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RESEARCH ARTICLE

NUTRITIONAL AND ORGANOLEPTIC EVALUATION OF *PINNI* PREPARED FROM DIFFERENT VARIETIES OF KIDNEY BEANS FLOUR OF HIMACHAL PRADESH

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ABSTRACT

The present study was carried out to develop kidney beans *pinni* which would be nutritious for the body. This is a ready to eat snack which can be easily eaten by the individuals. To prepare *pinni* kidney beans and wheat flour was used and they were combined in the ratio [100:0] [90:10] [70:30] and [50:50]. The kidney beans flour was formulated till the desired taste was achieved. The product was analyzed for major nutritional constituent's viz. moisture, protein, fat, fiber, ash, carbohydrates and amino acid, fatty acids and starch contents. A panel of ten experts was taken from the background of Nutrition.They were given 9 Hedonic scale to score the *pinni*. The samples were rated on the basis of color, texture, flavour and Overall acceptability.

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INTRODUCTION

Legumes occupy an important place in human nutrition, especially popularized among population of the developing countries. These are the food source that plays a significant role in traditional diets all over the world. Legumes are excellent sources of proteins, complex carbohydrates and fairly good sources of minerals, vitamins and polyunsaturated fatty acids. Majority of Indian population is vegetarian and legumes are treated as an important economical source of supplementary proteins (S. Kaur *et al*, 2009). Rapid increase in population is creating a continuous pressure on the researchers of these countries to find out an alternative or additional food ingredient to meet the demands of quality food in the future. Ghee traditionally made from cow's milk, is widely used in Indian cuisines. Ghee is an energy booster and also helps in curing allergies. It reduces inflammation and has antioxidant activity. It boosts immune system and aids in healthy heart maintenance. It prevents macular degeneration and development of cataract. Ghee is used in many of Indian recipes. Almonds are nutritionally dense food and are rich source of B-vitamins, riboflavin and niacin, vitamin E, minerals, calcium, iron, zinc etc.

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Almonds are also rich in dietary fibers. They also have cholesterol lowering properties. Almonds help prevent heart disease and heart attacks. They support healthy brain function. They maintain skin health. They help control blood sugar level and helps prevent diabetes. Prevents overeating hence helps in weight control. Almonds increase nutrients absorption and increase digestive health. They help fight inflammation as well as cancer. They help to maintain dental and bone health. Cashews are full of nutrition as they contain protein, minerals, calcium, iron, zinc, magnesium and potassium. They boost immune system. They help to lower risk of formation of gall stones and they also promote formation of red blood cells. They help to maintain good health of bones. Some of the kidney beans varieties that are grown in different of regions of Himachal Pradesh have their specialties such as Kanchan (HPR-35) which have semi-dwarf growth, determinate and early maturing variety (70-80 days) and recommended for mid and high hill areas. It has mottled deep pink bold grains with good cooking quality. Its yield is 12-15 q/ha. Jwala (HPR-12) is early maturing (75-85 days) and is erect and dwarf having compact plant type. Pod length is 8-10 cm, each pod contains 3-4 seeds and its 100 seed weight is 38-40 g. It yields, on an average, 12-15 q/ha. The strain has attractive scarlet seed colour. Suitable for cultivation in Kullu, Barot, Shimla and Chamba valleys between 1100-1800 m. Baspa (KRC-8) is a semi-dwarf variety and matures in 110-120 days. It is recommended for high hill areas of Himachal Pradesh.

It has attractive magenta coloured bold grains with good cooking quality. It averages yield is 18-20 q/ha. Him1 is a dwarf and early maturing (80-90 days) variety. Pods are 10-13 cm long containing 4-5 seeds per pod. The seeds are light pinkish with dark red spots. Besides, this variety is good flavoured. Its average yield is 9 q/ha. Triloki kidney bean (K-198) has determinate bushy growth, white flowers, broad dark green leaves, bold and creamish yellow coloured seeds with good cooking quality and taste. The height is 45-55 cm and matures in 98- 100 days. It is resistant to bacterial blight, angular leaf spot and anthracnose in whole in Zone IV except in Sangla valley where it is moderately susceptible to anthracnose. It is tolerant to shattering. Average yield is 25-27 q/ha. The incorporation of legumes in the daily diet has many beneficial physiological effects in controlling and preventing various metabolic diseases such as diabetes mellitus, coronary heart disease and colon cancer (R.N. Tharanathan and S. Mahadevamma, 2003). It has been reported by (B. D. Oomah*et al*, 2006) that the protective effects of dry beans in disease prevention, such as against cancer, may not be entirely associated to dietary fiber, but to phenolics and other non-nutritive compounds as polyphenols from dry beans may possibly act as antioxidants, hindering the formation of free radicals (J. Boateng *et al*, 2008). Keeping the importance of the kidney beans in view the present study was planned to analyze the nutritional and organoleptic evaluated and to prepared value added product *(Pinni)* from formulations contained kidney beans flour.

