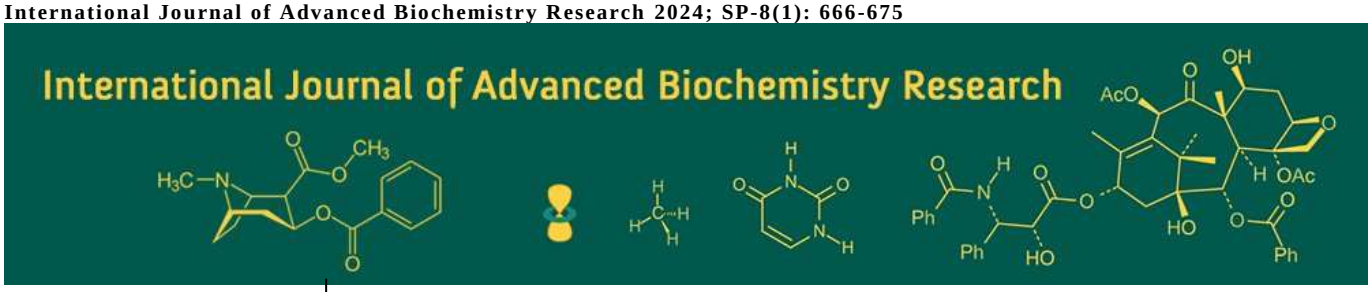

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Development of process technology for stevia-based foxtail millet (*Setaria italica* L.) Beauv.) biscuits

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Abstract
The demand for healthier and low-calorie food alternatives has increased in recent years due to rising health concerns and lifestyle changes. In response to this, the present study focuses on the development of process technology for stevia-based foxtail millet biscuits. Stevia, a natural sweetener with zero calories, is gaining attention as a substitute for traditional sugar in food industry. Foxtail millet, a nutritious and gluten-free grain, is used as the base ingredient for the biscuit formulation. The stevia-based foxtail millet biscuits were prepared by varying the percentage of foxtail millet flour (50:50, 75:25 and 100:0) and stevia concentrate (1.5, 2.0 and 2.5%). The prepared biscuits were analysed for quality characteristics such as physical properties, proximate compositions, textural properties and sensory properties. Among all the treatments, 100% foxtail miller flour + 2.5% stevia concentrate treatment was found to be best. The physical properties of this treatment biscuits *viz*., weight, diameter, thickness, spread ratio and percentage spread ratio were 11.18 g, 1.2 cm, 4.24 cm, 3.53 and 35.33 respectively and colour values were *L**(47.67), *a** (8.58) and *b** (25.09). These biscuits were high in crude protein (8.42%), crude fat (20.82%), crude fibre (4.23%) and total ash (3.68%) and it contains less moisture content (2.68%) and carbohydrates (60.17%). The textural properties *viz.*, hardness (16.98 N) and stickiness (-0.15 N) were found to be maximum and minimum respectively. In sensory attributes the overall acceptability of the selected treatment was found to be 8.25 which is almost similar to the control.

Keywords: Stevia, foxtail millet, biscuits, sensory

Introduction
The biscuits are amongst the lowest cost processed foods in the country, when compared to other Indian sweets and salted snacks. Biscuits are easy to use during travel or at home, because of their availability in varieties of packed sizes. It is no longer viewed as a luxury tea time snack, but as essential daily food component for an average Indian household. India is considered as the third largest producer of biscuits after USA and China. Indian biscuit industry has occupied around 55-60 percent of the entire bakery production. The per capita consumption of biscuits in India is 1.8 kg per annum as against 7.5 kg per annum in the developed countries (Indian Bakery Industry, 2020). The Indian biscuits market has reached USD 5,151.2 million in 2020. Biscuit industry in India in the organized sector produces around 60% of the total production, the balance 40% being contributed by the unorganized sectors. The biscuits are amongst the lowest cost processed foods in the country, when compared to other Indian sweets and salted snacks. Biscuits are easy to use during travel or at home, because of their availability in varieties of packed sizes. It is no longer viewed as a luxury tea time snack, but as essential daily food component for an average Indian household.

Today, millet ranks as the sixth most important grain in the world, sustains 1/3rd of the world's population and is a significant part of the diet in Northern China, Japan, Manchuria and various areas of the former Soviet Union, Africa, India, and Egypt. Raw millet has 73% carbohydrates, 11% protein, 9% water and 4% fat. The dietary carbohydrates content of millets is also relatively high. Starch is the main carbohydrate component and the millets contain a higher proportion of non-starchy polysaccharides (Dietary fibre). Millets are nutritionally superior to cereals, yet their utilization in the country is not widespread. They are mostly used in preparation of traditional dishes.

One possible way of extending their utilization could be by blending them with wheat flour after suitable processing. On addition of millet flour to wheat flour or other flours, there would be changes in physico-chemical, nutritional and functional characteristics of wheat flour. This information will be useful to food processors and nutritionists to formulate the products based on millet-wheat blends (Vijayakumar, 2009) [12].

Stevia is an amazing plant from the rain forest of Amazone. It is a natural sweetener plant known as "sweet weed", "sweet leaf", "sweet herb" and "honey leaf" which is estimated to be 200-300 times sweeter than sugar (www.webstevia.com). It is a magical plant which offers sweetness with fewer calories and do not show any side effects after consumption on human health. It is used for the treatment of various conditions such as cancer, diabetes, obesity, cavities, hypertension, fatigue, depression and in cosmetic and dental preparations (Snehal and Madhukar, 2011) [9].

Material and Methods

The foxtail millets (Variety: HMT 100-1) were procured from the Millet Processing Unit, Department of Processing and Food Engineering, College of Agricultural Engineering, University of Agricultural Sciences, Raichur. The foxtail millets were cleaned and subjected to grinding in a flour mill. The foxtail millet flour was sieved. Other ingredients like refined wheat flour, AMUL butter, baking powder, skim milk powder and vanilla powder were also procured from the local market of Raichur, Karnataka.

Standardization of process technology for development of stevia-based foxtail millet biscuits

The stevia-based foxtail millet biscuits were prepared by varying the percentage of foxtail millet flour and stevia concentrate. The foxtail millet flour and refined wheat flour were taken in the ratio of 50:50, 75:25 and 100:0 to make 100% of composite flour and stevia concentrate was used in three variations such as 1.5, 2.0 and 2.5.

