Development and sensory evaluation of *Muffin* incorporation of Multigrain flour and herbal extracts

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Abstract

The present study was carried out with the objectives to find out the development and sensory evaluation of value-added Muffin. The product prepared were "Muffin" by incorporation of Multigrain flour and Herbal extracts (curry leave and basil leave extract) in different proportions T_1 65:35:40:35, T_2 50:50:50:45, T_3 35:65:60:55 and T_4 30:80:70:65 respectively T_0, 100g of refined flour without incorporation of Multigrain flour and herbal extracts served as control. The products were sensory evaluation by using 9- point Hedonic scale. The data obtained during study were analysed statistically using analysis of variance (ANOVA) and C.D techniques. It was concluded that after sensory evaluation best treatment T_3 had highest score with regards overall acceptability contains Refined flour 35 g + Multigrain Flour 65g + Basil leaves extract 55 ml + Curry leaves extract 65 ml. On the basis of findings it was concluded that Multigrain flour and herbal mix can be incorporate successfully in the "Muffin" as well as colour, taste and flavour enhancer.

Keywords- Multigrain flour, Herbal extracts, Value-added, Sensory evaluation and Anova

Introduction

Bengal Gram (Cicer arientimum), also known as "chana", is a member of bean family (**A.E. Al-Snafi 2016**). It is one of the most used legumes all over the world, India being the leading consumer (**Somasekhara 2016**). On germination of Bengal gram, may provide efficient amount of nutrients specially protein and fibre. Sprouting of legumes improves digestibility and better availability of essential amino acids, iron and calcium than in dormant seeds. Apart from enhanced nutritional value, germination improves taste and texture. This quality can be used creatively in producing value added food products along with goodness of nutrients (**Srilakshmi 2003**).**Maize ((Zea mays L.)** is a multipurpose crop, providing food and fuel for human being and feed for animals (poultry and livestock). Its grain has great nutritional value and can be used as raw material for manufacturing many industrial products. (**Afzal *et al.,* 2009**). Due to nutritional composition of maize, it serves as a good. **Soyabean (Glycine max)** Soyabean is a major source of high quality protein and oil, soyabean seed also

contains about 33% carbohydrates, up to 16.6% of which are soluble sugars (**Hou *et al.* 2009).** Although soybean is rich in nutrients but its acceptability as raw food is limited due to the presence of antinutritional factors. Phytic acid (myo-inositol hexakis phosphate) contains 65–80% of total phosphorus in mature soybean seeds (**Raboy *et al.* 2000**). It chelates mineral nutrients such as Cu, Zn, Mn, Fe and Ca thus reducing their availability. **Oats (*Avena sativa*)** it is chiefly eaten as porridge, but may also be used in a variety of baked goods, such as oatcakes, oatmeal cookies oat bread. Oats are also an ingredient in many cold cereals, in particular muesli and granola. Oats are also occasionally used in several different drinks (**Gupta *et.al*.2016). Finger millet** (*Eleusine coracana*), is rich in protein, iron, calcium, phosphorus, fibre and vitamin content. The calcium content is higher than all the cereals and iodine content is said to be highest among all the food grains (**Desai *et al.,* 2010). Pearl millet (Pennisetum glaucum)** is a versatile cereal cultivated for food, feed and forages (**Arora *et al.,* 2003**). Pearl millet had higher protein (14.0 per cent), fat (5.7 per cent), fiber (2.0 per cent) and ash (2.1 per cent) content (Sade, 2009) when compared to the major cultivated cereal crops such as wheat (**Kavitha and Parimalavalli, 2014**), rice (**Ahmed *et al.,* 2014**), sorghum (**Awadelkareem *et al.,* 2015**). **Sorghum** ((Sorghum bicolor (L.) Moench) is a gluten free stable food. Protein content of sorghum grain ranges from 4.4 to 21.1 percent, with a mean of 11.4 percent. In comparison to other cereal grains, sorghum grain is recognised for its hardness. The grain's hardness is attributed to a higher content of the protein prolamin (3.6 to 5.1 percent) (**Mohamed TK *et.al.* 2009).** Herbs contains many vitamins and minerals, as well as antioxidants such as lutein, zeaxanthin, and beta-carotene, it helps in protect against infection, lower the blood sugar, lower your cholesterol, ease joint pain, and protect the stomach, antidepressant and antianxiety properties similar to antidepressant drugs. The study's goals included sensory evaluation of developed muffin by incorporation of multigrain flour and herbal extracts.