METHODOLOGY

An effort was made to prepare some value added product from selected kidney beans (*Kanchan, Jwala, Baspa, Him1, Triloki* and Chamba Landrace). The product developed was: Raw materials such as wheat flour, sugar, coconut, almonds, cashew, raisin, lotus seeds, desi ghee, angorigond was all purchased from the local market, Palampur, Himachal Pradesh, India. The raw material was physically examined to ensure they were disease-free and then were stored in cool temperature and used within 24 hours. All the preparations were done in the nutrition lab [CSKHPKV]. There were 4 different combinations using different ratio of wheat flour and kidney beans. The different ratios were 100 per cent, 90 per cent, 70 per cent and 50 per cent. The appropriate amounts were weighed using an electronic balance to give the various ratios of the wheat flour and kidney beans for use. Moisture, protein, fat, fiber, ash and energy contents of the *pinni* were determined according to standard AOAC 2000 methods. Crude protein content was calculated by multiplying Kjeldahl nitrogen by a factor of 6.25. Carbohydrates content was determined by NIN 1983 method.

Ingredients

Wheat flour	: 100g
Sugar	: 50g
Coconut	: 15g
Almonds	: 10g
Cashew	: 10g
Raisin	: 10g
Lotus seeds	: 15g
Desi ghee	: 100g
Angori gond	: 5g

Wheat flour and kidney beans as per the ratio [100:0] [90:10] [70:30] [50:50]

Recipe: As per the requirement all the ingredients were weighed and kept aside for use. The different ratios were taken in 4 different bowls. First roasted gondkatira and lotus seeds and then grinded them. Then roasted wheat flour until it turned brown and chopped almonds and cashew were added. After that gondkatira and lotus seed were added to the mixture. Turned off the flame and added grinded sugar, grated coconut and chopped raisin to the mixture.

Then rolled it out into equal size. Repeat all these steps for rest of the different ratios that have to be made. Put the prepared samples in 4 different bowls and name them as 1, 2, 3 and 4. Then, sensory evaluation of the product was conducted. For each sample, 9 hedonic test were conducted by 10 different panelists and semi-based panel of judges. After conducting the sensory evaluation, statistical analysis was done. This was done on the basis of mean and standard deviation of all attributes. The mean value and standard deviation was calculated from all the ratings given by 10 different individuals. Pictures of all the samples were clicked and the reviews were considered for further possible outcomes.

RESULTS AND DISCUSSION

The main reason behind making this recipe was its nutritive value. The recipe is a rich source of protein and energy. It was basically made for pregnant and lactating women, but anyone can consume it for better health. The nutritive values of the raw material are as follow:

Crude protein content: Table 3.1 shows the values of crude protein of different varieties of Kidney bean viz. *Kanchan*, *Jwala*, *Baspa*, *Him1*, *Triloki* and Chamba Landrace which were incorporated in the preparation of *pinni* were 8.02, 8.18, 8.12, 8.12, 8.05, 8.12 per cent. The mean crude protein content of different blends of wheat flour and kidney bean flours significantly higher in 50:50 (8.23 %) and lowest in 90:10 (8.00 %).

Crude fat content: Crude fat content were depicted in Table 3.1 which indicates the significantly data ($p \leq 0.05$) mean higher in variety *Triloki* (31.71 %) followed by Chamba Landrace (31.50 %), *Baspa* (31.42 %), *Kanchan* (31.32 %), *Him1* (31.11 %) and *Jwala* (30.26 %). The different blends of wheat flour and kidney bean flours significantly higher in 50:50 (31.74 %) and lowest in 90:10 (30.67 %).

Crude fiber content: Table 3.1 depicts the value of crude fiber of *pinni* prepared from kidney bean flour varieties. As it is clear from the data significantly ($p \leq 0.05$) higher crude fiber content was present in variety *Baspa* (1.71 %) whereas lowest mean crude fiber content was present in variety *Him1* (1.58 %). The mean crude fiber content between different formulations of wheat flour and kidney bean flours significantly higher in 50:50 (1.76 %) and lowest in 90:10 (1.58 %).

Crude ash content: The data for crude ash for the kidney bean *pinni* is given in Table 3.1. As it is clear from the data significantly ($p \leq 0.05$) higher mean crude ash content was present in variety Him1 (3.69 %) followed by Chamba Landrace (3.46 %), *Baspa* (3.33 %), *Kanchan* (3.32 %), *Triloki*

Table 2.1. Formulations/blends used/ standardized for preparation of different value added products.

