National Conference on Recent Trends in Synthesis and Characterization of Futuristic Material in Science for the Development of Society (NCRDAMDS-2018)
In association with
International Journal of Scientific Research in Science and Technology

Study on Nutritional Enrichment of Semolina Cookies Fortified with Spinach and Pea Protein Concentrate.

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ABSTRACT

Cookies were prepared from semolina fortified with spinach powder and pea protein concentrate to increase the protein and iron quantity. Cookies fortification increased the protein per cent up to 15% and iron content up to 3.2mg per 100gm .Sensory Evaluation of appearance, colour, texture, and flavour of the more successful types of fortified cookies compared favourably with that of the normal cookies. Spinach and pea protein concentrate gave the cookies desired greenish yellow colour that was considered attractive.

Keywords: Cookies, Fortification, Spinach, Pea Protein Concentrate

I. INTRODUCTION

Semolina (rava) is the basic ingredient in cookies making, white peas are increasingly important high protein crop which contain about 19.7% protein [1]. Process has been developed to produce pea flour and pea protein concentrate [2]. Here, cookies have been fortified with supplement of various high protein sources of improved nutritional properties.

These cookies are prepared from various flour fortified with spinach powder which is much rich in iron and other minerals [3] while yeast is used to lighten the dough of cookies, to maintain texture properties of baked product, leavening agent are also use [4].

The objective of research was to improve the quality of cookies by fortification of semolina with protein and iron rich source which will be a better supplement.

The raw spinach leaves were used as sources of iron and pea protein was used as a source of protein [9] in cookies.

II. MATERIAL AND METHOD

A. Flour and Concentrate:

The cookies were prepared in a pilot plant of Sau. Vasudhatai Deshmukh College of Food Tech. Amravati. Fresh spinach leaves were dried and powdered .The pea protein concentrate used as a protein source which provides up to 88% protein enrichment .Other food grade ingredients such as water, vegetable oil, and butter, salt were added as per the recipe.

B. Fortification:

In first batch, the semolina is the fortification only with spinach in various percentages as 5%, 10%, 15%, and 20%. The selection of proper percentages of spinach is done on the basis of sensory evaluation results and quantity of iron and minerals out of it. In 2nd batch, the semolina fortified with selected quantity of spinach i.e. 10% is further fortified with various percentages of pea protein concentrate i.e. 5%, 10%, 155, 20%. The selection of proper quantity of pea protein concentrate is done on the basis of sensory evaluation results and quantity of protein we are getting out of it.

C. Preparation of cookies:

Cookies were prepared by manual processes on a domestic cookies making machine from semolina

fortified with different concentrate of pea protein concentrate and powdered spinach (5%, 10%, 15%, 20%) flour was hand mix with the predetermined amount of butter or ghee and baking powder beat it well using wire whisk and make a dough, which were covered and rested for 30 min to permit optimum moisture equilibrium and hydration. After 30 min divided the dough into equal portion and make round shape dough and put the dough in cookies making machine, cookies were prepared according to desired shape and size. The cookies were then baked in the oven at 350 f (180 c) for approx. 10 min. to 15 min or until cookies start to turn golden brown .

D. Sensory evaluation:

10 member panels evaluated the cookies for colour, texture, appearance, flavour preference. The entire panellist was asked to indicate preference on 9 point hedonic scale and also to rank the cookies in order of overall preference. The sensory properties of cookies were measured using 9 point hedonic scale method [5].

E. Proximate Analysis:

Proximate analysis is carried out by standard AOAC (1997) method [6] for all samples including control. Protein, iron, curd fibre, moisture and ash were evaluated.

a) Moisture:

Moisture content of fortified and control cookies was measured by modified vacuum oven method 925.09 [6]. The moisture content of the cookies was measured at room temperature at weight basis.

b) Fat:

Fat content was estimated by method 920.85 [6]. The cookies sample was extracted with petroleum ether for 16 hr. The dried sample weight gave fat content profile.

c) Total ash:

5 gm. of sample were kept in muffle furnace at temp 525 degree Celsius for 6hr. Desiccated ash was weighed as per 100 gm. sample weight amounted 923.03 with slight modification. [6]

d) Crude fibres:

