Biological Forum – An International Journal **13(4): 156-159(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Nutritional and Organoleptic Characteristics of Cookies Prepared from Sprouted Pea Flour Blends

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(Received 19 August 2021, Accepted 12 October, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present investigation aimed to formulate and develop sprouted pea flour cookies by substituting refined wheat flour with pea flour to fight with malnutrition from cheap source as baked products for mankind at different levels (at 0, 05, 10, 15, 20 and 25%). Results indicated that the cookies prepared with 90% of refined wheat flour and 10% of sprouted pea flour (SPF) (T3) were most acceptable in view of sensory analysis. The carbohydrates, crude fat, fibre and energy value of treatment T1 was found maximum while protein, ash, Ca. P, Fe and moisture was found maximum in treatment T6. Blending of refined wheat flour with SPF upto 10% was most likely to acceptable by panel.

Keywords: SPF, Composite flour, Legumes and high nutritional value.

INTRODUCTION

Utilization of composite flour in formulation and development of various baked food products is an attractive approach to meet the global challenge of protein-calorie malnutrition.

The incorporation of composite flour into traditional refined wheat flour based food products provided farther nutrients from non-wheat material and improved the proximate, nutritional organoleptic value of the products De Ruiter (1978).

To overcome the protein calorie malnutrition and to increase intake of dietary protein in to the diet, the combination of cereal based products with legumes is of considerable importance (Kadam *et al.,* 2012). Legumes (the poor man's meat) play a vital role in human nutrition since they are rich sources of protein, fat, calories, certain minerals and vitamins etc. (Deshpande, 1992).

Peas are recognized as a low in fat (3%), high in protein (24%), carbohydrates (58%) and dietary fibre (12%) carrying food (Iqbal *et al.*, 2006). Pea containing a rich amount of vitamin A, vitamin C, vitamin B complex, iron, calcium, copper, zinc and manganese. No significant value of anti-metabolites or toxicity has been reported in pea (Garg *et al.*, 2015; Narayanan *et al.*, 2015). The pea flour and pea protein exhibits different functional properties like solubility, emulsifying and foaming properties, gelling ability and water holding capacity. These functional properties are desirable in different foods to increase stability and storage period (Ettoumi and Chibane 2015).

Functional foods; foods and food components that provide a health benefit beyond basic nutrition (for the intended population). For examples conventional foods; fortified, enriched or enhanced foods; and dietary supplements (MacAulay *et al.* 2005).

Cookies are admired for their taste, aroma, convenience, and long shelf stability, increasing consumer demand for healthier foods has triggered the development of cookies made with natural ingredients exhibiting functional or nutritional properties and providing specific health benefits beyond those to be gained from traditional nutrients Hai-Jung Chung (2007).

MATERIALS AND METHODS

The present investigation was undertaken on "Nutritional and Organoleptic Characteristics of Cookies Prepared from Sprouted Pea Flour Blends" at MGCGVV, Chitrakoot, Satna (M.P.), India.

A. Experimental materials

The wheat and pea was procured from the local market and all other ingredients (sugar, vegetable oil, glucose, ammonium bicarbonate, common salt sodium bicarbonate, vanilla and baking powder) were purchased from the retail market and department. The materials were transported to department.

Preparation cookies through selected wheat and pea sprouted grains:

Processing of grains: The grains (wheat and pea) were washed and cleaned to remove the dirt, dust and foreign matter by winnowing.

***Sprouting process*:** wheat and pea grains were sprouted as described by (Murugkar, 2014).

Development and optimization of baked products (Cookies): First of all studies were conducted to standardize the formulation for the development of the different cereal-pulses based baked products (Cookies). Cookies were processed using the traditional creamery method described by Whitley (1970).

Proximates value:

***Moisture*:** Moisture was analyzed using the MBS4 moisture analyzer at 100°C for 10 minutes. Protein, Fat, Carbohydrates and Ash content in the sample was estimated by the procedure indicated in the AOAC (1984).

Estimation of Minerals: Minerals content of cookies were estimated through the Gopalan table values (Gopalan *et al.,* 2000).

Calorific Value: The total energy values were estimated with using the values of 4, 4, and 9 for protein, carbohydrate and fat respectively as follows: Total calorie (kcal/100g) = [(% available carbohydrates X4) + (% protein X4) + (% fat X9)].

Organoleptic value: The organoleptic qualities of nutritious cookies were evaluated by a nine point hedonic scale as indicated by the Amerine *et al.,* (1965).