Products/Ingredients Ratio	Control	F1	F2	F3
Pinni				
Wheat flour	100	90	70	50
Kidney beans	--	10	30	50

Table 3.1 Nutritional characteristics of *Pinni* supplemented with Kidney bean varieties of Himachal Pradesh (%dwb)

Parameters/ Blends (Wheat flour: *Rajmash*)	Varieties						
	Kanchan	Jwala	Baspa	Him 1	Triloki	Chamba Landrace	Mean
Crude protein (%)							
100: 0	8.00±0.05	8.00±0.05	8.02±0.03	8.10±0.01	8.10±0.05	8.00±0.00	8.04±0.03
90: 10	7.88±0.09	8.12±0.01	8.05±0.08	7.99±0.04	7.95±0.07	8.03±0.32	8.00±0.05
70: 30	8.04±0.02	8.22±0.01	8.12±0.01	8.15±0.03	8.03±0.06	8.17±0.01	8.12±0.02
50: 50	8.14±0.02	8.35±0.01	8.27±0.01	8.22±0.01	8.10±0.12	8.30±0.00	8.23±0.01
Mean	8.02±0.05	8.18±0.02	8.12±0.03	8.12±0.02	8.05±0.05	8.12±0.01	
Crude fat (%)							
100: 0	31.16±0.08	31.56±0.08	31.03±0.03	31.48±0.04	31.51±0.12	31.26±0.12	31.33±0.08
90: 10	30.86±0.08	29.19±0.49	31.00±0.58	30.00±0.58	31.54±0.10	31.43±0.17	30.67±0.16
70: 30	31.10±0.05	30.08±0.07	31.30±0.11	31.24±0.09	31.80±0.05	31.63±0.12	31.12±0.08
50: 50	32.13±0.08	30.18±0.09	32.36±0.02	31.73±0.12	32.00±0.05	32.05±0.02	31.74±0.06
Mean	31.32±0.08	30.26±0.18	31.42±0.05	31.11±0.07	31.71±0.08	31.50±0.11	
Crude fiber (%)							
100: 0	1.50±0.02	1.58±0.00	1.64±0.02	1.48±0.00	1.57±0.01	1.53±0.02	1.55±0.01
90: 10	1.66±0.03	1.55±0.01	1.62±0.01	1.50±0.00	1.51±0.01	1.63±0.02	1.58±0.01
70: 30	1.76±0.04	1.63±0.01	1.75±0.02	1.60±0.01	1.62±0.01	1.68±0.00	1.67±0.01
50: 50	1.77±0.05	1.72±0.01	1.82±0.01	1.72±0.01	1.82±0.01	1.72±0.01	1.76±0.02
Mean	1.67±0.04	1.62±0.01	1.71±0.01	1.58±0.01	1.63±0.01	1.65±0.01	
Crude ash (%)							
100: 0	3.02±0.01	2.97±0.03	3.13±0.08	3.43±0.08	3.00±0.05	3.23±0.12	3.13±0.06
90: 10	3.03±0.00	3.03±0.03	3.00±0.05	3.63±0.08	3.06±0.03	3.43±0.03	3.20±0.04
70: 30	3.50±0.00	3.26±0.03	3.53±0.08	3.81±0.01	3.30±0.05	3.49±0.05	3.48±0.04
50: 50	3.70±0.00	3.30±0.05	3.66±0.08	3.90±0.00	3.40±0.05	3.66±0.03	3.60±0.04
Mean	3.32±0.00	3.14±0.03	3.33±0.08	3.69±0.04	3.19±0.05	3.46±0.06	
Total CHO (%)							
100: 0	50.98±0.07	50.07±0.03	50.44±0.17	49.74±0.10	50.18±0.13	50.21±0.09	50.27±0.10
90: 10	51.09±0.14	52.04±0.48	49.97±0.09	50.78±0.02	49.39±0.17	49.69±0.16	50.50±0.18
70: 30	50.01±0.12	50.46±0.08	48.85±0.19	49.06±0.09	48.66±0.11	49.52±0.20	49.42±0.13
50: 50	48.59±0.08	49.90±0.23	47.11±0.12	48.21±0.11	47.69±0.01	48.20±0.08	48.29±0.10
Mean	50.17±0.10	50.62±0.27	49.09±0.14	49.45±0.08	48.98±0.10	49.40±0.18	
Energy (Kcal)							
100: 0	516.44±0.49	516.40±0.61	513.15±0.33	514.76±0.46	516.73±0.78	514.26±0.85	515.29±0.59
90: 10	513.69±0.57	503.43±2.53	511.09±0.47	505.10±0.62	513.32±0.56	513.82±1.12	510.07±0.98
70: 30	512.11±0.27	505.50±0.38	509.58±0.69	510.01±0.31	512.96±0.19	511.86±0.31	510.34±0.36
50: 50	516.17±0.55	504.69±0.04	512.81±0.33	511.34±0.64	511.20±0.59	514.53±0.16	511.79±0.39
Mean	514.60±0.47	507.50±0.89	511.66±0.45	510.30±0.51	513.70±0.53	513.62±0.61	

Table 3.2. Organoleptic evaluation of *Pinni* supplemented with selected Kidney bean flour

