Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.36, 2015

An Investigation on the Preparation of Contaning Low Caloric Biscuits with Supplementation of Dietary Fiber

Tariq Kamal
Department of Agricultural Extension Education & Communication,Faculty of Rural Social sciences, The University of Agriculture Peshawar, Pakistan
Email Address: tariqkamal10@gmail.com

Abstract
This research was conducted to find out the effect of wheat bran, rice bran, corboxy methyl cellulose (CMC) and guar gum supplementation on the quality of whole wheat flour biscuits. The proximate composition of whole wheat flour (WWF), wheat bran (WB) and rice bran (RB) were 9.0, 11.30, and 7.00 % moisture, 7.19, 12.61 and 14.80 % crude protein, 1.92, 3.79, and 2.29 % crude fat, 0.36, 4.78 and 9.96 % ash, 1.97, 12.7 and 14.2% crude fiber and 75.95, 67.52 and 65.95 %NFE respectively. Biscuits were prepared by adding this bran's @ 4 to 8% and CMC and guar gum @ 0.14% in WWF. The samples were prepared as B_o (control), B_1 96%WWF+4%WB, B_2 92%WWF+8%WB, B_3 96%WWF+4%RB, B_4 92%WWF+8%RB, B_5 96%WWF+4% WB + 0.14% CMC, B_6 96%WWF+4% WB +0.14 % guar gum, B_7 96%WWF+4% RB + 0.14 CMC and B_8 96%WWF+4%RB +0.14% guar gum. The moisture content (%) increased in WB (from 2.71 to 2.87) and RB (from 2.69 to 2.78) supplemented biscuits, while decrease was recorded in CMC (from 2.82 to 2.62) and guar gum (from 2.69 to 2.58) respectively. Protein content (%) increased in WB (from 5.09 to 5.51) and RB (from 5.17 to 5.61) supplemented biscuits, while decrease was recorded in CMC (from 5.44 to 5.35) and guar gum (from 5.33 to 5.08) respectively. The NFE content (%) decreased in WB (from 65.39 to 59.0) and RB (66.74 to 66.09) supplemented biscuits, while it is increased in CMC (from 64.05 to 64.69) and guar gum (from 64.42 to 65.17) respectively. The moisture, crude protein, crude fat, crude fiber, ash content and NFE were significantly ($p<0.05$) influenced by the level of supplementation. The physical analysis i.e. width and spread factor decreased by increasing the levels of bran, CMC and guar gum, while thickness increased by increasing levels of bran and decreased in CMC and guar gum supplementation. There was significant difference in the mean scores for sensory evaluation of the biscuit ($p<0.05$).
Keywords: Wheat &Rice Bran, Biscuits, Quality, Supplementation, Chemical Evaluation.

INTRODUCTION

Wheat is grown throughout the world across a wide range of environments. It is the number one food grains consumed directly by humans, and its production leads among all crops including rice and maize etc. It shares for 30% of the world grain production and over 50% of the world grain trade (Pomeranz, 1988). Flour is the main defined product of wheat after milling. To meet the increasing demand for white flour, the roller mills have replaced stone mills. The milling of wheat in India and Pakistan have been modified so as to produce white flour (Maida) semolina (60-65%), bran (10-15%) and residue called "resultant atta" (25-35%) from which chapatties are made. For making chapattis flour or cookies flour wheat should have thousand kernel weight, plump grains, light color bran and a protein content of 10.5-11%. Strong gluten is not required, but water absorption of the flour should be high. Flour of fine granularity yields cookies of superior quality (Knet, 1983).

Wheat bran is the by product of flour milling industry. It is one of the most important dietary fiber sources used in the bread baking industry (Vetter 1988).Wheat and rice bran are important source of dietary fiber and has a potential as food ingredient, particularly in baked products. However in few cases dietary fiber is reported to have detrimental effect on the quality of baked products (Mckee and Latner, 2000). Wheat bran is a good source of protein and dietary fiber. It is cheap and readily available. It is mainly used for animal feed. Recently the use of wheat bran and other cereal bran has gained great importance in the formulation of various types of food products. Wheat bran has been reported to increase in fecal weight and reduce transit time, thereby decreasing the incidents of diverticular diseases (Anderson and Siesel, 1990). Wheat bran contained dietary fiber content of 44% and a soluble fiber content of 2.1% (Bushuk and Rasper 1994). They also observed that wheat bran is a good source of water insoluble fiber, which may be very helpful in the prevention and management of several disorders of the intestinal tract. The composition of whole wheat bran is as follows fat 4.08%, protein 15%, total ash 4.99%, total dietary fiber 45.6%, soluble fiber 2.8%, and insoluble fiber 42.8% is reported by the (Shenoy and Prakash 2002).

