample 2 and -0.25mg in sample 3. Total vitamin C for 200ml original pineapple juice was 78mg. After supplemented pineapple juice vitamin C decreased by -18.5mg in sample 1, -15.2mg in sample 2 and -10.8mg in sample 3. Total vitamin A for 200ml original pineapple juice was 36mg. After supplemented pineapple juice vitamin A increased by +17.5µg in sample 1, +5.2µg in sample 2 and decreased by -5.4µg in sample 3. Total phosphorus for 200ml original pineapple juice was 18mg. After supplemented pineapple juice phosphorus increased by +40.5mg in sample 1, +33.65mg in sample 2 and +39mg in sample 3.

Thus, it can be concluded that supplemented pineapple juice was more nutritious as compared to original pineapple juice except for iron and vitamin C.

Orange juice:

Result shows that total energy for 200ml original orange juice was 96 kcal. After supplemented orange juice energy increased by +29.4kcal in sample 1, +24.7kcal in sample 2 and +134.5kcal in sample 3. Total carbohydrate for 200ml original orange juice was 21.8 g. After supplemented orange juice carbohydrate increased by +1.72g in sample 1, +1.81g in sample 2 and +5.27g in sample 3. Total fat for 200ml original orange juice was 0.4 g. After supplemented orange juice fat increased by +1.95g in sample 1, +1.52g in sample 2 and +12.24g in sample 3. Total protein for 200ml original orange juice was 1.4 g. After supplemented orange juice protein increased by +1.25g in sample 1, +2.21g in sample 2 and +0.81g in sample 3. Total calcium for 200ml original orange juice was 52 mg. After supplemented orange juice calcium increased by +47.6mg in sample 1, +49.8mg in sample 2 and decreased by -2.7mg in sample 3. Total iron for 200ml original orange juice was 0.64 mg. After supplemented orange juice iron decreased by -0.06mg in sample 1, -0.05mg in sample 2 and increased +0.39mg in sample 3. Total vitamin C for 200ml original orange juice was 60mg. After supplemented orange juice vitamin C decreased by -14mg in sample 1, -11.6mg in sample 2 and -8.1mg in sample 3. Total vitamin A for 200ml original orange juice was 2208mg. After supplemented orange juice vitamin A decreased by -25.5µg in sample 1, -29.2µg in sample 2 and -9.2µg in sample 3. Total phosphorus for 200ml original orange

juice was 40mg. After supplemented orange juice phosphorus increased by +36.05mg in sample 1, +29.25mg in sample 2 and +36.05mg in sample 3.

Thus, it can be concluded that supplemented orange juice had more nutrient as compared to original orange juice except iron, vitamin C and vitamin A. supplementation increased phosphorus, calcium and protein content for all 3 samples.

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Received : 06.12.2013; Revised: 01.03.2014; Accepted : 10.03.2014