Parameters/ Blends (Wheat flour : *Rajmash*)	Varieties						
	Kanchan	Jwala	Baspa	Him 1	Triloki	Chamba Landrace	Mean
Colour							
100: 0	7.21	7.85	7.85	7.86	7.54	8.01	7.72
90: 10	7.20	7.19	7.54	7.53	7.89	7.65	7.5
70: 30	7.54	7.05	8.06	7.63	7.35	7.21	7.47
50: 50	7.62	7.14	7.21	7.11	7.74	7.13	7.32
Mean	7.39	7.30	7.66	7.53	7.63	7.30	
Taste							
100: 0	7.31	7.62	7.73	7.72	7.21	7.97	7.59
90: 10	7.21	6.74	7.23	7.32	7.46	7.38	7.22
70: 30	7.23	6.75	7.74	7.26	7.02	7.38	7.23
50: 50	7.41	7.38	6.72	7.31	7.45	6.65	7.15
Mean	7.29	7.12	7.35	7.40	7.28	7.34	
Flavour							
100: 0	7.32	7.36	7.52	7.79	7.18	7.82	7.49
90: 10	7.26	6.91	7.35	7.38	7.41	7.31	7.27
70: 30	7.06	6.75	7.81	7.57	7.32	7.28	7.29
50: 50	7.12	7.05	6.81	7.56	7.75	6.62	7.15
Mean	7.19	7.01	7.37	7.57	7.41	7.25	
Texture							
100: 0	7.28	7.38	7.71	7.62	7.43	7.81	7.53
90: 10	7.12	7.24	7.68	7.64	7.51	7.53	7.45
70: 30	7.32	7.51	7.76	7.51	7.38	7.28	7.46
50: 50	7.41	7.25	7.06	7.18	7.65	6.98	7.25
Mean	7.28	7.34	7.55	7.48	7.49	7.40	