Materials and Methods

Experimental site-

The present Study was conducted in the research laboratory of Foods Nutrition and Public Health department, ECHS, SHUATS, Prayagraj.

Procurement of Raw Materials:-

Sorghum (Sorghum bicolor), pearl millet (Pennisetum americanum), bengal gram (Cicer arietinum), Maize (Zea mays), Finger millet (*Eleusine coracana*), Oats (*Avena sativa L.*), and soya bean (Glycine max) were collected from the local market of Prayagraj.

Preparation of the Multigrain Flour-The multigrain flour were prepared by processed grains like Oats, Maize, Pearl Millet, Soyabean, Bengal Gram, Sorghum and Ragi and following processing methods were used for the selected grains-

Roasting of Bengal gram and Soyabean-

 Bengal Gram and soyabean was clean and roasted in hot air oven at 115^0c for 10-15 Minute. After the roasting Bengal gram were grinded into fine powder and utilized in the development of multi-grain flour. **Source- Shrilakshmi (2003).**

Development of Oats, Maize, Pearl Millet, Sorghum and Finger millet flour

The selected grains i.e. Oats, Maize, Pearl Millet, Sorghum and Finger millet. All these grains were cleaned and further grinded with milling machine. Collected the flour from the machine and sieved. The flour got stored in air tight containers for development of multigrain flour and further analysis.

Development of Multigrain Flour
For the preparation of value- added *Muffin* we prepared multigrain flour by the utilization of different flours in different ratio. Oats flour 20gm, Maize flour 20gm, Soyabean flour 15gm, Bengal Gram flour 15gm, Pearl Millet flour 10gm, Finger millet flour 10gm and Sorghum flour 10gm.

Preparation of herbal extracts-

Basil and Curry leaves washed, and then blended in a mixer grinder with the help of some water. After blending of leaves used muslin cloth for the filter of extract (**Srivastava and Kumar, 2009).**

Details of treatments and replications of value- added Muffin.

The Multigrain flour and herbal extracts were used in different rations in four treatments for the preparation of value –added Muffin is given amount which represents by the **Table 1.**

Table no. 1 Different ratio of the Multigrain flour and Herbal extracts:

Sr. no.	Ingredients	Treatments					Replications
		T_0 (gm/ml)	T_1 (gm/ml)	T_2 (gm/ml)	T_3 (gm/ml)	T_4 (gm/ml)	
1.	Refined flour	100g	65	50	35	30	
2.	Multigrain flour	-	35	50	65	80	
3.	Curry leaf extract	-	40	50	60	70	3 times
4.	Basil leaf extract	-	35	45	55	65	

Sensory Evaluation-

Sensory evaluation of the Multigrain flours and herbal mix value- added *Nutribar* for their acceptability was done by a panel of judges using 9-point hedonic scale for color and appearnce, taste and flavour, body and texture, and overall acceptability **(Srilakshami B. 2007)**.

Statistical analysis

The data was statistically analyzed by using analysis of ANOVA and a significant difference between the treatments was determined by using CD (Critical difference) test. (**Gacula, Jr. and Singh 2008).**

Result and Discussion

The results of various experiments conducted during the study period are summarized below-

Table 2. Average sensory scores of control and treated sample of value-added *Muffin*

Control and Treatments	Colour and Appearance	Body and Texture	Taste and Flavour	Overall Acceptability
T_0	6.66	7	6.13	6.7
T_1	7.4	7.36	7.06	7.32
T_2	7.7	7.36	7.4	7.5
T_3	8.16	8.3	7.4	8.33
T_4	7.13	7.1	8.06	7.32
F_{Cal} (5%)	7.38	6.58	9.1	8.58
F_{Tab} (5%)	3.84	3.84	3.84	3.84
CD (P≤0.05)	0.52	0.52	0.94	0.52
S.A.	S*	S*	S*	S*

