



FORMULATION OF *KAINTH* (*PYRUS SEROTINA*) BASED FUNCTIONAL FOOD PRODUCTS AND CHANGES DURING STORAGE

¹Anita Kumari and Y. S Dhaliwal ²

¹Department of Nutrition Biology, School of Interdisciplinary and Life Sciences,
Central University of Haryana, Mahendergarh, Haryana-123029

²Department of Food Science, Nutrition & Technology, College of Home Science,
CSK Himachal Pradesh Krishi Vishvavidalaya, Palampur - 176 062, India.

ABSTRACT

The present investigation was undertaken with aim to analyze physico- chemical, nutritional, proximate, mineral and functional constituent's present in fig fruit and to develop functional food products from highly nutritious indigenous kainth fruit (Pyrus serotina) of Himachal Pradesh. The fruit contain good amounts of vitamin C, pectin and mineral content. Spread was prepared by using this fruit. Instant chutney powder was also prepared with supplementation of wild aonla in different proportions of kainth powder : wild aonla powder. The pH and reducing sugars increased while acidity and ascorbic acid decreased with the increase of storage interval in instant chutney powder. The prepared products were evaluated organoleptically to a panel of 10 members at different storage intervals and the products were acceptable even up to storage interval of 9 months at ambient conditions. The colour, taste, flavour and consistency of all the products were found to be good.

Key words: Kainth, products, nutritional, storage stability, organoleptic evaluation

Introduction: *Pyrus serotina* commonly known as *kainth* mostly found in Kangra, Mandi and Kullu districts of Himachal Pradesh. Locally the fruit is known by the name of *kainth*. It is cheaper and highly nutritious underutilized fruit of sub tropical region and possesses great therapeutic and medicinal value. Fruits are eaten by children and local people. The fruit is smaller in size. The fruit is purple from outside and pale yellow in colour from inside. The fruit

ripens in the month of July- August. Fruits are usually astringent and slight acidic in taste. The plant is used as a rootstock for pear. The fruit is eaten only in ripe state. By keeping in view the significance of this fruit, attempts have been made to formulate products from this fruit.

Materials and Methods

The fruit was procured from Kullu district of Himachal Pradesh while wild aonla was procured from palampur, Kangra district. The fruits were sorted, graded and washed under running tap water to remove adhering dirt etc. The fruit was analyzed for their physico-chemical analysis. The specific parameters viz fruit colour, flesh colour and shape were assessed by visual appearance. Physical methods viz., length and breadth of the fruit were assessed by using vernier caliper. The weight of the fruit was assessed by electronic weighing balance. The TSS and pH content was measured by hand refractometer and pH meter, respectively. The moisture, protein, fat, ash and fibre and sugars were estimated¹. The carbohydrates were determined as².

Total carbohydrates (%) = 100- (moisture % + protein % + fat % + fibre % + ash %)

The acidity, sugars and minerals were estimated³. The ascorbic acid, β -carotene, Vitamin A, anthocyanin and pectin were assessed⁴. The tannins, simple and total phenols were estimated by the method⁵. The NDF, ADF and hemicellulose contents were estimated by the method⁶. The available/ digestible carbohydrates were determined by subtracting NDF from total carbohydrate. The unavailable/ indigestible carbohydrates were determined by subtracting available carbohydrate from total carbohydrate. The total energy was calculated by multiplying by the protein, fat and total carbohydrate by 4.0, 9.0 and 4.0, respectively and summing up the values. The available energy was calculated by multiplying by the per cent protein, fat and available carbohydrate by 4.0, 9.0 and 4.0, respectively and summing up the values. The values were reported as KCal /100g on dry matter basis.

Sample preparation

The procured fruits were washed thoroughly under running tap water. The fruits were boiled and passed through a pulper to obtain homogeneous pulp. The pulp was sieved with the help of muslin cloth. 1.0g sodium benzoate was added to 1 litre of pulp and stored in pre-sterilized glass bottles for preparation of spread. The fruits (*Kainth* and wild aonla) were dried to make instant chutney powder in different proportions of *kainth*: *amla* powder. The recipe for the preparation

of spread was standardized in the lab. The instant chutney powder was prepared in different combinations of kainth: aonla powder (100:00, 75:25, 50:50, 25:75, 00:100). The products were assessed for their nutritional analysis as per the methods³. The 9 point Hedonic scale⁷ was employed for the sensory evaluation of prepared products. The prepared products were evaluated organoleptically for colour, taste, flavour, texture/consistency and overall acceptability to a panel of 10 judges by using 9 point Hedonic scale.