Experimental procedure

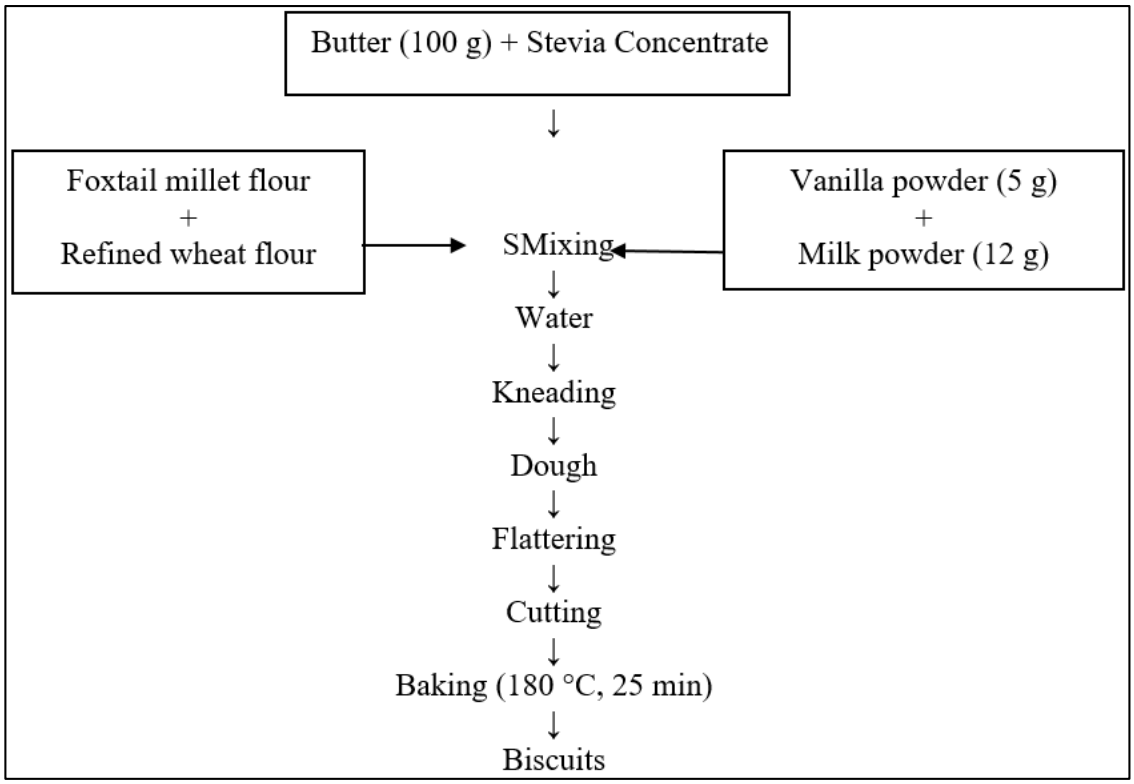

Fig 1: Process flow chart for development of stevia-based foxtail millet biscuits

The basic ingredients used for every 250 g of composite flour were 100 g of butter, 12 g of milk powder, 5 g of vanilla powder, 3 g of baking powder and 100 ml water. All ingredients were added to dough mixture and mixed for 15 min. The prepared dough was flattened with the help of a traditional wooden roller "belan" used in making chapattis, to a thickness of about 5.0 mm round pieces of size 40 mm diameter were taken out of the flattened dough with the help of a steel mould. These moulds of biscuits were kept in a tray and placed in a rotary oven. The cut-out dough pieces were baked at 180 ºC for 25 min in rotary oven. The prepared biscuits were cooled at room temperature (30±2 °C). These baked biscuits were packed in biscuit box and evaluated for physico-chemical and quality parameters.

Physical properties

The physical properties of stevia-based foxtail millet biscuits such as weight, thickness, diameter, spread ratio, percent spread factor and colour (L^*, a^* and b^*) values were determined. The weights of biscuits were determined by electronic balance (Essae make) before and after baking. The thickness and diameter of biscuits were measured by using vernier callipers (Absolute Digimatic, Mitutoyo Corp, Japan). The spread ratio of biscuits were calculated by the ratio of diameter to thickness. Hunter's lab colourimeter (Premier colour scan, Colour Flex EZ; Mumbai, India) was used for the measurement of colour of biscuits.

Proximate compositions

The developed biscuits have been analyzed for the proximate composition in triplicates like moisture, carbohydrate, crude protein, crude fat, crude fibre and total ash as per the procedure followed by AOAC, (2005) [3]. By placing 5g of the sample in a hot air oven for 24 h at 105 °C, followed by cooling in a desiccator to determine weight loss, the moisture content of the produced formulation was calculated. The crude protein of biscuits was determined using Kjeltec distillation unit. The crude fat was determined by Soxhlet extraction method using SOCS-PLUS apparatus. The crude fibre and total ash were determined by sequential acid and alkali hydrolysis method using Fibra-Plus and muffle furnace method respectively The differential approach was used to compute the amount of carbohydrates, which is 100 minus (Moisture + Fat + Protein+ Crude Fibre + Ash%).

Textural properties

Textural Analyzer (TA. XT Plus/TA. HD Plus) was used for measuring textural properties of biscuits. The texture analyzer (TA) was a microprocessor-controlled analysis system, which could be interfaced to a wide range of peripherals, including PC-type computers. The texture analyzer measured force, distance and time in a most basic test, thus providing three-dimensional product analysis. Forces could be measured against set distances and distances may be measured to achieve set forces. The probe carrier contained a very sensitive load cell. The TA. HD plus load cell had electronic overload protection. The TA-XT plus load cell had mechanical overload. The analyzer was linked to a computer that recorded the data via a software program Stable Micro System Exponents software (Stable Micro Systems, England).

Sensory evaluation

The biscuits were rated on a nine-point Hedonic scale. Nine points were awarded as like extremely-9, like very much-8, like moderately-7, like slightly-6, neither like nor dislike-5, dislike slightly-4, dislike moderately-3, dislike very much-2, dislike extremely-1.The members of consumer test panel awarded grades for different quality aspects of biscuits like general appearance, flavor, taste, texture, mouth feel and overall acceptability.

Statistical analysis

All the experiments in the study were conducted in triplicate and the mean values were reported. Factorial completely randomized design (FCRD) was used to analyse the data. After proper analysis, data were accommodated in the tables as per the needs of objectives for interpretation of results. Statistical significance of the terms in the quadratic equation was examined by analysis of variance (ANOVA) for each response. The experimental design was done with the aid of the design-expert software version 7.7.0 (Statease Inc., Minneapolis, USA) to identify optimum levels of two independent variables *viz.*, foxtail millet: refined flour percentage and stevia concentration.