The above table no. 2 and graph 1 shows that average sensory score of value-added *Muffin* on the basis of all parameters like Colour and appearance, Body and texture, Taste and flavour, and Overall acceptability. A result of sensory evaluation of value-added *Muffin* by using 9 point hedonic scale shows that value-added *Muffin* illustrated that according to colour and appearance T_3 had the highest score 8.16 followed by T_2 (7.7), T_1 (7.4), T_4 (7.13) and T_0 (6.66). The incorporation of Multigrain flour and fresh leaf extracts of Curry leaves and Basil gave the greenish brown colour to the "*Muffin*". The reason of brown colour is due to bran, endosperm and the germ of grain found in multigrain flour and greenish colour was due to leaf extract. Body and Texture indicate that T_3 had the highest score 8.3 followed by T_1 (7.36), T_2 (7.36) T_4 (7.1) and T_0 (7), respectively. The incorporation of Multigrain flour, fresh leaf extracts of Curry leaves and Basil and also baking soda gave soft body and texture to the "*Muffin*". The reason of soft texture is due to sodium bicarbonate and added leafs extract Taste and Flavour of the value-added *Muffin* indicate that T_4 had the highest score 8.06

followed by T_2 (7.4), T_3 (7.4) T_1 (7.06), and T_0 (6.13) respectively. Sugar gave the sweetness in muffin and little bit bitter taste due to leaves extracts. **Jadhao *et. al. (*2015)** found that better taste in Multigrain muffin due to incorporation of Finger millet. The sensory score of Overall acceptability of value-added Muffin treatment T_3 (8.33) was more acceptable followed by T_1 (7.32), T_4 (7.32) T_2 (7.5), and T_0 (6.7) respectively. The amount of best treatment T_3 had Refined flour 35 g + Multigrain Flour 65g + Basil leaves extract 55 ml + Curry leaves extract 60 ml. **Agrawal and Verma (2016)** reported that preparing multigrain biscuit they was found that treatment (T_2) was best compare to all treatments. Best Treatment (T_2) score had (8.3) followed by treatment T_0 (7.5), T_1 (8.2), T_3 (7.1) &T_4(7.0).
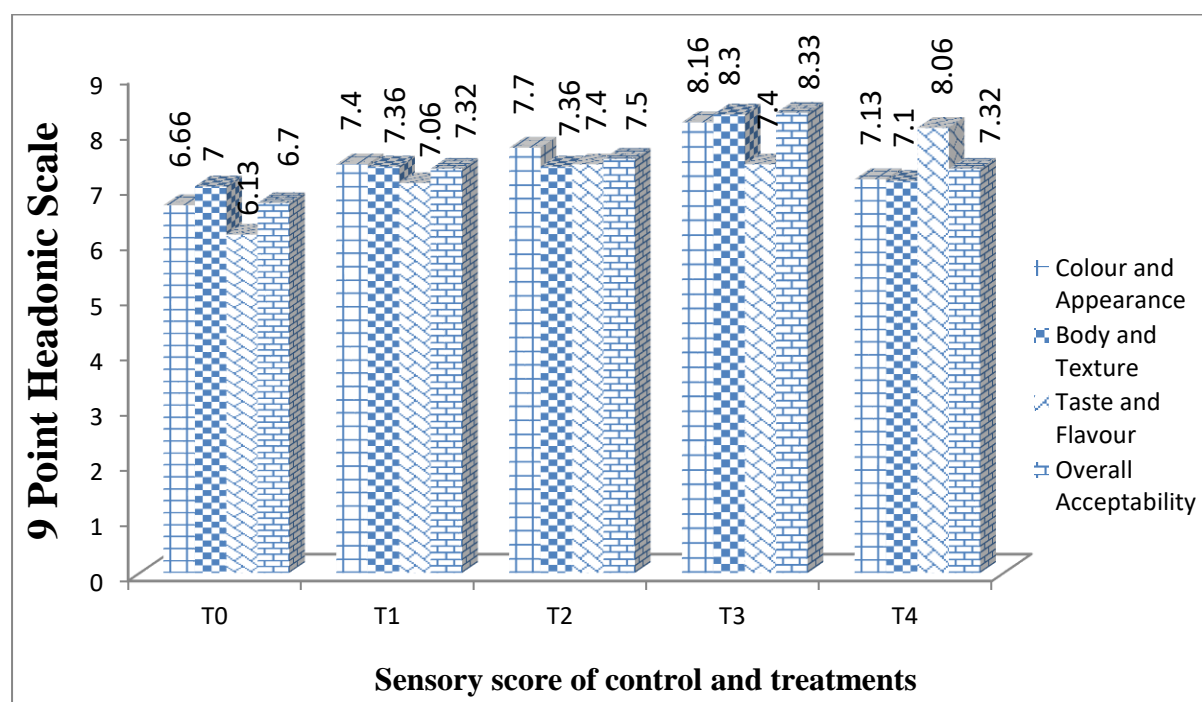
Fig no.1. The effect of incorporation of Multigrain flour and herbal extracts on different levels in the sensory attributes of *Muffin.*