Crude fibre content was evaluated by ceramic fibre filter method 920.86 [6]

e) Carbohydrate:

Carbohydrate concentration was estimated by subtracting other solid (ash +fat+ protein fibre) from 100 gm. / 100gm

f) Protein:

Protein % was determined using modified Kjeldahl procedure with nitrogen to protein conversion factor to 6.25 (method 960.52). 250 mg of sample was digested with concentrated H_2SO_4 and digestion mix, digested sample was put for a protein estimation protein % = % nitrogen * 6.25

g) Iron:

Iron is determined by converting iron to ferric from by using oxidizing agents like potassium persulphate or hydrogen peroxide and treating thereafter by potassium thiocyanate from the red ferric thiocyanate which is measured colorimetrically at 480.

III. RESULTS AND DISCUSSION

Sample	A	B	C	D	E
Attribute					
Appearance	7.4	6.5	5.5	5.8	6.8
Colour	6.8	6.3	5.3	5.5	6.7
Texture	6.9	6.2	5.6	5.2	6.4
Flavour	7.5	6.5	6.6	6.4	6.9
Overall Acceptability	7.15	6.375	5.75	5.725	6.7

A. Sensory evaluation:

The selection of 10% spinach by weight was done on the basis of sensory evaluation of all samples of various spinach percentages as 5%, 10%, 15%, and 20% from the sensory score it was observed that as the per cent of spinach of increased in the semolina the acceptance level decreased from the side of panel members. The 10 % of spinach sample got maximum score (7.6) from the panel members. So it was selected for the final fortification. The sensory evaluation score of each and every sample containing 10 % spinach and various percentages of pea protein concentrate (5%, 10%, 15%, and 20%) were analysed and compared with respect to their attributes. The given table helped in making easy decisions regarding s

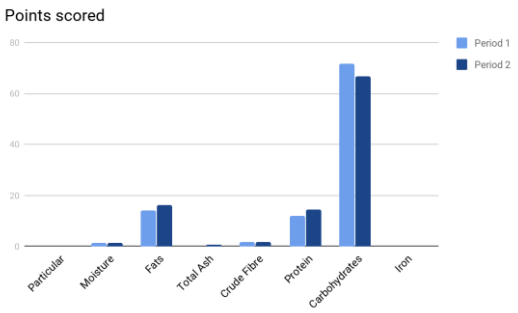
election of final product. Where, A-10% spinach and 5% pea protein concentrate, B- 10% spinach and 10% pea protein concentrate D-10% spinach 20% pea protein concentrate E- unfortified / control sample .

Fortified cookies (A) gain more sensory score than the control cookies at each attribute of overall acceptability. The appearance scores of fortified cookies (A) increase 7.4 from 6.8 of control cookies (E). In case of colour the score increase up to 6.8 from 6.7 0f control cookies. Flavour of the fortified cookies was very much acceptable by the panel members and gain the score 7.5 which was much higher than 6.9 of a control sample. The overall acceptability of control cookies is 6.7 which is less as compared to 7.6 of 10% spinach 5% pea protein concentrate fortified cookies.

B. Proximate Analysis:

Proximate analysis of overall acceptability and control cookies is carried out and result obtained is presented in table. It is a showed from the table that, cookies fortified with 10 % of spinach and 5% of pea protein concentrate contained up to 14.40% protein as compared to 12% in control sample of semolina as well as iron quantity is also increased up to 3.5 mg/100gm iron from 2.2mg/100gm.

Particular	**E (%)**	**A (%)**
Moisture	1.25	1.56
Fats	14.13	16.10
Total Ash	0.11	0.80
Crude Fibre	1.83	1.91
Protein	12	14.40
Carbohydrates	71.60	66.70
Iron	0.022	0.035



From this comparison it can be clearly observed that, the cookies fortified with spinach and pea protein concentrate is superior in the nutritional qualities than the semolina flour cookies, quality of protein is increased by about 2.4% and quantity of iron also increased by 1.30mg per 100gm.

IV. CONCLUSION

Pea protein offers alternative to various proteins, this will helps to increase the pea percentage. So by this we can provide an excellent supplement in the form of cookies, which will surely meet the body's requirements for protein and iron during growing period.

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