Results and Discussion

The equal weight of individual biscuits before baking for all the treatments was found to be 14 g. After baking, the weight was reduced to the range of 11.09 to 11.18 g. The average thickness and diameter of biscuits before baking for all the treatments were kept at 1.5 cm and 5 cm, respectively whereas, after baking the thickness and diameter were reduced to the range of 1.20 to 1.40 cm and 4.20 to 4.25 cm respectively. The spread ratio of biscuits before baking was 10 and found to be in the range of 2.83 to 3.53. The weight, thickness, diameter and spread ratio of control samples was found to be 11.31 g, 1.47 cm, 4.70 cm and 3.13, respectively. The results are in good agreement with Suresha *et al.* (2019) [10] for foxtail millet gluten free cookies.

The results of the L^* values varied from 47.67 to 50.02, 51.68 to 53.94 and 54.37 to 55.51 at various levels of foxtail millet flour: refined wheat flour and stevia concentrations. The minimum L^* value of stevia-based foxtail millet biscuits was found in the treatment T_3 (47.67) for 100% foxtail millet flour and 2.5% stevia concentrate whereas the maximum value was recorded in the treatment T_7 (55.51) for 50% foxtail millet flour: 50% refined wheat flour and 1.5% stevia concentrate. The L^* value of control biscuits was found to be 55.35. This implies that the colour of the biscuits became little darker at higher stevia concentrations and higher foxtail millet percentage and also due to the thermal stability, stevioside does not degrade and reacts with amino acids by maillard reaction (Akesowan, 2009) [2].

The results of a^* values varied from 7.98 to 8.58, 6.03 to 7.82 and 5.00 to 5.81 at various levels of foxtail millet flour: refined wheat flour and stevia concentrations. The maximum a^* value of stevia-based foxtail millet biscuits was found in the treatment T_3 (8.58) for 100% foxtail millet flour and 2.5% stevia concentrate whereas the minimum value was recorded in the treatment T_7 (5.00) for 50% foxtail millet flour: 50% refined wheat flour and 1.5% stevia concentrate. The a^* value of control biscuits was found to be 7.26. This implies that the colour of the biscuits became little darker at higher stevia concentrations and higher foxtail millet percentage and due to the thermal stability. Stevioside does not degrade and reacts with amino acids by maillard reaction (Akesowan, 2009) [2].

The results of the b^* values varied from 26.01 to 25.09, 27.65 to 26.92 and 29.32 to 28.20 at various levels of foxtail millet flour: refined wheat flour and stevia concentrations. The maximum b^* value of stevia-based foxtail millet biscuits was found in the treatment T_7 (29.32) for 50% foxtail millet flour: 50% refined wheat flour and 1.5% stevia concentrate whereas the minimum value was recorded in the treatment T_3 (25.09) for 100% foxtail millet flour and 2.5% stevia concentrate. The b^* value of control biscuits was found to be 27.02. This implies that the colour of the biscuits became little darker at higher stevia concentrations and higher foxtail millet percentage and also due to the thermal stability, stevioside does not degrade and reacts with amino acids by maillard reaction (Akesowan, 2009) [2].

Proximate compositions of stevia-based foxtail millet biscuits

The results presented in Table 2. show that the moisture content ranged from 2.50 to 3.08% for various levels of foxtail millet flour: refined wheat flour and stevia concentrations. The moisture content of control biscuits was found to be 3.16%. It was noticed that, with the increase in foxtail millet flour percentage (50% to 100%) and stevia concentration (1.5 to 2.5%) the moisture content of biscuits increased. This might be due to the increase in stevioside in stevia leaf powder results in an increase in the moisture of

the biscuits. According to Vatankhah *et al*., (2015) [11] the polar hydroxyl group in stevioside is hydrophilic which easily binds to water and increases the moisture of biscuits.

The results presented in Table 2. Show that the carbohydrate of stevia-based foxtail millet biscuits ranged from 60.17% to 66.05% among the different levels of foxtail millet flour: refined wheat flour ratio and stevia concentrations the carbohydrate of control biscuits was found to be 61.02%. Suresha *et al.,* (2019) [10] reported that the foxtail millet flour consists of less carbohydrate (63.2 g/100 g) compared to refined wheat flour (73.9 g/100 g).The carbohydrate of the foxtail millet biscuits decreased with increase in stevia concentration due to the influence of other nutritional components, namely protein, fat, water, and ash, the lower the other nutritional components, the higher the carbohydrate content Ooi *et al*., (2012) [8].

The data obtained on crude protein content is presented in Table 2, the crude protein of stevia-based foxtail millet biscuits ranged from 7.08% to 8.42% among the different levels of foxtail millet flour: refined wheat flour ratio and stevia concentrations. The crude protein of control biscuits was found to be 7.08%. Suresha *et al.,* (2019) [10] reported that the foxtail millet flour consists of more protein (11.2 g/100 g) compared to refined wheat flour (1.1 g/100 g). The stevia leaf powder consists of more protein (12.44%) according to Gasmalla *et al*., (2014) [4] the results are in good agreement with the earlier findings of Jariyah *et al.,* (2021) [5] who had reported that the addition of stevia increased the protein content of mocaf-pedada biscuits.

The results presented in Table 2. show that, the crude fat of stevia-based foxtail millet biscuits ranged from 20.82% to 19.21% among the different levels of foxtail millet flour: refined wheat flour ratio and stevia concentrations. The crude fat of control biscuits was found to be 23.01%. Suresha *et al.,* (2019) [10] reported that the foxtail millet flour consists of more fat (4 g) compared to refined wheat flour (0.9 g). The stevia leaf powder also consists of more fat (4.39%) according to Gasmalla *et al*., (2014) [4]. The results are in good agreement with the earlier findings of Jariyah *et al.,* (2021) [5] who had reported that the addition of stevia increased the fat content of mocaf-pedada biscuits.

The results regarding crude fibre content are given in Table 2., the crude fibre of stevia-based foxtail millet biscuits ranged from 4.23% to 3.32% among the different levels of foxtail millet flour: refined wheat flour ratio and stevia concentrations. The crude fibre of control biscuits was found to be 3.48%. Suresha *et al.,* (2019) [10] reported that the foxtail millet flour consists of more fibre (6.7 g) compared to refined wheat flour (0.3 g). The stevia leaf powder also consists of more fibre according to Gasmalla *et al*., (2014) [4]. Hence, with the increase in foxtail millet flour and stevia concentration the crude fibre also increased.