Rice bran is the best source of protein, lipids, dietary fiber, vitamins and minerals. Chemically rice bran contains protein 11-17%, fiber 10%, ash content 9%, fat 11-18% and nitrogen free extract 45-65%. It is rich source of vitamins B and minerals such as copper, zinc, iron, potassium, and phosphorous. The amino acid profile of rice bran has been generally reported to be superior to cereal grain proteins (Farrel, 1994).

Dietary fiber can be defined in different ways. Physiologically it refers to those indigenous compounds

of plant origin that resist digestion in human gastro-intestinal tract (Schneeman and Tietyen, 1994). Chemically, dietary fiber consists of cellulose, hemi cellulose, pectin, gums and mucilage's. Some researches consider other compounds, such as resistant starch, millard reaction products and lignins as dietary fiber.

Dietary fiber has acquired an important position in the diet of modern man. Health specialists recommended dietary fiber as an essential food component for the maintenance of good health and that its consumption should be increased in diet (Bingham *et al.,* 1985).

A chemically leavened bread type product is known as biscuit. The term biscuit is used in European countries and cookies in the United States of America (Hoseny, 1994). Biscuits and biscuits like products have been made and eaten by man hundreds of years. Cookies are ideal for nutrient value, palatability compactness and convenience. They are different from other products like bread and cakes because they have low moisture content which ensures that cookies are generally free from microbial spoilage and confer a long shelf life on the product (Wade, 1998).

Objectives

1. To evaluate the wheat and rice bran as a supplementary product in bakery.
2. To study the Chemical evaluation of wheat bran and rice bran supplemented bakery products.
3. To find out the effect of wheat and rice supplementation in wheat flour on the overall quality cookies.

MATERIALS AND METHOD

Research was performed with the coordination of the Department of Agricultural Extension Education & Communication and Food Science & Technology Lab, The University of Agriculture, Peshawar, Pakistan. Fine wheat flour and wheat bran was collected from Sihala Flour Mills Rawalpindi and rice bran from Barket Rice Mills, Islamabad. Dietary fiber from wheat bran and rice bran was incorporated as a substitute in wheat flour in different proportions for preparation of low caloric biscuits. Biscuits were physically analyzed for their width, thickness and spread factor. Biscuits were than analyzed for their proximate composition and mineral contents.

Preparation of Biscuits

Biscuits were prepared by AACC (2000) method No. 10-52 using the following recipe.

S. No.	Ingredients	Amount (grams)
1.	Flour	500
2.	Sugar	250
3.	Industrial fat	250
4.	Baking powder	6
5.	Salt	0.037
6.	Egg	1

Method

Shortening and sugars were creamed together until uniform mass was obtained. The flour, bran, baking powder and salt was sifted for 3 to 4 times (75 micron sieve), added to sugar shortening mass. It was rolled out with the help of rolling pin and cookies were cut with the help of cookie cutter (two inch diameter). These biscuits was baked at 205^0C for 13 minutes and allowed to cool at room temperature for 10 minutes. Biscuits were packed in polyethylene bags for further analysis.

Scheme of Study

B_0 = control
B_1 = Fine flour + sugar + 4% wheat bran
B_2 = Fine flour + sugar + 8% wheat bran
B_3 = Fine flour + sugar + 4% rice bran
B_4 = Fine flour + sugar + 8% rice bran
B_5 = Fine flour + sugar + 4% wheat bran +0.14 %CMC
B_6 = Fine flour + sugar + 4% wheat bran +0.14 %guar gum
B_7= Fine flour + sugar + 4% rice bran +0.14 %CMC
B_8 = Fine flour + sugar + 4% rice bran +0.14 %guar gum

Physical Analysis of Biscuits

Biscuits were physically analyzed for their width, thickness and spread factor by using AACC (2000) method number 10-50.

Width and Thickness

Average width and thickness of biscuits was determined randomly by placing 6 biscuits edge to edge and measuring total width and thickness to get the average width and thickness.

Spread Factor

Spread factor was obtained by using the following formula.
Spread factor= (width/thickness) × correction factor × 10
Correction factor at constant atmospheric pressure is one.

Proximate Analysis

Standard method of (AOAC) 1990 was used for proximate analysis of samples i.e. wheat flour (maida), wheat bran, rice bran and biscuits. The nitrogen free extract was measured by difference.

