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Amit Kumar
Deptt. of Food Science & Tech., Faculty of Science, S.V. University, Gajraula, Uttar Pradesh, India

S.K. Goyal
KVK, Institute of Agril. Scs., RGSC, BHU, Barkachha, Mirzapur, Uttar Pradesh, India

Munesh
Deptt. of Food Science & Tech., Faculty of Science, S.V. University, Gajraula, Uttar Pradesh, India

Correspondence
Amit Kumar
Deptt. of Food Science & Tech., Faculty of Science, S.V. University, Gajraula, Uttar Pradesh, India

Study on physico-chemical analysis for the development of multi grain flour biscuits

Amit Kumar, S.K. Goyal and Munesh

Abstract
The moisture content for the different samples which range from 3.2% to 7.9% depending upon the ratio. The highest value was observed in samples 7.9% of T_2 and lowest value observed 3.2 of T_3 samples. It is clear that the moisture content of the samples decreases with increases in the proportion of others biscuits samples. The moisture content effect on the samples during storage because of the increased moisture in the sample due to the reason of sugar content. The sugar content effect on moisture content and storage period basically low sugar content samples are durability during storage. We use the blends or wheat, rice, oat and soybean flours which resulted in reduction moisture content of composite flours. The ash content of different sample is presented in table 3.2 which range from 1.02% to 2.08% depending upon the ratio. The highest value was observed in samples 1.62% of control and lowest value observed 1.02 of T_1 samples. It is clear that the ash content of the samples decreases with increases in the proportion of others biscuits samples. The ash content effect on the samples during storage because of the increased ash in the sample due to the reason of sugar ratio. The TSS content for the different sample is presented in table no. 3.3 which range from 35.93% to 40.99% depending upon the ratio. The highest value was observed in samples 40.99% of T_{13} and lowest value observed 35.93 of T_{10} samples. It is clear that the TSS content of the samples decreases with increases in the proportion of others biscuits samples. The TSS content effect on the samples during storage because of the increase TSS in the sample due to the reason of sugar percentage. The sugar percentage effect on TSS content and storage period basically low sugar content samples are durability during storage.

Keywords: physico-chemical analysis, multi grain flour biscuits

Introduction
Being one of the most popular ready to eat bakery product biscuits possess several attractive features including palatability, relatively long shelf life and easy storage, more convenient and good eating quality. Due to their increasing demand among consumers, the interest in bakery industry is growing fast (Hood and Jood, 2005) [5]. Development of composite flour bakery products is the latest trend in the bakery industry. Most of the bakery products are in demand because they are rich in fibre and protein and are nutritious with good sensory characteristics.

The consumption of cereal snack foods such as biscuits, cookies, wafers and short bread has become very popular in Sri Lanka especially among children. Among these biscuits possess various attractive features including wider consumption base relatively long shelf-life, and good eating quality. Long shelf-life of biscuits makes the possibility of large scale production and distribution. Good eating quality makes biscuits attractive for protein fortification and nutritional improvements, particularly in children feeding programs, for the elderly and low-income groups.

Many countries have made great strides to improve their food and nutrition situation, but hunger and malnutrition remain a serious problem in many parts of the world especially in third world countries (FAO 2007) [4]. There are a large number of people in the world who are chronically undernourished. Most of them are small children who are suffering from acute or chronic deficiency problems. Chronic diet-related diseases are also emerging as serious health problems in both developed and developing countries. Sri Lanka faces one of the most serious nutritional problems in protein energy malnutrition.

In this present study, trying to made supplement wheat flour with soybean flour to develop nutritionally protein–enriched biscuits. At the same time, the utilization of soybean may encourage the farmers to grow more soybeans. Thus, the malnutrition problem may be solved and the poverty in the country could be reduced to a certain level.