The ash content value of stevia-based foxtail millet biscuits ranged from 1.21% to 3.68% among the different levels of foxtail millet flour: refined wheat flour ratio and stevia concentrations. The ash of control biscuits was found to be 2.25%.This might also be due to stevia concentrate contains minerals such as calcium, phosphorus, iron, sodium, and potassium which contribute to increasing the ash of biscuits, according to Gasmella *et al* (2014) [4]. Suresha *et al.,* (2019) [10] also reported that the foxtail millet flour consists of more minerals compared to refined wheat flour. The results are in good agreement with the earlier findings of Jariyah *et al.,* (2021) [5] who had reported that the addition of stevia increased the ash content of mocaf-pedada biscuits.

Textural Properties of stevia-based foxtail millet biscuits

The values of hardness of stevia-based foxtail millet biscuits from this study varied between 13.17 and 18.86 N among the different levels of foxtail millet flour: refined wheat flour ratio and stevia concentrations. The hardness of control biscuits was found to be 15.81 N. This might also be due to there were hygroscopic and had the ability to bind water, so water was free to be retained, which had an impact on the texture of biscuits (Jariyah *et al*., 2021) [5].

The values of stickiness of stevia-based foxtail millet biscuits from this study varied between -0.07 and -0.19 N among the different levels of foxtail millet flour: refined wheat flour ratio and stevia concentrations. The stickiness of control biscuits was found to be -0.12 N. This might also be due to there were hygroscopic and had the ability to bind water, so water was free to be retained, which had an impact on the texture biscuits Jariyah *et al*. (2021) [5].

Sensory properties of the stevia-based foxtail millet biscuits

From the Table 5. it was seen that the overall acceptability of control and optimized stevia based foxtail millet biscuit (Composition of 100% foxtail millet flour and 2.5% stevia concentration) were found to be 8 and 8.25, respectively. From the Fig.13 it was observed that the combination T_3 (100% foxtail millet flour and 2.5% stevia concentration) was on par with the control (T_{10}).

Table 1: Physical properties of stevia-based foxtail millet biscuits

Treatment	Weight (g)	Thickness (cm)	Diameter (cm)	Spread ratio (D/T)	PSF (D/T*1*10)
T_1	11.14	1.20	4.20	3.50	35.00
T_2	11.16	1.30	4.22	3.25	32.46
T_3	11.18	1.20	4.24	3.53	35.33
T_4	11.16	1.40	4.22	3.01	30.14
T_5	11.17	1.40	4.21	3.01	30.07
T_6	11.15	1.30	4.24	2.83	28.27
T_7	11.16	1.30	4.25	3.27	32.69
T_8	11.10	1.40	4.23	3.02	30.21
T_9	11.09	1.20	4.21	3.51	35.08
T_{10} (Control)	11.31	1.47	4.70	3.13	31.33
S.D	0.042	0.79	0.021	0.390	0.21
Mean	52.33	6.76	27.27	3.29	32.94

Table 2: Effect of foxtail millet flour: refined wheat flour and stevia concentration on colour values of stevia-based foxtail millet biscuits

Treatment	Colour values *L* a* b**		
T_1	50.02	7.98	26.01
T_2	48.64	8.09	25.86
T_3	47.67	8.58	25.09
T_4	53.94	6.03	27.65
T_5	53.43	6.60	27.11
T_6	51.68	7.82	26.92
T_7	55.51	5.00	29.32
T_8	55.49	5.12	29.10
T_9	54.37	5.81	28.20
T_{10} (Control)	55.35	7.26	27.02
S.D	0.04	0.79	0.02
Mean	52.33	6.76	27.27
R^2	0.999	0.762	0.999
C.V. @ 1%	0.08	11.62	0.08

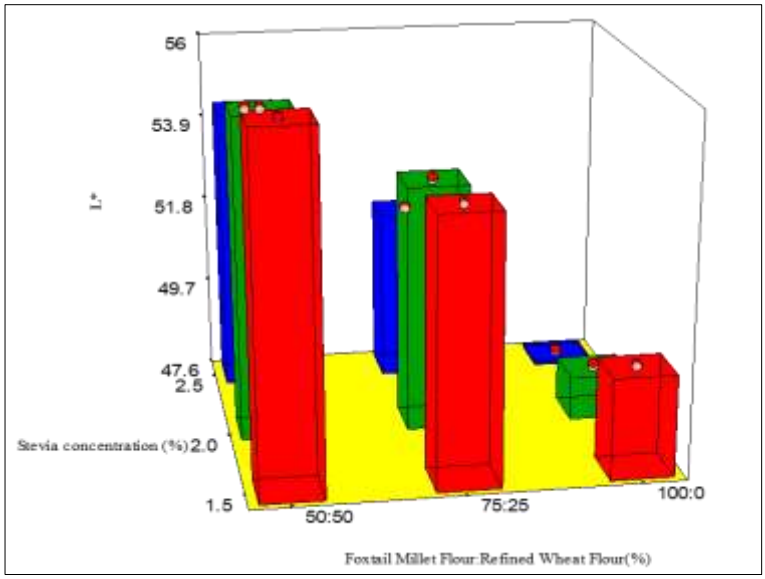

Fig 2: Effect of foxtail millet flour: refined wheat flour and stevia concentration on *L** of stevia-based foxtail millet biscuits

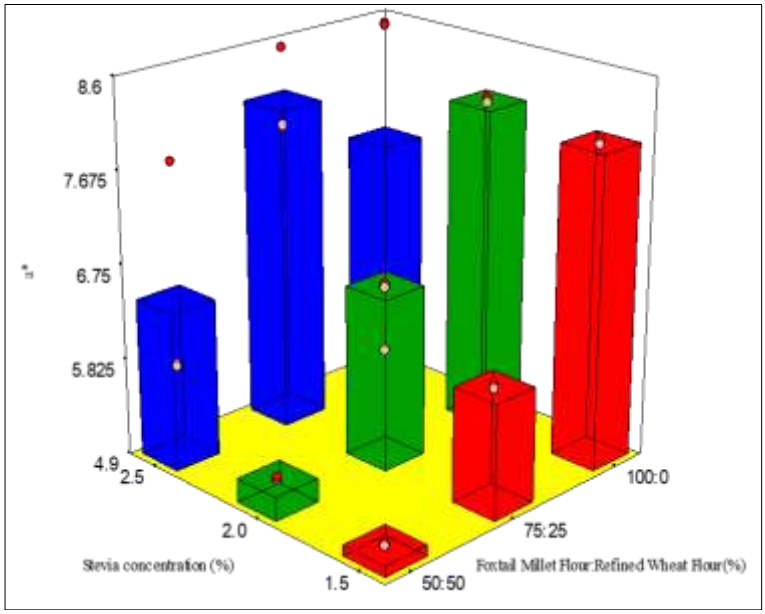

Fig 3: Effect of foxtail millet flour: refined wheat flour and stevia concentration on *a** of stevia-based foxtail millet biscuits