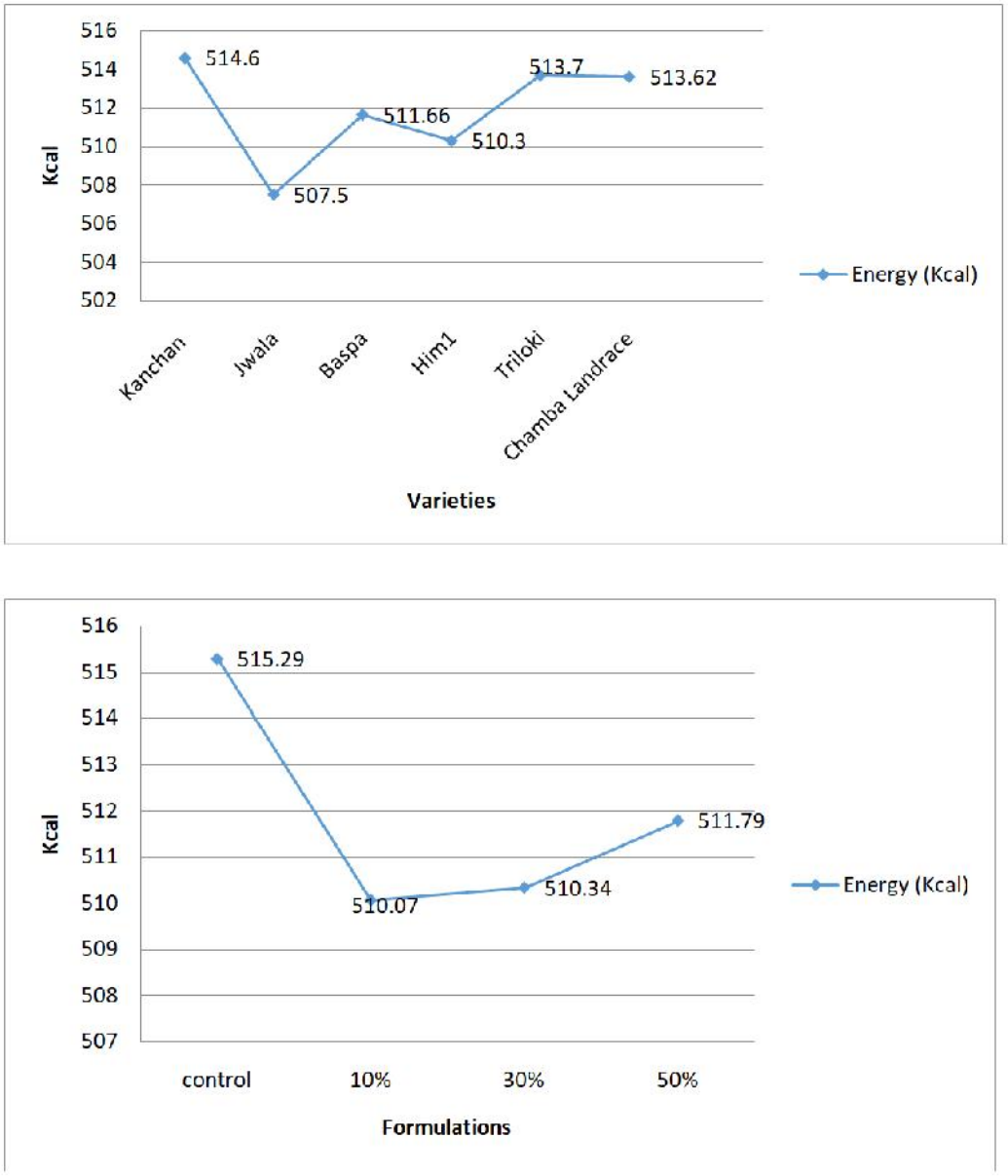

Figure 3.1. Energy content of *Pinni* prepared from different formulations contained kidney bean flour of different varieties

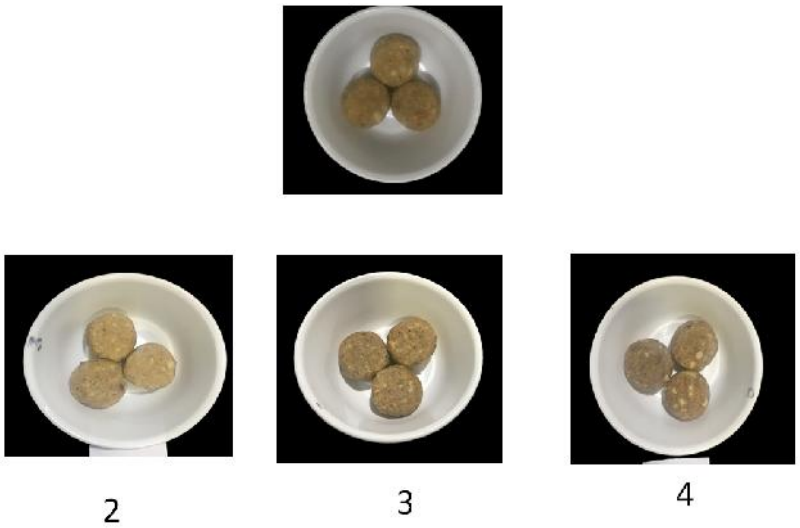

Plate 3.2. *Pinni* prepared from blends contained different proportions of Wheat flour: Kidney bean variety Kanchan (1-100:0, 2-90:10, 3-70:30, 4-50:50)

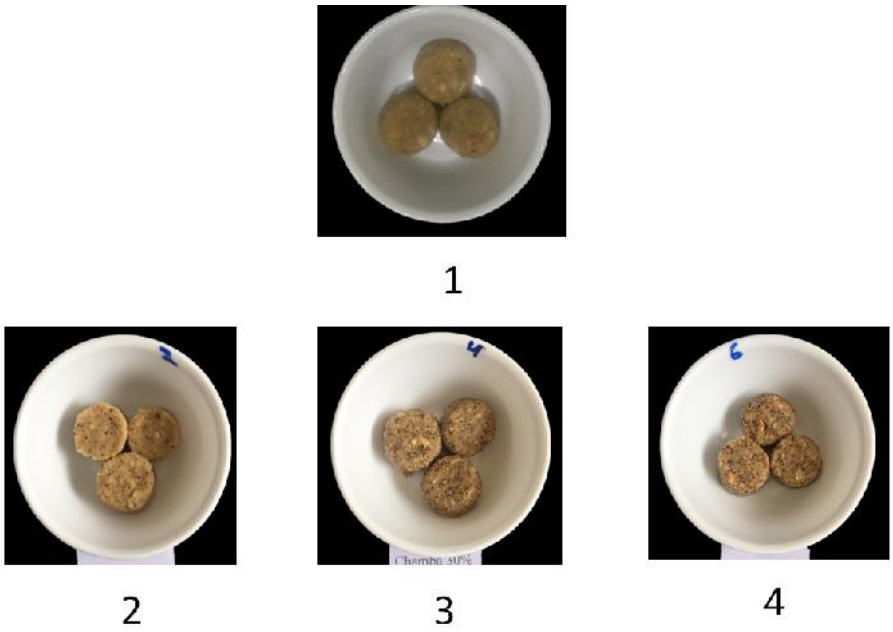

Plate 3.3 *Pinni* prepared from blends contained different proportions of Wheat flour: Kidney bean variety Baspa (1-100:0, 2-90:10, 3-70:30, 4-50:50)