The demand of processed food is also increasing rapidly in various developing country to increasing urbanization. Among the processed foods, bakery products, particularly biscuits command wide popularity in rural as well as urban areas among all the age groups. Breads and

biscuits are major products accounting for 80% of the total bakery products in India (Agarwal, 1990) [1]. Biscuit along with bread form major baked food accounting for over 30 and 50% of total bakery products respectively, produced in India (Shukla *et al.*, 2000) [10]. The prepared biscuits have in biscuit have the principal ingredients are wheat flour, sugar, fat, water and salt. These are mixed together with other minor ingredients like baking powder, skimmed milk, emulsifier and sodium meta bisulphite to form dough containing well-developed gluten network. Biscuits are higher value of carbohydrates, fat and calorie but lower value of fiber, vitamin, and mineral which make it unhealthy for daily use. Because of its acceptability in all age group, longer shelf life, better taste and its position as snacks it is considered as a good product for protein fortification and another nutritional improvement (Serrem *et al.*, 2011) [11].

Material and method

Raw materials viz., wheat flour (Maida or refined flour), rice flour, oat flour, soybean flour, chemicals, packaging materials (HDPE, glass jar and Aluminium flexible packages) etc. were procured from the local market for the present study.

Table 2.1: Experimental layout for the development of biscuits from multi-grain flour

Grain Flour	Control	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}
Wheat Flour	100	10	25	40	70	30	20	10	30	20	10	30	20	10
Rice Flour	00	30	25	20	10	10	40	70	30	20	10	30	20	10
Oat Flour	00	30	25	20	10	30	20	10	10	40	70	30	20	10
Soy Flour	00	30	25	20	10	30	20	10	30	20	10	10	40	70

Physico-chemical quality of products

Moisture content

Initial moisture content of samples was determined by hot air oven drying method as recommended by AOAC (2000) [2].

Ash content (%)

Ash content was determined by the method as recommended by AOAC (2000) [2].

$$Ash\ (\%) = \frac{weight\ of\ ash}{weight\ of\ sample} x\ 100$$

Total soluble sugars (TSS)

Total soluble sugars were estimated by the method of Yemm and Willis (1954).

Result and Discussion

Effect on moisture content

The moisture content for the different sample is presented in table 3.1 which range from 3.2% to 7.9% depending upon the ratio. The highest value was observed in samples 7.9% of T_2 and lowest value observed 3.2 of T_3 samples. It is clear that the moisture content of the samples decreases with increases in the proportion of others biscuits samples. The moisture content effect on the samples during storage because of the increased moisture in the sample due to the reason of sugar content. The sugar content effect on moisture content and storage period basically low sugar content samples are durability during storage. We use the blends or wheat, rice, oat and soybean flours which resulted in reduction moisture content of composite flours.

We are found the moisture content in the table according on days, the highest moisture content 4.9 of T_2 sample and lowest value 3.6 of T_1 samples at the end date of 30 days. We are found the moisture content in the table according on days, the highest moisture content 6.7 of T_2 sample and lowest value 4.4 of T_1 samples at the end date of 60 days. We are found the moisture content in the table according on days, the highest moisture content 7.5 of T_2 sample and lowest value 5.1 of T_1 samples at the end date of 90 days. We are found the moisture content in the table according on days, the highest moisture content 7.9 of T_2 sample and lowest value 5.5 of T_1 samples at the end date of 120 days. The moisture content range and calculated data are shown in table 3.1. the moisture content was increased at room temperature because the resistant to moisture movement is relatively higher in thickness of biscuits. It is observed that the time required for moisture content and moisture ratio level was dependent on environmental conditions with pre-treatment. The rate of moisture movement in food production increase due to the orientation of fibre, which allows more rapid moisture movement along their length than across the structure. As a result of the shelf life of the product may be significantly reduced. The physical changes in biscuits are frequently caused by storage in appropriate condition. For example, when dehydrated food is stored at high humidity, the process of moisture uptake will place. as a result, the product becomes soggy, leading to degraded quality and self life (Singh *et al.*, 2004) [12]. An increase in moisture and ash content of lined oil cookies were reported by Wade (1988) [13], Leelavathi and Rao, (1993) [6], Rao *et al.*, (1995) [8], Pasha *et al.*, (2002) [7], and Butt *et al.* (2004) [3].