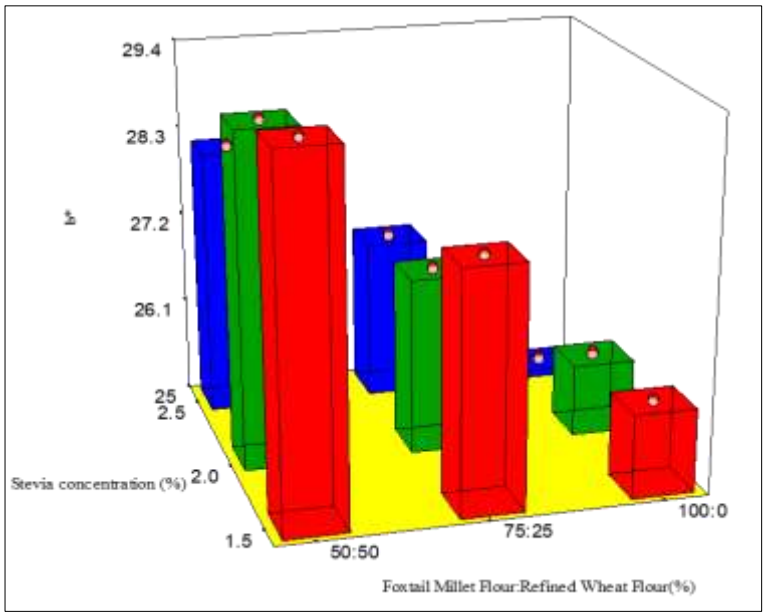

Fig 4: Effect of foxtail millet flour: refined wheat flour and stevia concentration on *b** of stevia-based foxtail millet biscuits

Table 3: Effect of foxtail millet flour: refined wheat flour and stevia concentrations on proximate composition of the developed stevia-based foxtail millet biscuits

Treatment	Moisture content (%)	Carbohydrate (%)	Crude protein (%)	Crude fat (%)	Crude fibre (%)	Ash (%)
T_1	2.50	60.95	8.07	20.66	4.01	2.98
T_2	2.62	60.99	8.21	20.78	4.11	3.29
T_3	2.68	60.17	8.42	20.82	4.23	3.68
T_4	2.73	64.12	7.71	20.05	3.61	2.03
T_5	2.84	63.25	7.83	20.14	3.72	2.23
T_6	2.91	62.42	7.96	20.23	3.85	2.61
T_7	3.01	66.05	7.21	19.21	3.32	1.21
T_8	3.05	64.96	7.42	19.39	3.46	1.76
T_9	3.08	64.30	7.69	19.45	3.59	1.90
T_{10} (Control)	3.16	61.02	7.08	23.01	3.48	2.25
S.D	0.020	0.470	0.023	0.02	0.02	0.02
Mean	2.830	63.020	7.840	20.08	3.770	2.410
R^2	0.993	0.960	0.997	0.998	0.996	0.999
C.V. @ 1%	0.700	0.750	0.290	0.120	0.540	0.860

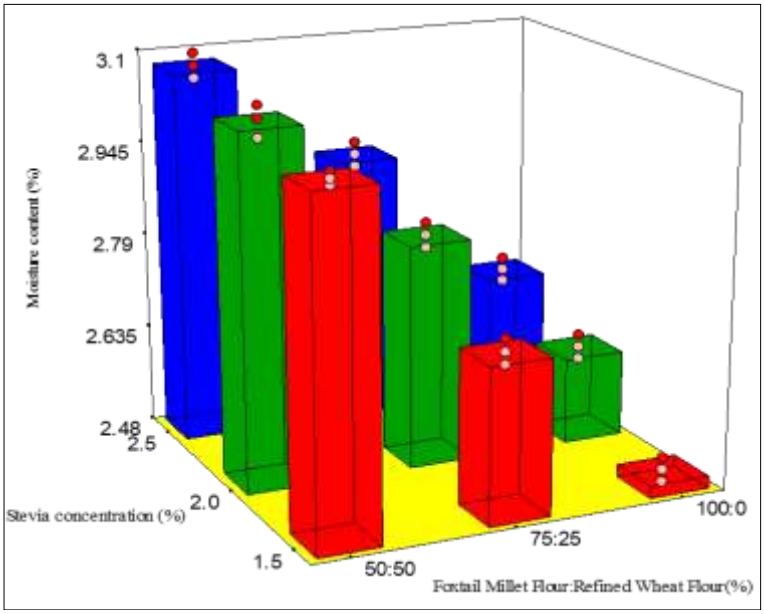

Fig 5: Effect of foxtail millet flour: refined wheat flour and stevia concentration on moisture content of stevia-based foxtail millet biscuits

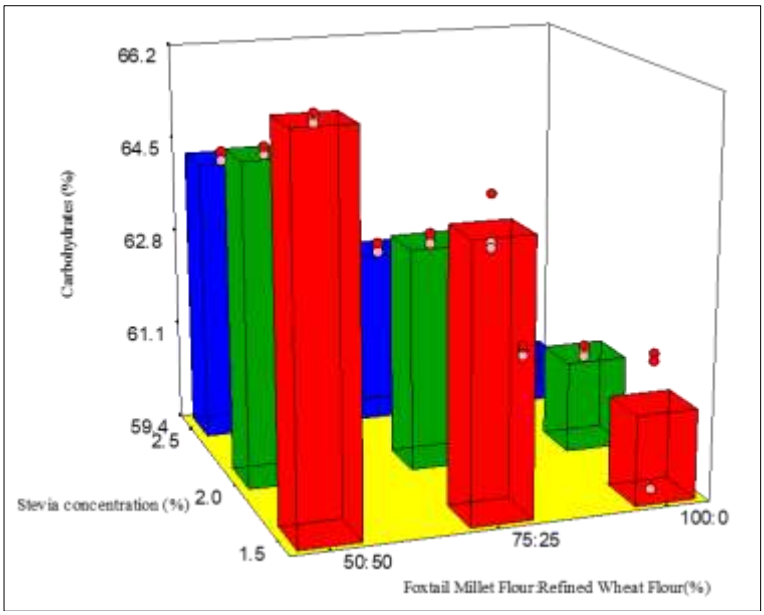

Fig 6: Effect of foxtail millet flour: refined wheat flour and stevia concentration on carbohydrates of stevia-based foxtail millet biscuits