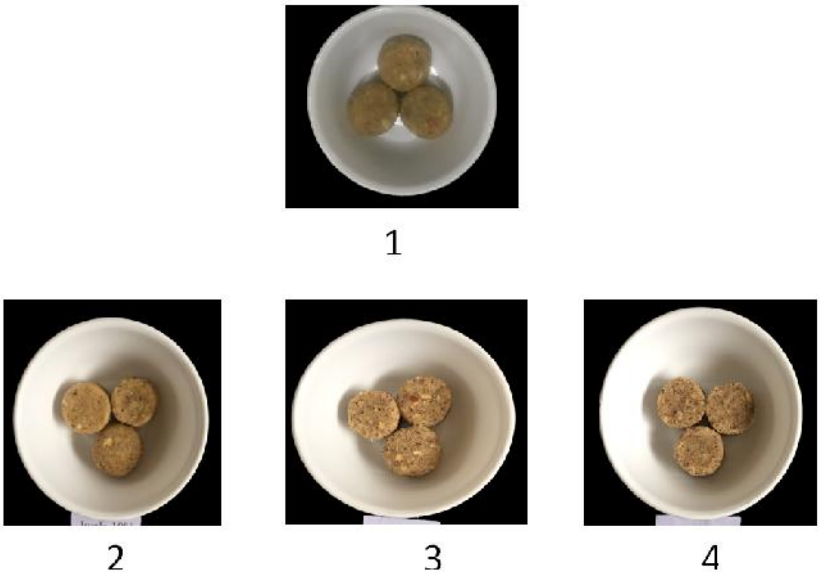

Plate 3.4 *Pinni* prepared from blends contained different proportions of Wheat flour: Kidney bean variety Him 1 (1-100:0, 2-90:10, 3-70:30, 4-50:50).

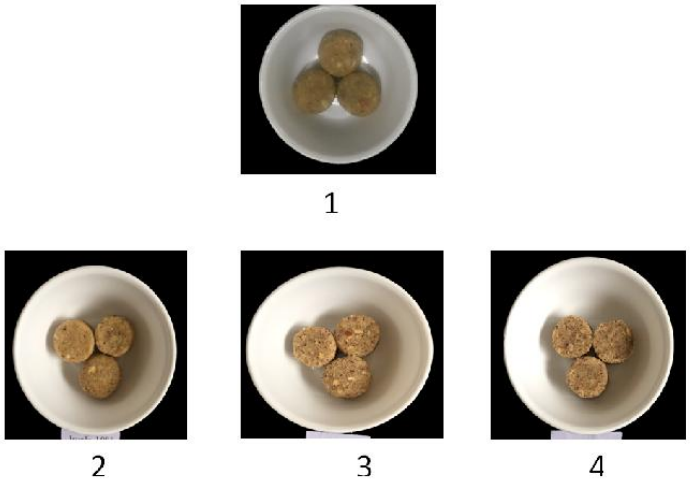

Plate3.5. *Pinni* prepared from blends contained different proportions of Wheat flour: Kidney bean variety Triloki (1-100:0, 2-90:10, 3-70:30, 4-50:50).

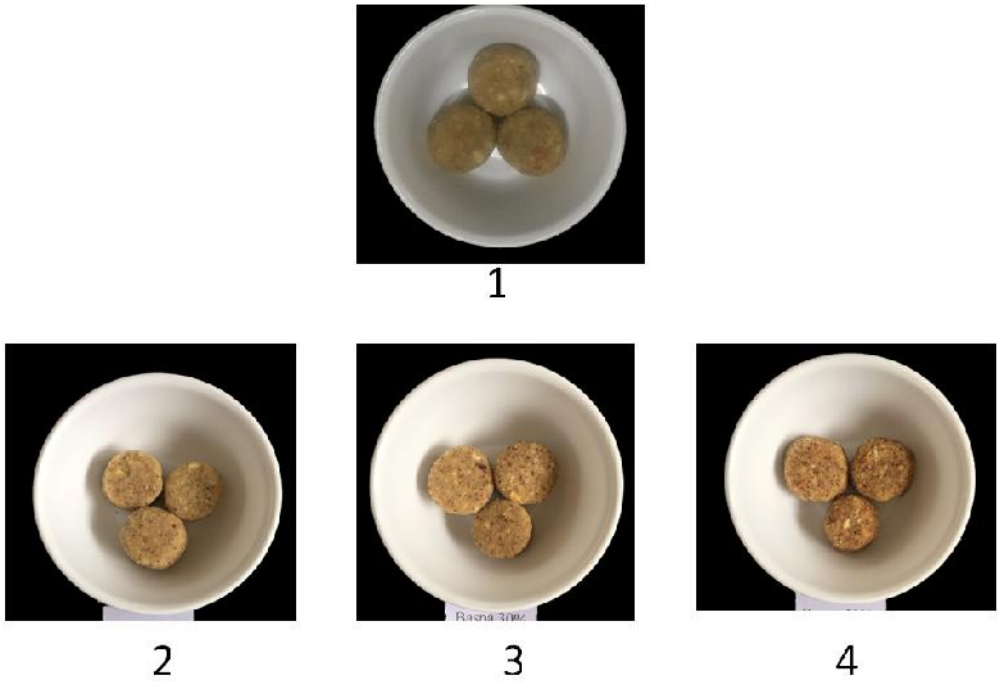

Plate 3.6 *Pinni* prepared from blends contained different proportions of Wheat flour: Kidney bean variety Chamba Landrace (1-100:0, 2-90:10, 3-70:30, 4-50:50).