Table 3.1: Change the moisture content value of multigrain biscuits during room storage conditions

Moisture Content %														
Storage period	**Control**	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}
0	3.4	3.2	4.3	3.2	3.2	3.4	3.8	3.9	3.5	3.3	3.7	3.5	3.9	3.6
30	3.9	3.6	4.9	3.7	3.8	4.1	4.6	4.6	4.2	4.0	4.5	4.3	4.6	4.3
60	4.6	4.4	6.7	4.6	4.6	4.9	5.2	5.4	4.9	4.7	5.3	5.1	5.3	5.2
90	5.2	5.1	7.5	5.2	5.4	5.6	5.8	6.1	5.3	5.6	6.0	5.9	6.1	6.3
120	5.7	5.5	7.9	5.9	5.8	5.8	6.4	6.8	6.7	6.5	6.9	6.7	7.0	7.0

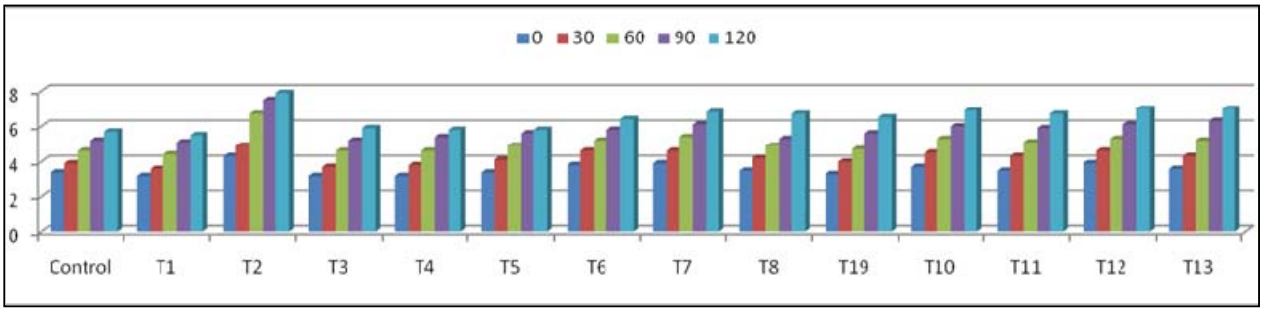

Fig. 3.1: Change the moisture content value of multigrain biscuits during room storage conditions

Effect on ash content

The ash content of the samples during storage of 120 days showing in table 3.2. It was analyse to see the effect of an ash content of the samples of different ratio biscuits. Packed and storage at room temperature. The data were also present as bar diagram in figure 3.2. The ash content of different sample is presented in table 3.2 which range from 1.02% to 2.08% depending upon the ratio. The highest value was observed in samples 1.62% of control and lowest value observed 1.02 of T_1 samples. It is clear that the ash content of the samples decreases with increases in the proportion of others biscuits samples. The ash content effect on the samples during storage because of the increased ash in the sample due to the reason of sugar ratio. The sugar ratio effect on ash content and storage period basically low sugar content samples are durability during storage. We use the blends or wheat, rice, oat and soybean flours which resulted in reduction moisture content of composite flours.

We are found the moisture content in the table according on days, the highest moisture content 1.71 of T_3 sample and lowest value 1.32 of T_1 samples at the end date of 30 days. We are found the ash content in the table according on days, the highest ash content 1.77 of T_3 sample and lowest value 1.29 of T_4 samples at the end date of 60 days. We are found the ash content in the table according on days, the highest ash content 1.91 of $T1_0$ sample and lowest value 1.36 of T_4 samples at the end date of 90 days. We are found the ash content in the table according on days, the highest ash content 2.08 of T_{10} sample and lowest value 1.42 of T_{11} samples at the end date of 120 days. The rate of browning reaction depends on temperature, environment effect and storage condition during the storage period, the ash content of the product, time of heat treatment and the sample ratio reaction. The rate increase with increasing ash content ratio due to the amount of sugar concentration and flour ratio in the different samples of biscuits. This colour development is easily undesirable, but the knowledge of the reaction involved, it is easy to work out method for controlling this change. An increase in moisture content of cookies samples during storage and decrease a gradual ash content of cookies were reported by Wade (1988) [13], Leelavathi and Rao (1993) [6], Rao *et al*., (1995) [8], Pasha *et al*., (2002) [7], Butt *et al*., (2004) [3], and Sharif *et al*., (2009) [9] either due to atmosphere or packaging material.