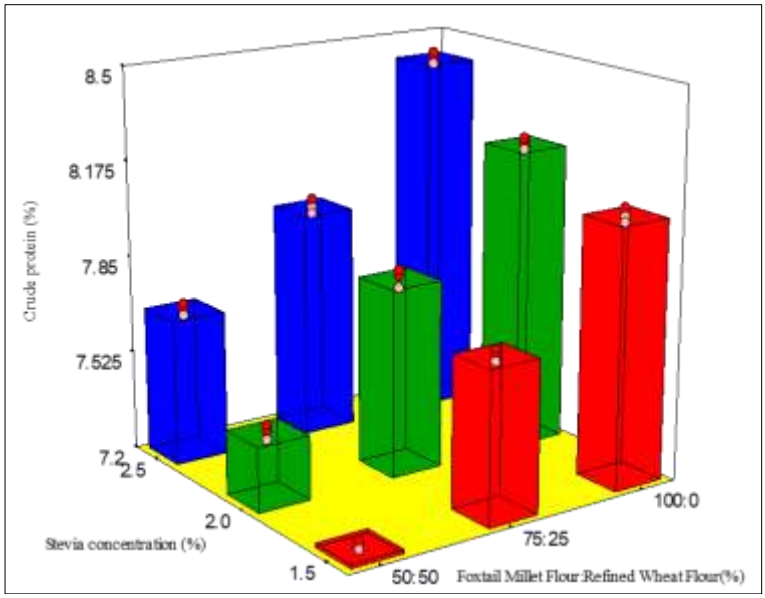

Fig 7: Effect of foxtail millet flour: refined wheat flour and stevia concentration on crude protein of stevia-based foxtail millet biscuits

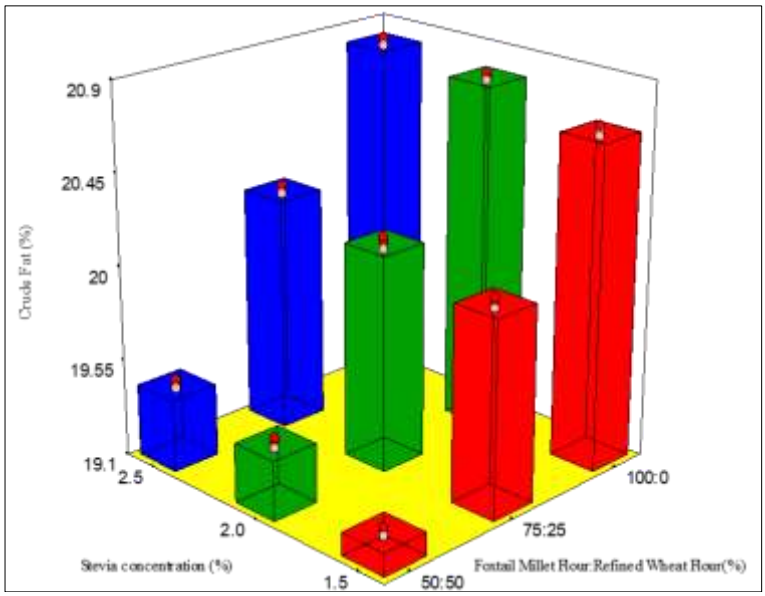

Fig 8: Effect of foxtail millet flour: refined wheat flour and stevia concentration on crude fat of stevia-based foxtail millet biscuits

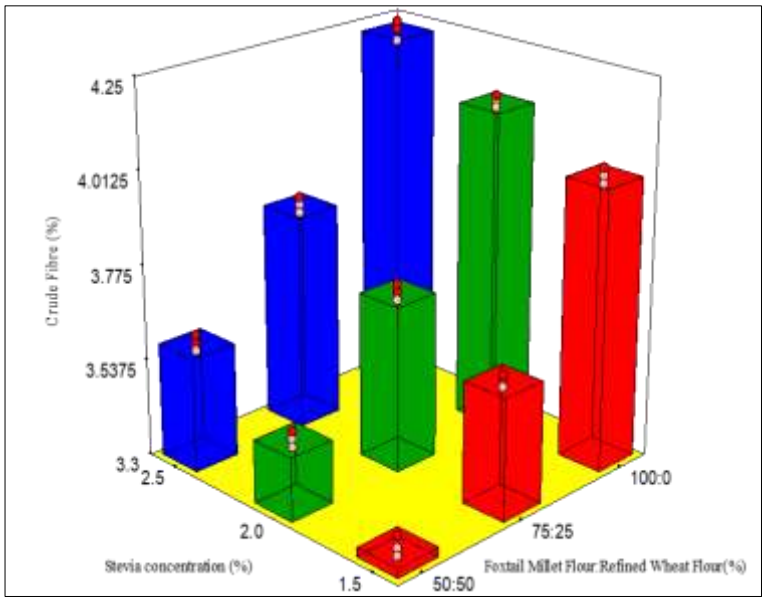

Fig 9: Effect of foxtail millet flour: refined wheat flour and stevia concentration on crude fibre of stevia-based foxtail millet biscuits

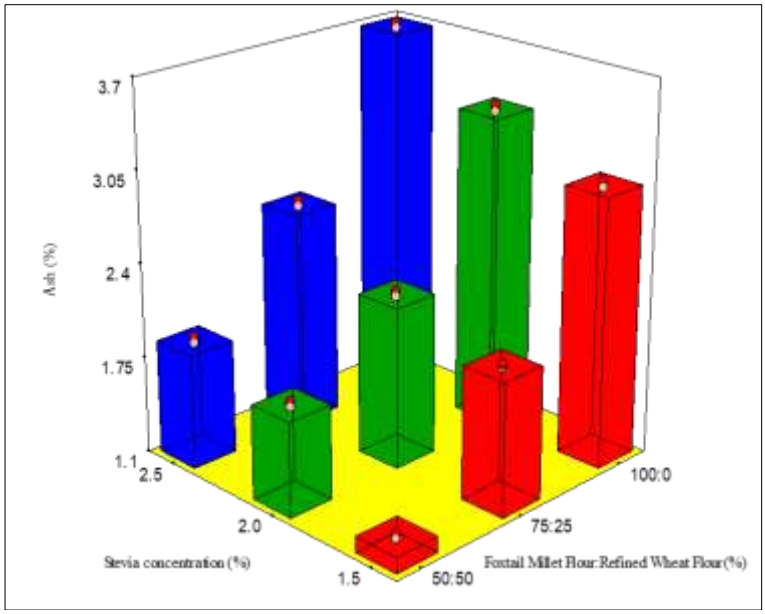

Fig 10: Effect of foxtail millet flour: refined wheat flour and stevia concentration on ash of stevia-based foxtail millet biscuits