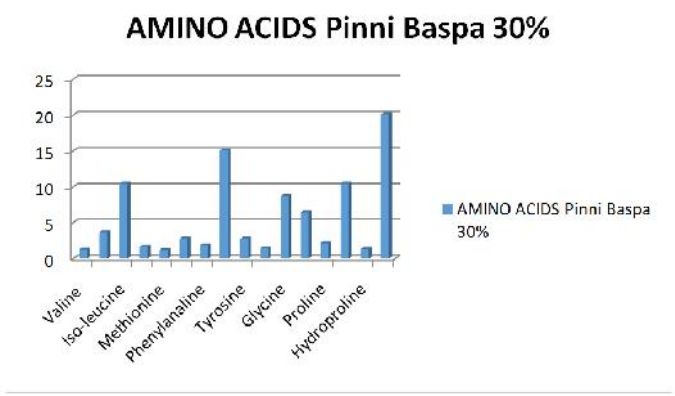

Figure 3.2. Amino acids content in best formulations products

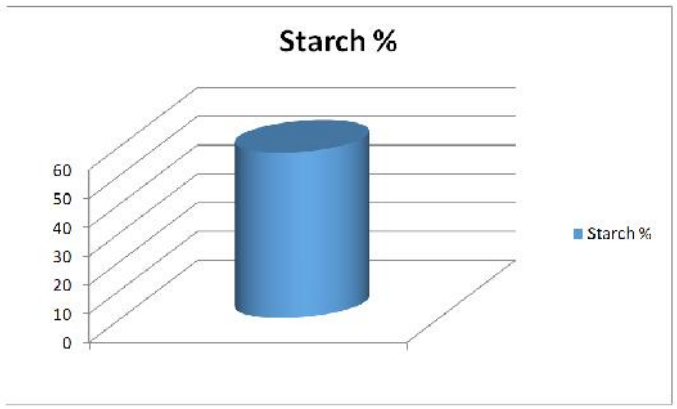

Figure 3.3. Starch content in best formulations products

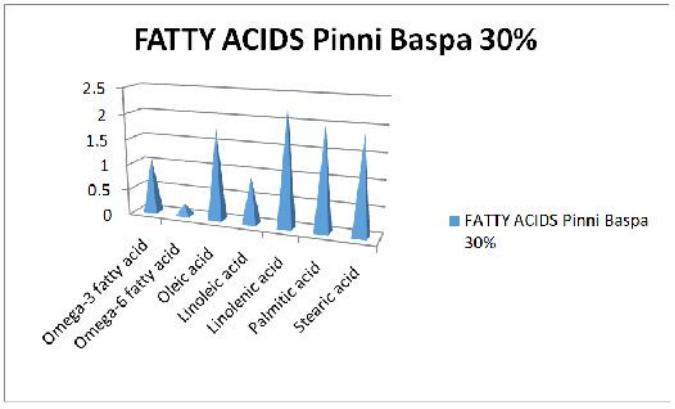

Figure 3.4. Fatty acids content in best formulations products

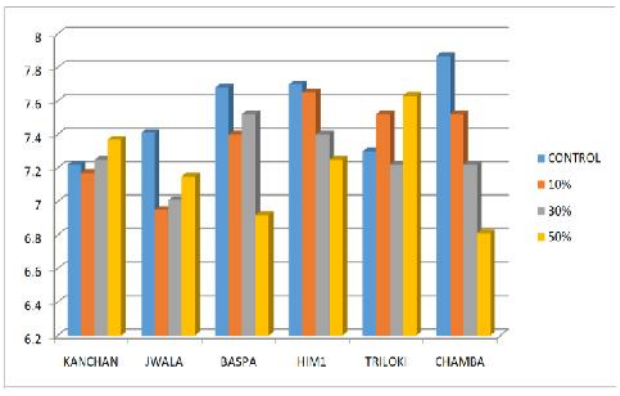

Figure 3.5. Overall acceptability of *Pinni* of different varieties of kidney bean

(3.19 %) and *Jwala* (3.14 %). The mean crude ash content of different blends of wheat flour and kidney bean flours significantly higher in 50:50 (3.60 %) and lowest was present in 90:10 (3.20 %).

Total carbohydrate content: Table 3.1 depicts the total carbohydrates for the kidney bean flour based *pinni*. As it is clear from the data significantly ($p \leq 0.05$) higher mean total carbohydrates content was present in variety *Jwala* (50.62 %) followed by *Kanchan* (50.17 %), Him1 (49.45 %), Chamba Landrace (49.40 %), *Baspa* (49.09 %) and *Triloki* (48.98 %). The mean total carbohydrates content of different blends of wheat flour and kidney bean flours significantly higher in 90:10 (50.50 %) and lowest in 50:50 (48.29 %).