Result and Discussion

The specific parameters of *Pyrus serotina* fruit shows that the fruit and flesh colour was observed as light brown and pale yellow with round shape. The fruit had spotted skin and slight astringent and acidic in taste. The flesh firmness was soft, pulpy and gritty. The mean values for length, breadth and weight were recorded as 4.24 (cm), 4.44 (cm) and 50.10 (g), respectively. The specific gravity of the fruit was 1.0 g/ml. The mean values for TSS (⁰B), pH, total sugar, reducing sugar and non-reducing sugars were reported as 19.00, 3.94, 7.45, 4.80 and 2.51, respectively. The data on proximate composition reveal that moisture, fat, fibre, ash, protein and total carbohydrate contents were reported as 72.00, 0.46, 1.43, 0.83, 3.26 and 22.02 per cent, respectively. The dietary fibre constituents viz., NDF, ADF and hemi-cellulose contents were noted as 14.86, 11.20 and 3.66 per cent. The available, unavailable carbohydrate (%), total energy and available energy (Kcal) were reported as 8.49, 14.86, 110.68 and 51.21, respectively. The mean values of anti-nutrients viz., tannins, simple and total phenols were reported as 0.48, 9.77 and 10.25 per cent, respectively.

Table 2 shows functional constituents of *kainth* fruit. Vitamin C and pectin contents were noted as 2.67mg/100g and 0.77 per cent, respectively. The data on per cent mineral content shows that the fruit the fruit contain calcium (27.13), phosphorous (15.12), magnesium (0.17), iron (3.18), potassium (2.81). The results of the present investigation are in agreement with⁸.

Quality evaluation of *kainth* based value added products

a) Spread

The data pertaining to effect of storage on nutritional and sensory parameters of *kainth* spread is given in Table 3. According to the results obtained, it has been observed from the table that the TSS value for fresh was 68.03⁰B which did not alter after 3 month of storage and thereafter a variation was noticed up to 9 month of storage with mean value reported as 68.02⁰B.

69.00°B TSS for grape spread and the TSS remained constant during 6 month of storage⁹.

The pH values varied significantly when the value of fresh was compared with the values of different storage intervals. The pH content increases with the increase of storage period. The pH values ranged from 2.96 to 3.27 from the initial day of analysis. However, a non-significant decrease in per cent acidity from 0.55 to 0.42 was reported. A decrease in acidity might be due to chemical interaction between organic acid. A decrease in acidity from 0.56 to 0.50 per cent from initial day of storage to 9 month of storage in grape spread⁹. So the results of the present findings are in conformation. There is a complete loss of ascorbic acid during 0, 3, 6 and 9 months of storage. Complete loss of ascorbic acid might be due to prolonged heating of *kainth* pulp which leads to complete loss of ascorbic acid. The values for per cent reducing sugars varied non-significantly among different storage intervals. The values for total sugar content ranged from 65.90 to 62.51 per cent. The non-reducing sugar content decreased significantly with the increase of storage period. The increase in reducing sugar might be assigned to the conversion of non-reducing sugar, owing to the process of hydrolysis. An increase in total sugars might be due to the hydrolysis of polysaccharides like pectin and starch into simple sugars while decrease in non-reducing sugars might be due to the hydrolysis of non-reducing sugars to reducing sugars during storage. The results are in conformation with who observed same results for grape spread⁹.