Table 3.2: Change the moisture content value of multigrain biscuits during room storage conditions

Ash %														
Storage period	**Control**	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**T_8**	**T_9**	**T_{10}**	**T_{11}**	**T_{12}**	**T_{13}**
0	1.62	1.26	1.42	1.64	1.12	1.35	1.37	1.53	1.27	1.43	1.39	1.02	1.33	1.54
30	1.69	1.32	1.48	1.71	1.23	1.42	1.43	1.58	1.34	1.49	1.47	1.18	1.43	1.64
60	1.71	1.37	1.67	1.77	1.29	1.51	1.51	1.60	1.39	1.54	1.63	1.30	1.56	1.72
90	1.73	1.43	1.76	1.79	1.36	1.59	1.58	1.63	1.42	1.69	1.91	1.39	1.73	1.86
120	1.75	1.49	1.87	1.83	1.48	1.67	1.63	1.68	1.48	1.78	2.08	1.42	1.82	1.93

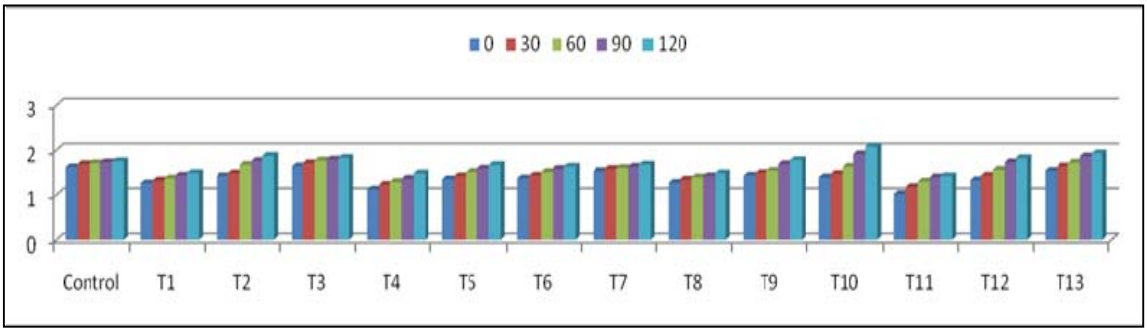

Fig 3.2: Ash content changing of different samples ratio of biscuits during storage conditions at room temperature.

Effect on TSS

The TSS content for the different sample is presented in table no. 3.3 which range from 35.93% to 40.99% depending upon the ratio. The highest value was observed in samples 40.99% of T_{13} and lowest value observed 35.93 of T_{10} samples. It is clear that the TSS content of the samples decreases with increases in the proportion of others biscuits samples. The TSS content effect on the samples during storage because of the increase TSS in the sample due to the reason of sugar percentage. The sugar percentage effect on TSS content and storage period basically low sugar content samples are durability during storage. We use the blends or wheat, rice, oat and soybean flours which resulted in reduction moisture content of composite flours.

We are found the moisture content in the table according on days, the highest TSS content 40.34 of T_{13} sample and lowest value 36.24 of T_{10} samples at the end date of 30 days. We are found the TSS content in the table according on days, the highest TSS content 40.57 of T_{13} sample and lowest value 36.54 of T_{10} samples at the end date of 60 days. We are found the TSS content in the table according on days, the highest TSS content 40.81 of T_{13} sample and lowest value 36.82 of T_{10} samples at the end date of 90 days. We are found the ash content in the table according on days, the highest ash content 40.99 of T_{13} sample and lowest value 37.19 of T_{10} samples at the end date of 120 days. The TSS increases with increasing of different flour making biscuits samples during storage periods. The main reason is increasing TSS, sugar content level and moisture effect on samples during storage. Increase TSS during storage was probably due to the conversion of leftover polysaccharides into soluble sugar.