Energy content: The data for mean energy content for the kidney bean *pinni* is given in Table 3.1 and graphical representation of mean energy content between varieties and formulations were shown in Figure 3.1. The energy content of different blends of wheat flour and kidney bean flours significantly higher in 50:50 (511.79 Kcal) and lowest in 90:10 (510.07 Kcal). Higher energy content was present in variety *Kanchan* (514.60 Kcal) followed by *Triloki* (513.70 Kcal), Chamba Landrace (513.62 Kcal), *Baspa* (511.66 Kcal), *Him1* (510.30 Kcal) and *Jwala* (507.50 Kcal). Plates 3.1 to 3.6 indicate the "*Pinni*" prepared from formulations contained different proportions of Kidney bean flour

(B. Sadana *et al*, 2008) reported that the protein, fat, carbohydrate and energy content was 14.7g/100g, 31.2 g/100g, 47.1 g/100g and 528 kcal/100g for *pinni* supplemented with soybean flour. Sharma et al. (2019) analyzed that the moisture content of *ladoo* were ranged from 7.06 to 6.23, protein content 9.91 to 7.05, fat content 21.01 to 23.73, fiber content 2.68 to 3.90 and carbohydrates content was ranged from 64.08 to 62.09 per cent, respectively. (T. Jain *et al*,2016) reported that the protein, fat, carbohydrate and energy content was 8.56 g/100g, 25.23 g/100g, 56.74 g/100g and 488.75 Kcal/100g with addition of garden cress seeds at 15 and 10 per cent for Indian food *pinni*. (P. Prasad, 2016) studied that the moisture, protein, fat, fiber, ash, carbohydrate and energy content was ranged from 3.6 to 4.4 g/100g, 8.5 to 9.0 g/100g, 7.8 to 8.6 g/100g, 2.1 to 3.0 g/100g, 0.4 to 0.9 g/100g, 73.9 to 77.3 g/100g and 409.5 to 414.6 Kcal/100g, respectively whereas 2.8 to 3.3 g/100g, 8.0 to 8.2 g/100g, 15.4 to 16.02 g/100g, 2.0 to 3.3 g/100g, 1.0 to 1.5 g/100g, 70.1 to 71.1 g/100g and 444.6 to 451.6 Kcal/100g, respectively for *panjiri* and *pinni* supplemented with spinach leaves powder, respectively. (B. Dhanesh *et al*, 2018) considered that the moisture, protein, fat, ash, and carbohydrate content was 4.91, 20.18, 18.09, 3.20 and 41.92 g/100g for *pinni* supplemented with partially defatted peanut cake flour and dehydrated spinach leaves powder.

Amino acids profile of Kidney bean based value added products: Although all the preparations of value added products from different varieties of kidney bean were acceptable. Figure 3.2 shows the result of amino acids content of best selected formulations of different varieties of kidney bean among all the formulations.

Starch content of Kidney bean based value added products: The preparations of value added products from different varieties of kidney bean were acceptable. Figure 3.3 shows the result of starch content of best selected formulations of different varieties of kidney bean among all the formulations.

Fatty acid content of Kidney bean based value added products: Although all the preparations of value added products from different varieties of kidney bean were acceptable. Figure 3.4 shows the result of mean fatty acids content of best selected formulations of different varieties of kidney bean among all the formulations.

Organoleptic evaluation of *Pinni* prepared from formulations contained Kidney bean flours of different varieties. Table 3.2 depicts the highest scores for colour (8.06), taste (7.74), flavour (7.81), texture (7.76) and overall acceptability (7.72) were obtained by Baspa variety formulated with 30 per cent were liked moderately. Figure 3.5 shows the overall acceptability scores were lowest in variety Chamba Landrace variety, 6.81 which was liked slightly. Results were given by (Prasad 2016) that the highest average scores of organoleptic evaluation for different sensory parameters in *pinni* were obtained for T2 treatment (2.5 % spinach leaves powder) after control (T1) treatment.

Conclusion

The kidney bean based *pinni* prepared in the present study have improved nutritional profile in relation to overall acceptability of the products. As we can see, Baspa variety formulated with 30 per cent were liked moderately. The overall acceptability scores were lowest in variety Chamba Landrace variety, 6.81 which was liked slightly. The standardized/ developed kidney bean based product has great potential for household food security and add variety to diet for better nutrition. The improved/ developed formulations can be popularized for preparation of products with added advantages and meaningful utilization of kidney bean in specialty products. As we have seen the main purpose behind making this recipe was to provide good nutrition. All the ingredients that were used have high nutritive value and serves various health benefits to the body. Benefits such as help in weight loss, diseases related to heart. Main idea behind making these *pinni* was to provide good nutrition to pregnant and lactating women.

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