Further scrutiny of data reveals effect of storage on sensory scores for *kainth* spread. The scores for colour varied non-significantly. As far as taste and flavour are concerned, the scores for taste and flavour varied from 6.80 to 6.10 and 7.30 to 6.10 from the initial day of storage to 9 month of storage. The consistency of a product decreased non-significantly from 8.00 to 7.70. The score for overall acceptability at fresh was 7.27, which decreased significantly to 7.12, 6.80 and 6.57 for 3, 6 and 9 months of storage interval. Sensory scores decreased from 8.50 ± 0.04 to 7.54 ± 0.32 during storage of 6 months in grape spread⁹. The product had a good acceptability during storage.

b) Instant chutney powder

Data with respect to effect of blending of wild aonla and storage on nutritional parameters are presented in Table 4. The data regarding pH content reveal that the pH values varied from 2.94 to 3.07. The mean value for freshly prepared pure *kainth* based instant chutney powder was 3.06 which varied non-significantly up to 75:25 proportions of *kainth*: wild aonla

based instant chutney powder. Irrespective of blending proportions, with storage the pH values remained constant for 3 month and thereafter the values increased significantly. An increase in pH from 3.85 to 3.86 and 2.90 to 2.94 in pudina and gongura instant chutney powder during 3 months of storage¹⁰.

The data with respect to per cent acidity (as citric acid) shows that as the concentration of wild aonla increased per cent acidity. The value for acidity for all the blends varied significantly with

maximum acidity was noted in 00:100 proportions of *kainth*: wild aonla (2.49 %) and lowest in pure *kainth* based instant chutney powder (1.35 %). However, the mean storage values decreased with the increase of storage period. The decrease in acidity might be due to chemical interaction between organic acids. The results of the present investigation are in agreement with the results¹⁰. The mean values for ascorbic acid (mg/100 g) content exhibits that blending of wild aonla powder had significant effect on ascorbic acid content. As the concentration of wild aonla powder increased, the ascorbic acid content increases for different proportions. On storage, the ascorbic acid content decreased. A decrease in ascorbic acid content might be due to oxidation of ascorbic acid to dehydro-ascorbic acid in the presence of oxygen in its environment. The data pertaining to reducing, total and non-reducing sugar content reveal that addition of wild aonla powder in different proportions resulted in a significant difference. Similarly with storage the values for reducing, total and non-reducing sugars varied significantly.

The mean range for reducing, total and non-reducing sugars for all the blends were 4.95 to 3.42, 7.63 to 5.54 and 2.57 to 1.97 per cent, respectively. Irrespective of blending proportions, the mean storage values for reducing, total and non-reducing sugars decreased from 3.91 to 4.29, 6.93 to 5.94 and 2.86 to 1.57 per cent, respectively. The decrease in total sugar content might be due to maillard reaction and other chemical reactions of sugar with acids during the storage whereas decrease in non-reducing sugars might be due to the higher rate of conversion of the non-reducing sugars to the reducing sugar.

c) Organoleptic evaluation

Table 5 depicts effect of blending and storage on organoleptic scores of instant chutney powder.

The results with respect to colour scores reveal that all the blends had non-significant effect. However, storage produced a non-significant effect on colour till 6 months of storage and thereafter, the scores varied significantly. The scores with respect to taste reveal that equal

blending of *kainth* : wild aonla powder resulted in higher scores for taste (7.32), followed by 25:75 (7.07), 00:100 (6.85), 75:25 (6.60) and 100:00 (6.37). The least scores for taste were observed for pure *kainth* based instant chutney powder. The decrease in taste scores for pure *kainth* based instant chutney powder is because of bland taste of fruit. The mean scores for flavour shows that the highest mean score was observed for pure aonla based instant chutney powder (7.15) and minimum flavour scores were observed for pure *kainth* based instant chutney powder (6.17). The consistency scores for all the blends were in the range of 7.77 to 7.90. The scores for consistency varied non-significantly when pure *kainth* based instant chutney powder was compared with other blends. However, the mean consistency scores decreased with the increase of storage interval.

The overall acceptability of the product shows that the maximum score was noticed for pure aonla based instant chutney powder (7.53). However, all the blends except 00:100 proportions of *kainth*: wild aonla, the scores were in the range of 7.16 to 7.44. Irrespective of blending proportions, the overall acceptability of the product decreases from 7.62 to 6.94 from the initial day of storage to 9 months of storage interval. Similar trend in pudina and gongura based instant chutney powder¹⁰. Similar observations were recorded for mango chutney powder¹¹.