Table 4: Effect of foxtail millet flour: refined wheat flour and stevia concentrations on textural properties of the developed stevia-based foxtail millet biscuits

Treatment	Hardness (N)	Stickiness (N)
T_1	18.86	-0.19
T_2	18.36	-0.17
T_3	16.98	-0.15
T_4	15.97	-0.13
T_5	15.18	-0.11
T_6	14.97	-0.09
T_7	13.86	-0.08
T_8	13.51	-0.05
T_9	13.17	-0.07
T_{10} (Control)	15.81	-0.12
S.D	0.027	0.020
Mean	12.53	-0.110
R^2	0.999	0.895
C.V. @ 1%	0.210	17.65

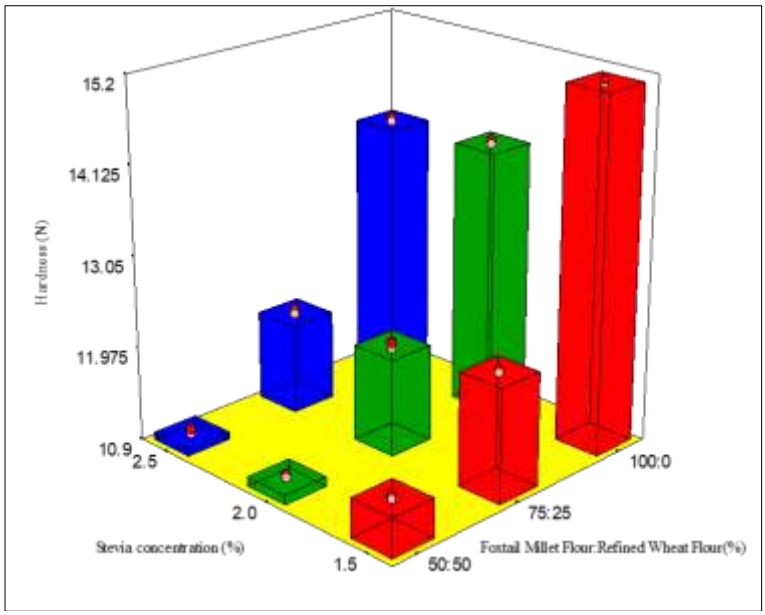

Fig 11: Effect of foxtail millet flour: refined wheat flour and stevia concentration on hardness of stevia-based foxtail millet biscuits

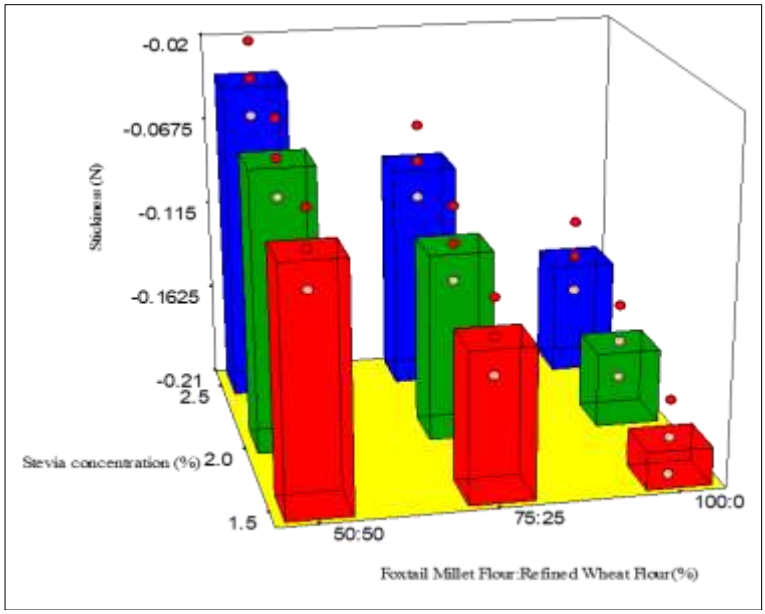

Fig 12: Effect of foxtail millet flour: refined wheat flour and stevia concentration on stickiness of stevia-based foxtail millet biscuits

Table 5: Sensory evaluation of stevia-based foxtail millet biscuits

Treatment	Appearance	Flavour	Taste	Texture	Mouth feel	Overall acceptability
T_3	8.50	8.00	8.00	7.50	7.50	8.25
T_6	7.75	7.50	7.00	7.00	7.00	7.50
T_9	5.25	6.00	5.50	6.00	6.00	5.75
T_{10} (Control)	8.50	8.25	7.50	7.50	7.25	8.00