Statistical analysis: The data were subjected to analysis of variance (ANOVA). The Completely Randomized Design (CRD) at 5% level of significant.

Table 1: Preparation and development of sprouted wheat and pea based cookies.

Sr. No.	Treatments	Wheat	Pea
1.	**T1**	100	-
2.	**T2**	95	5
3.	**T3**	90	10
4.	**T4**	85	15
5.	**T5**	80	20
6.	**T6**	75	25

RESULTS AND DISCUSSION

Proximate composition of wheat and pea cookies (%):- ***Moisture content*:** Moisture content was highest in treatment T6 (3.60%) whereas lowest moisture content was found in treatment T2 (2.45%) are presented in Table 2. Furthermore, cookies absorbed moisture content from surrounding atmosphere due to hygroscopic nature of wheat flour. Increases in moisture per cent of cookies during storage were reported by Butt *et al*., (2004); Sharif *et al*., (2009).

***Carbohydrates content*:** The maximum carbohydrates content was found to be in treatment T2 (65.02%) whereas the minimum carbohydrates content was found to be in treatment T6 (63.53%) are presented in Table 2. This might be due to the supplementation of legume and similar findings have been supported by Mahgoub (1999).

***Protein content*:** The wheat and pea supplemented cookies ranged from 12.26 to 14.07 %. The maximum protein % of wheat and pea flour based cookies were in treatment T6 (14.07%) whereas minimum protein per cent of wheat and pea based cookies products was in treatment T2 (12.26%) are presented in Table 2. This could be due to the supplemental with the pulses findings have been given by Vardis and Trichopoulou *et al.,* (2009).

***Fat content*:** The fat content of wheat based cookies is 19.55 per cent and that of wheat and pea cookies ranged from 17.90 to 19.11 per cent in 90 days storage period. The values of fat per cent reported in present study were more or less similar to the value reported by Curley (2008).

***Fibre content*:** Maximum fibre content in treatment T6 (3.46%) whereas minimum fibre content was found to be in treatment T2 (3.17%). The mean fibre content of wheat and pea supplemented cookies were significantly higher than the treatment T1 cookies are presented in Table 2. Similar issues were reported by Tariqual *et al.,* (2007).

***Ash content*:** Cookies ranged from 1.95 to 2.31 per cent ash content. The ash content was higher in treatment T6 (2.31%) whereas lowest ash content was found to be in treatment T2 (1.95%) in Table 2. Similar findings were reported by Hahn *et al*., (1990).

***Energy value*:** Data depicted in Table 2 clearly shown the maximum energy value was found to be in treatment T2 (481.11 kCal) whereas the minimum energy value was found to be in treatment T6 (471.49 kCal). Addition of legume increased energy value of cookies and similar findings were recorded by Rana *et al.,* (2020); Thongram *et al.,* (2016).

Mineral content (mg/100g): ***Calcium (Ca)*:** The calcium content was higher in treatment T6 (33.65 mg) whereas lowest calcium content was found to be in treatment T2 (24.62 mg) presented in Table 2. The result shows that supplemented of pea to the wheat improve their calcium content. Similar issues have been reported by Kanu *et al.,* (2009).

***Phosphorous (P)*:** Maximum fibre content in treatment T6 (154.64 mg) whereas minimum fibre content was found to be in treatment T2 (120.60 mg). The mean phosphorous content of wheat and pea supplemented cookies was significantly higher than the control cookies are presented in Table 2. Similar work was carried out by Uthumporn *et al*., (2015); Nicole *et al*., (2010).

***Iron (Fe)*:** Data shown in the table 2 that the maximum energy value was found to be in treatment T6 (3.56 mg) whereas the highest iron content was found to be in treatment T2 (2.66 mg). The iron content revealed that there is significant difference among the formulations. Results clearly showed that higher amount of pea flour substituted into formulation resulted in increased iron content in cookies. Similar findings were found in Uthumporn *et al*., (2015).

Table 2: Proximate composition in % of wheat and pea blended cookies.