Table 1. Specific parameters of *kainth* (*Pyrus serotina*) fruit

Parameters	Observations/ Mean values
Specific parameters	
Fruit colour	Light brown
Flesh colour	Pale Yellow
Shape	Round
Taste	Astringent and acidic
Flesh firmness	Soft, pulpy and gritty
Physical parameters	
Length (cm)	4.24
Breadth (cm)	4.44
Weight (g)	50.10
Specific gravity (g/ml)	1.00
Nutritional parameters	
TSS (^o B)	19.0
Ph	3.94
Acidity (% Citric acid)	1.44
Reducing sugars (%)	4.80

Total sugars (%)	7.45
Non- reducing sugars (%)	2.51
Proximate composition	
Moisture (%)	72.0
Fat (%)	0.46
Fibre (%)	1.43
Ash (%)	0.83
Protein (%)	3.26
Total carbohydrates (%)	22.02
Other parameters	
NDF (%)	14.86
ADF (%)	11.20
Hemicellulose (%)	3.66
Available Carbohydrates (%)	8.49
Unavailable Carbohydrates (%)	14.86
Total Energy (Kcal/100g)	110.68
Available Energy (Kcal/100g)	51.21
Anti- nutritional Parameters	
Tannins (%)	0.48
Simple Phenols (%)	9.77
Total Phenols (%)	10.25

Table 2: Functional constituents in kainth (*Pyrus serotina*) fruit

Functional constituents	
Vitamin C (mg/100g)	2.67
Pectin (%)	0.77
Minerals	
Calcium (mg/100g)	27.13
Phosphorous (mg/100g)	15.12
Magnesium (mg/100g)	0.17

Iron (mg/100g)	3.18
Potassium (mg/100g)	2.81

Table 3: Effect of storage on nutritional and sensory parameters of *kainth* spread

Parameters	Storage (months)					CD (P≤0.05)
	Fresh	3	6	9	Mean	
TSS (⁰ B)	68.03	68.03	68.00	68.03	68.02	NS
pH	2.96	3.01	3.18	3.27	3.10	0.02
Acidity (% Citric acid)	0.55	0.51	0.47	0.42	0.49	NS
Ascorbic acid (mg/100g)	-	-	-	-	-	-
Reducing sugars (%)	58.62	59.22	59.52	59.62	59.24	NS
Total sugars (%)	65.90	64.68	63.59	62.51	64.17	0.76
Non- Reducing sugars (%)	6.92	5.19	5.58	2.84	5.13	0.58
Sensory Parameters (9 point Hedonic Scale)						
Colour	7.00	7.00	6.80	6.50	6.82	NS
Taste	6.80	6.50	6.30	6.10	6.42	0.46
Flavour	7.30	6.70	6.30	6.10	6.60	0.76
Consistency	8.00	8.00	7.80	7.70	7.87	NS
Overall acceptability	7.27	7.12	6.80	6.57	6.94	0.58

Table 4 Effect of blending and storage on nutritional parameters of *kainth* and wild aonla based Instant chutney powder

Parameters	Blends K: WA	Storage (months)				
		Fresh	3	6	9	Mean
pH	100:00	3.02	3.01	3.07	3.13	3.06
	75:25	3.02	3.02	3.08	3.16	3.07
	50:50	2.97	2.97	3.01	3.03	2.99
	25:75	2.95	2.96	2.98	2.99	2.97
	00:100	2.93	2.94	2.95	2.97	2.94
	Mean	2.98	2.98	3.02	3.05	
Acidity (% Citric acid)	100:00	1.45	1.37	1.33	1.27	1.35
	75:25	1.74	1.66	1.60	1.57	1.64
	50:50	1.99	1.96	1.92	1.82	1.92.