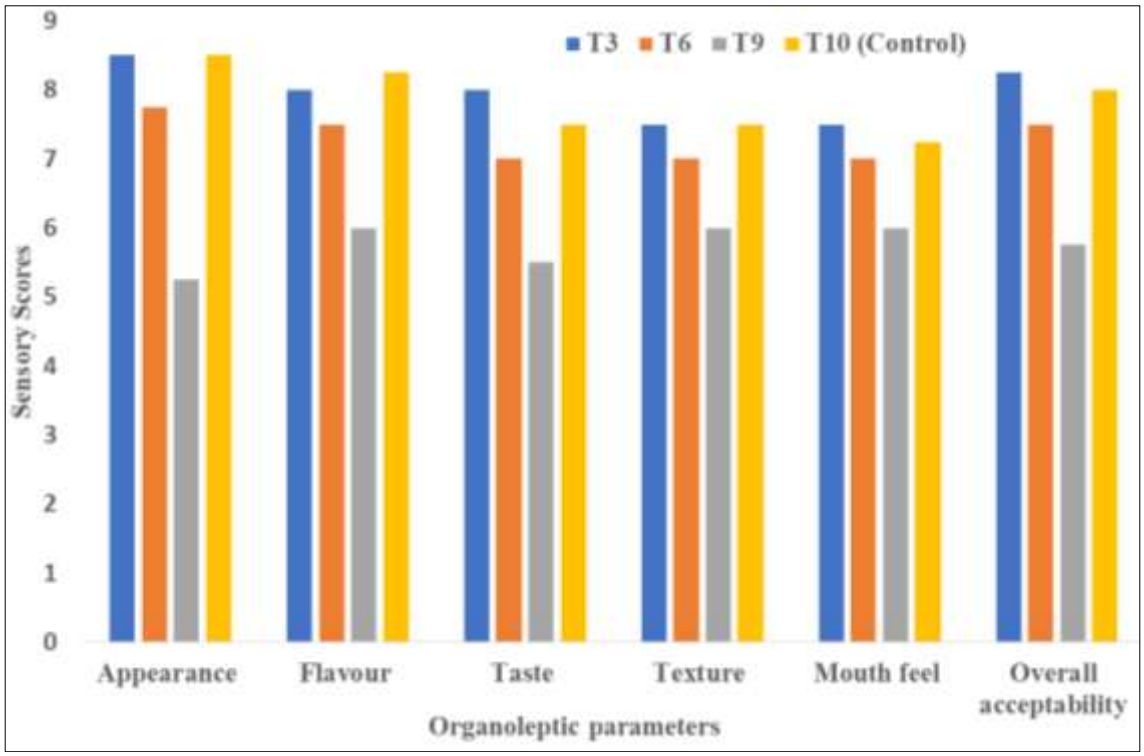

Fig 13: Sensory evaluation of stevia-based foxtail millet biscuits

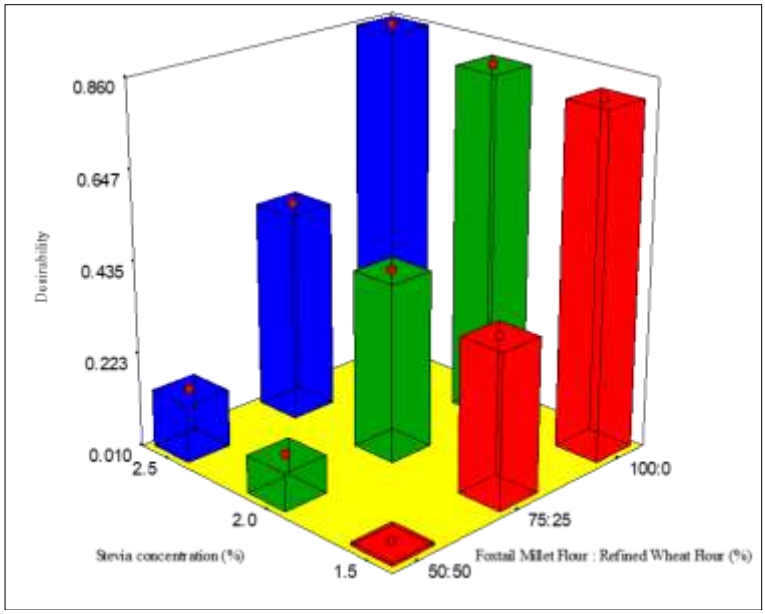

Fig 14: Effect of foxtail millet flour: refined wheat flour and stevia concentration on desirability of stevia-based foxtail millet biscuits

Conclusions

The results showed that 100% foxtail millet flour and 2.5% stevia concentrate treatment found to be optimized. The physical properties *viz*., weight, diameter, thickness, spread ratio and percentage spread factor of this treatment were 11.18 g, 1.2 cm, 4.24 cm, 3.53 and 35.33, respectively. However, there is no significant difference between treatment to treatment. In proximate composition moisture content, crude protein, crude fat, crude fibre and ash increased with increase in foxtail millet flour percentage (50% to 100%) and stevia concentration (1.5% to 2.5%). Whereas, carbohydrate decreased with increase in foxtail millet flour percentage and stevia concentration. The proximate composition *viz.*, moisture content, carbohydrate, crude protein, crude fat, crude fibre and total ash content of optimized treatment 100% foxtail millet flour and 2.5% stevia concentrate were found to be 2.68%, 60.17%, 8.42%, 20.82%, 4.23% and 3.68% respectively. In case of textural properties *viz.*, hardness and stickiness of 100% foxtail millet flour and 2.5% stevia concentrate was the best as compared to other treatment combinations. The hardness of 16.98 N and stickiness of -0.15 N were the values for optimized treatment. On the basis of overall acceptability in sensory evaluation of biscuits 100% foxtail millet flour and 2.5% stevia concentrate treatment biscuits were having the high overall acceptability when compared to other and almost equal to the control treatment. It could be concluded that biscuits prepared with 100% foxtail millet flour and 2.5% stevia concentration in biscuits could be considered optimum with respect to sensorial quality characteristics.

4. References

1. Ababa A. Accounting and cost calculation manual. Ethiopian Business Development Services Network (EBDSN), Ethiopia; c2004.
2. Akesowan A. Quality of reduced-fat chiffon cakes prepared with erythritol-sucralose as replacement for sugar. Pak J Nutr. 2009;8(9):1383-1386.
3. AOAC. Official Methods of Analysis. 16th ed. Washington, DC: Association of Official Analytical Chemists; c2005.
4. Gasmalla MAA, Yang R, Amadou I, Hua X. Nutritional composition of Stevia rebaudiana Bertoni leaf: effect of drying method. Trop J Pharm Res. 2014;13(1):61-65.
5. Jariyah, Winarti S, Sarofa U, Subagio MR. Study of the Influence of Stevia and Fructose to the Physicochemical Characteristics of Mocaf-pedada Biscuits. In: Proceedings of the 6th International Conference of Food, Agriculture, and Natural Resource (IC-FANRES 2021). 2021;16:337-341.
6. Railey K. Whole Grains: Millet. J Health Beyond Online; c2011.
7. Okaka JC, Isieh MI. Development and quality evaluation of cowpea-wheat biscuits. Niger Food J. 1990;8(2):56-62.
8. Ooi DJ, Iqbal S, Ismail M. Proximate composition, nutritional attributes and mineral composition of *Peperomia pellucida* L. (Ketumpangan Air) grown in Malaysia. Molecules. 2012;17(9):11139-11145.
9. Snehal, Madhukar. Preliminary phytochemical screening of aqueous and alcoholic extracts of *Stevia rebaudiana* (Bertoni). Int J Ayurvedic Herb Med. 2011;1(3):68-75.
10. Suresha SV, Hiregoudar S, Mamatha HS. Development and standardization of foxtail millet (*Setaria italica*) gluten-free biscuit. Int J Chem Stud. 2019;Issue 6:955-959.
11. Vatankhah M, Garavand F, Elhamirad A, Yaghbani M. Influence of sugar replacement by stevioside on physicochemical and sensory properties of biscuit. Qual Assur Saf Crop Foods. 2015;7(3):393-400.
12. Vijayakumar PT, Mohankumar JB. Formulation and characterization of millet flour blend incorporated composite flour. Int J Agric Sci. 2009;1(2):46-54.