Treatment	Carbohydrates	Protein	Fat	Fibre	EV	Ash	Ca	P	Fe	Moisture
T1	**65.65**	11.90	**19.21**	**3.11**	**408.28**	**1.99**	**21.45**	**112.57**	**2.56**	**2.45**
T2	63.83	**11.85**	19.14	3.09	399.78	2.27	23.72	113.55	2.60	2.45
T3	62.08	11.96	19.02	2.95	391.09	2.37	26.62	116.69	2.68	2.70
T4	60.30	11.94	18.88	2.96	382.47	2.52	28.64	118.00	2.79	2.55
T5	58.89	11.88	18.52	**2.92**	374.81	2.70	30.45	120.93	2.85	2.95
T6	**57.39**	**12.03**	**18.16**	2.93	**366.40**	**3.02**	**33.49**	**122.10**	**2.92**	**3.60**
Sem	0.03	0.311	0.029	0.052	0.039	0.028	0.021	0.060	0.048	0.028
CD	0.09	0.959	0.088	0.162	0.120	0.087	0.065	0.186	0.148	0.088
CV	0.08	4.538	0.264	3.051	0.018	2.042	0.133	0.090	3.072	1.77
SIG	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**

Table 3: Sensory score combination of the wheat and pea cookies.

Treatment Mean	Appearance	Colour	Crispiness	Taste	Texture	Overall acceptability
T1	7.10	6.90	**7.45**	7.10	7.80	7.18
T2	7.10	**7.25**	7.25	7.25	7.30	7.32
T3	**7.80**	7.05	7.40	**7.80**	**8.30**	**7.45**
T4	**7.00**	**6.85**	6.85	**6.90**	**6.70**	**6.86**
T5	7.10	**6.85**	7.25	7.50	7.40	7.22
T6	7.20	6.95	**6.75**	7.20	6.80	7.02
Sem	0.030	0.034	0.035	0.030	0.035	0.035
CD	0.094	0.105	0.106	0.094	0.107	0.109
CV	0.729	0.847	0.836	0.722	0.813	0.851
SIG	**NS**	**S**	**S**	**S**	**S**	**S**

Organoleptic analysis:

***Appearance*:** Sensory scores shown in Table 3, of wheat and pea based cookies ranged from 6.15 to 7.15 in appearance. The maximum appearance was found to be in treatment T3 (7.15) whereas minimum appearance was found to be in treatment T4 (6.15). Appearance was found to be significantly lower in wheat based cookies as per Ganorkar and Jain (2014).

***Colour*:** The maximum colour was found to be in treatment T3 (6.75) whereas minimum colour was found to be in treatment T4 (6.05). Colour was found to be significantly higher in wheat flour based cookies. The scores for colour recorded due to the Millard reaction Narender *et al.,* (2007).

***Crispiness*:** Sensory scores of wheat and pea based cookies ranged from 6.05 to 7.10 in crispiness. The maximum crispiness was found to be in treatment T3 (7.10) whereas minimum crispiness was found to be in treatment T4 (6.05). Crispiness was found to be significantly lower in wheat based cookies. Reduction in fat per cent had most significant effect over crispiness of cookies, as it becomes harder Srivastava and Rao (1993).

***Taste*:** The maximum taste was found to be in treatment T3 (7.50) whereas minimum taste was found to be in treatment T4 (6.10). Taste was found to be significantly lower in wheat based cookies. This might be halfway due to increase in moisture content during the storage and resultant hydrolytic and oxidative degradation changes during storage. Our results support the findings of other works Galla *et al*., (2017).

***Texture*:** The maximum texture was found to be in treatment T3 (7.25) whereas minimum texture was found to be in treatment T5 (7.50). Texture was found to be significantly lower in wheat based cookies. Aziah *et al.*, (2012) found that texture of cookies become hard with incorporation if protein rich legume flour.

***Overall Acceptability*:** The maximum overall acceptability was found to be in treatment T3 (7.15) whereas minimum overall acceptability was found to be in treatment T4 (6.06). Overall acceptability was found to be significantly lower in wheat based cookies, Padiyar (2010).

CONCLUSION

The present study revealed that cookies can be successfully formulated and developed by the substitution of RWF up to 25%. And T3 (RWF90+SPF10%) shown best organoleptically. The Proximates of the standardized cookies in respect to protein, ash, moisture and minerals (calcium, phosphorus and iron) was superior to that of the control one (T1). The findings cleared that calorific value of cookies decreased with increased levels of SPF in cookies.

FUTURE SCOPE

The investigation indented to develop the functional food fortified with wheat, ragi, green gram and microgreens to enrich the nutritional value of baked products. This could make more acceptable for the consumers and feasible in context of marketing opportunities.

Conflict of Interest: None.

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How to cite this article: Rana, G. K.; Mishra, S. P.; Rahangdale, H. K.; Pandey, J.; Rahangdale, C. P. and Deshmukh, K. K. (2021). Nutritional and Organoleptic Characteristics of Cookies Prepared from Sprouted Pea Flour Blends. *Biological Forum – An International Journal, 13*(4): 156-159.