	25:75	2.49	2.39	2.35	2.30	2.38
	00:100	2.52	2.51	2.38	2.38	2.49
	Mean	2.04	1.98	1.91	1.87	
Ascorbic acid (mg/ 100g)	100:00	1.31	1.02	0.44	-	0.92
	75:25	92.66	83.07	62.27	49.00	72.75
	50:50	201.33	187.33	171.67	154.00	178.58
	25:75	400.67	394.33	364.00	336.00	373.75
	00:100	533.87	514.27	502.13	477.00	506.82.
	Mean	245.96	236.06	221.07	203.42	
Reducing sugars (%)	100:00	4.77	4.88	5.03	5.13	4.95
	75:25	4.51	4.69	4.87	5.07	4.78
	50:50	3.54	3.63	3.71	3.81	3.67
	25:75	3.50	3.47	3.46	3.62	3.51
	00:100	3.23	3.36	3.26	3.83	3.42
	Mean	3.91	4.00	4.07	4.29	
Total sugars (%)	100:00	8.15	7.62	7.51	7.20	7.63
	75:25	7.66	7.20	6.82	6.45	7.03
	50:50	6.46	6.49	5.85	5.58	6.09
	25:75	6.35	5.86	5.66	5.42	5.82
	00:100	6.05	5.72	5.30	5.07	5.54
	Mean	6.93	6.59	6.23	5.94	
Non- reducing sugars (%)	100:00	3.32	2.63	2.35	1.97	2.57
	75:25	2.95	2.40	2.02	1.32	2.17
	50:50	2.77	2.42	2.04	1.68	2.23
	25:75	2.74	2.27	2.08	1.71	2.20
	00:100	2.54	2.23	1.93	1.17	1.97
	Mean	2.86	2.39	2.09	1.57	

CD (P≤0.05)	pH	Acidity	Ascorbic acid	Reducing sugars	Total sugars	Non-Reducing sugars
Between Blends (A)	0.01	0.07	5.81	0.05	0.16	0.16
Between Storage (B)	0.01	0.06	5.20	0.05	0.15	0.15
Between Blends x Storage (AXB)	0.02	0.13	11.63	0.11	0.32	0.34

Table 5: Effect of blending and storage organoleptic scores (9 point Hedonic Scale) of *kainth* based instant chutney powder

Parameters	Blends K :WA	Storage (months)				
		Fresh	3	6	9	Mean
Colour	100:00	8.10	8.00	7.90	7.80	7.95
	75:25	8.00	8.00	7.80	7.70	7.87
	50:50	8.20	8.10	7.80	7.70	7.95
	25:75	8.00	8.00	7.90	7.80	7.92
	00:100	8.00	8.10	7.80	7.60	7.87
	Mean	8.06	8.00	7.80	7.70	
Taste	100:00	6.70	6.50	6.30	6.00	6.37
	75:25	7.00	6.80	6.50	6.10	6.60
	50:50	8.00	7.60	6.90	6.80	7.32
	25:75	7.70	7.30	6.80	6.50	7.07
	00:100	7.40	7.10	6.60	6.30	6.85
	Mean	7.36	7.06	6.62	6.34	
Flavour	100:00	6.50	6.40	6.00	5.80	6.17
	75:25	6.80	6.50	6.30	6.00	6.40
	50:50	7.00	6.90	6.50	6.20	6.65
	25:75	7.30	7.10	6.70	6.40	6.87
	00:100	7.60	7.30	7.00	6.70	7.15
	Mean	7.04	6.84	6.50	6.22	
Consistency	100:00	8.10	8.00	7.70	7.50	7.82
	75:25	8.10	8.00	7.60	7.40	7.77
	50:50	8.10	8.10	7.60	7.50	7.82
	25:75	8.20	8.10	7.70	7.60	7.90
	00:100	8.10	8.10	7.60	7.40	7.77
	Mean	8.12	8.00	7.64	7.48	
Overall Acceptability	100:00	7.32	7.25	6.97	6.77	7.08
	75:25	7.45	7.35	7.05	6.80	7.16

	50:50	7.67	7.55	7.12	6.92	7.32
	25:75	7.77	7.65	7.27	7.07	7.44
	00:100	7.90	7.77	7.32	7.12	7.53
	Mean	7.62	7.51	7.15	6.94	

CD (P≤0.05)	Colour	Taste	Flavour	Consistency	Overall acceptability
Between Blends (A)	0.34	0.33	0.38	0.37	0.19
Between Storage (B)	0.31	0.30	0.34	0.33	0.17
Between Blends x Storage (AXB)	0.69	0.67	0.76	0.75	0.39

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