Table 3.3: Change the TSS value of multi-grain biscuits during room storage condition

TSS %														
Storage period	**Control**	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**T_8**	**T_9**	**T_{10}**	**T_{11}**	**T_{12}**	**T_{13}**
0	39.32	38.19	37.84	38.18	38.83	38.36	37.33	39.14	38.34	37.32	35.93	37.07	38.60	40.13
30	39.87	38.42	37.98	38.36	38.97	38.47	37.52	39.47	38.57	37.53	36.24	37.23	38.73	40.34
60	40.25	38.63	38.12	38.56	39.11	38.63	37.78	40.64	38.79	37.74	36.54	37.41	38.87	40.57
90	40.76	38.84	38.27	38.74	39.23	38.76	37.99	40.82	39.17	38.94	36.82	37.57	39.12	40.81
120	40.94	39.07	38.48	38.96	39.34	38.91	38.17	41.23	39.38	38.21	37.19	37.72	39.27	40.99

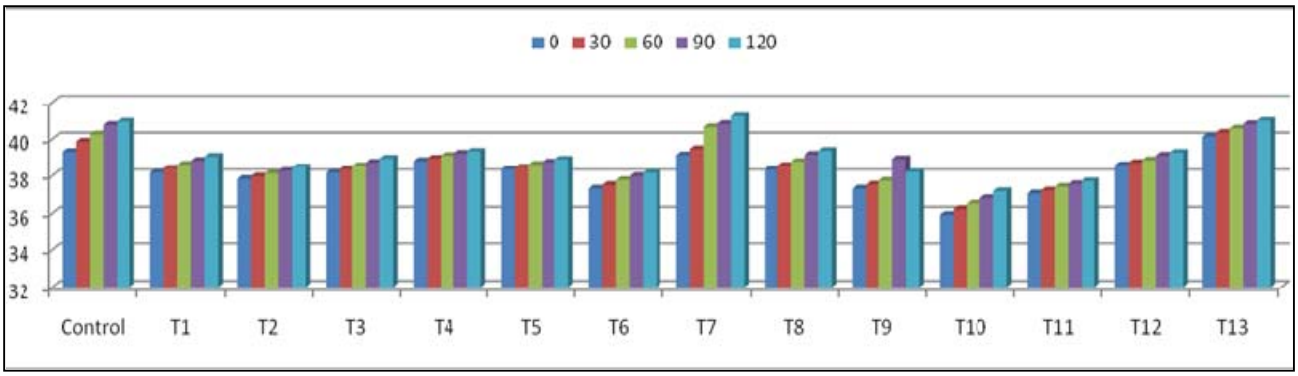

Fig 3.3: TSS content changing of different samples ratio of biscuits during storage condition at room temperature

Conclusion

The moisture content effect on the samples during storage because of the increased moisture in the sample due to the reason of sugar content. The sugar content effect on moisture content and storage period basically low sugar content samples are durability during storage. We use the blends or wheat, rice, oat and soybean flours which resulted in reduction moisture content of composite flours. the ash content of the samples decreases with increases in the proportion of others biscuits samples. The ash content effect on the samples during storage because of the increased ash in the sample due to the reason of sugar ratio. The sugar ratio effect on ash content and storage period basically low sugar content samples are durability during storage. TSS content of the samples decreases with increases in the proportion of others biscuits samples. The TSS content effect on the samples during storage because of the increase TSS in the sample due to the reason of sugar percentage. The sugar percentage effect on TSS content and storage period basically low sugar content samples are durability during storage. We use the blends or wheat, rice, oat and soybean flours which resulted in reduction moisture content of composite flours.

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