The statistical analysis carried out on different sensory parameters have clearly shown that there calculated value of 'f' is greater than the tabulated value of 'f' on 4 and 8 degree of freedom at 5% probability level so there was significant difference between control and treatments regarding all sensory Attributes such as Colour and appearance, Body and texture, Taste and flavour, and Overall acceptability of the *Muffin.* In the relation to colour and appearance calculated value of 'f' (7.38) due to treatments was higher than the tabulated value of 'f' (3.84). Therefore indicates that there was significant difference in Colour and Appearance between the four treatments of "*Muffin*". It compared against Critical Difference (C.D.) value i.e. (0.52) was significant the difference in the mean value of (T_0, T_1) (T_0, T_2) (T_0, T_3) (T_1, T_2), (T_1, T_3) (T_2, T_4) and (T_3, T_4) because mean value higher than value of C.D.

In the relation to Body and texture calculated value of 'f' (6.58) due to treatments is higher than the tabulated value of 'f' (3.84). Therefore indicates that there was significant difference in Body and Texture between the four treatments of "*Muffin*". It compared against Critical Difference (C.D.) value i.e. (0.52) was significant the difference in the mean value of (T_0, T_3), (T_1, T_3) (T_2, T_3) and (T_3, T_4) was higher than C.D., therefore the difference was significant.

In the relation to Taste and flavour calculated value of 'f' (9.1) due to treatments was higher than the tabulated value of 'f' (3.84). Therefore indicates that there was significant difference in Taste and Flavour between the four treatments of "*Muffin*". It compared against Critical Difference (C.D.) value i.e. (0.94) was significant the difference in the mean value of (T_0, T_2) (T_0, T_3), (T_0 T_4) (T_1, T_3) (T_1, T_4) and (T_2, T_3) was higher than C.D., therefore the difference was significant.

In relation to Overall acceptability calculated value of 'f' (8.58) due to treatments was Greater than the tabulated value of 'f' (3.84). Therefore indicates that there was significant difference in Overall acceptability between the four treatments of "*Muffin*". It compared against Critical Difference (C.D.) value i.e. (0.52) was significant the difference in the mean value of (T_0, T_1) (T_0, T_3) (T_0, T_4) (T_1, T_4) (T_1, T_3), (T_2, T_3) (T_2, T_4), and (T_3, T_4), was higher than C.D., therefore the difference was significant. It is therefore concluded that the average score for all parameters of sensory attributes of Value- added *Muffin* differ significantly, which may be attribute to different ratios of Multigrain flour and Herbal extracts in value-added *Muffin.* **Limbachiya and Amin** (**2015**) reported that sample T_2 (40:20:40) Soybean: Ragi: Maize Muffin and Sample T_3 (30:20:50) Soybean: Ragi: Maize Muffin was non-significant difference compared to the T_1 ratio (50:20:30) of Soybean: Ragi: Maize Muffin.

Conclusion

It is concluded that Multigrain flour and Herbal extracts can be successfully incorporated in "*Muffin*". On the basis of sensory evaluation T_3 (Refined flour 35 g + Multigrain Flour 65g + Basil leaves extract 55 ml + Curry leaves extract 65 ml) as found best in "*Muffin"* with regards colour and appearance, Body and Texture and overall acceptability. Treatment T_4 (Oats 30 g+ Multigrain Flour 80g + Basil leaves extract 70 ml + Curry leaves extract 65ml) was best treatment regarding to Taste and Flavour. It concludes that, a novel culinary concept for creating bakery product addition of Multigrain flour and herbal extracts has been developed.

Recommendation

It's recommended that prepared value-added Muffin is very beneficial and useful for the Nutritional deficiency people.

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