Moisture (%)

The moisture quantity of all the samples was resolute in oven. 2.0 g of mixed sample was precisely weighed and dried glass dish (w_f). The dish was positioned in an oven at 100±5^{0}C for 4-6 hours until and weight was obtained. After complete drying the dish was positioned in desiccators for half an hour in order to cool it. The dish was weighed again after cooling (w_i). The moisture % was determined by following formula.

$$\text{Moisture (\%)} = \frac{\text{wi} - \text{wf}}{\text{wt. of sample}}$$

W_i = weight of glass dish + sample before drying

W_f = weight of glass dish + sample after drying

Crude Protein (%)

Protein was calculated by determining the nitrogen content of the samples. For this reason micro kjeldahl procedure was employed. The samples were digested by heating with concentrated H_2SO_4 in the presence of digestion mixture. The mixture was then made alkaline. Ammonia is released when ammonium sulfate is formed, which was together in 4% boric acid solution and then titrated against standard H_2SO_4. Total protein was determined by multiplying the quantity nitrogen with protein conversion factor (5.70 for wheat) and the amount of protein was calculated.

Reagents

- 0.1N Sulfuric acid (standard)
- Sulphuric acid (Conc.)
- Sodium hydroxide solution (40%; w/v)
- Digestion mixture: 0.5g $CuSO_4.5H_2O$ + 8.5gK_2SO_4.
- Boric acid: four gram of boric acid was dissolved in sufficient water and made the volume up to 100ml.
- Mixed indicator: methyl red, 0.25% in 95% ethanol + methylene blue, 0.2% in 95% ethanol (3:2)

Procedure

The samples were first digested with 1.5g of digestion mixture and 10 ml of concentrated Sulfuric acid. The digest was then cooled and transferred to 100 ml volumetric flask, with the washing make the volume up to the mark. All the digested mixture was added to the kjeldahl distillation flask. 10 ml sodium hydro oxide (40%) was added and then distilled into a flask containing boric acid solution, and assorted indicator. This concentrate was then titrated against 0.1N H_2SO_4. A blank (with out sample) was run through the same procedure to detect the traces of the nitrogen in the chemicals. The % nitrogen and crude protein were calculated through the following formula.

$$\text{Nitrogen (\%)} = \frac{(\text{S} - \text{B}) \times 0.014 \times \text{D}}{\text{Wt. of sample} \times \text{V}} \times 100$$

Where

S = volume of standard acid used for sample titration

B = volume of standard acid for blank titration

N = normality of the acid

D = sample dilution after digestion

V = volume of the digest taken for distillation after digestion

Crude protein (%) = % N × (5.7 for wheat flour)

Crude Fat (%)

Soxhlet apparatus were used for the finding of crude fat. About 1 g of wet free sample was taken in fat free thimble. The thimble was plug with permeable cotton wool and placed in extraction tube. A formerly hygienic and desiccated 250 ml round bottom flask was weighed and filled up one third of this flask with anhydrous petroleum ether (40-60^{0}C B.P). The flask was linked with the extraction tube. The fat was extracted frequently with 4-6 siphoning. After total extraction, the thimble was removed from the extraction tube and receiving flask was heated so that all the petroleum ether recollected for future use. The flask was then dried at 105^{0}C for 1 hr. Finally it was cooled and weighed again. The percent oil content of the sample was calculated as follow.

$$\text{Crude fat (\%)} = \frac{(\text{wt. of flask} + \text{oil}) - (wt. \text{of empty flask})}{\text{weight of sample}} \times 100$$

Ash (%)

Two grams of each sample was taken into a clean dried crucible and charred over a burning flame. The samples

were then placed in the muffle furnace and ashed at 550^0C until fixed weight was obtained. The amount of ash was calculated as follow:

$$\text{Ash (\%)} = \frac{\text{wt. of Ash}}{\text{weight of sample}} \times 100$$

Crude fiber (%)

Moisture free and fat free samples were used for determination of crude fiber by digested with dilute NaOH solution. The undigested filtrate together after digestion was ignited and loss in mass after ignition was regarded as crude fiber.

Reagents

- H_2SO_4 0.15M solution (21 ml H_2SO_4 (1.81g/ml) was completed to 2.5 liter with distilled water.
- NaOH 1.5M solution (155g NaOH per 2.5 liter distilled water).
- HCL acid 0.3M solution (50 ml HCL (1.14g/ml) was completed to 2 liter with distilled water).
- Na_2 EDTA (disodium ethylene diaminetetra acetate, dehydrate crystal).
- Acetone.

Procedure

Two grams of sample was placed in to the tall beaker and 100 ml H_2SO_4 solution was added to it. Condenser was positioned on the mouth of the beaker and water flow to the condensers. It was heated for five minutes strongly for quick boiling and then heating was subjected to give even boiling. Heating was continued for 30 minutes. 50 ml NaOH solution was then added and continued heating for further 35 minutes. 0.5g Na_2 EDTA also added five minutes before the boiling time was over. The solution was then filtered through crucible which is attached to filtration apparatus. For filtration low vacuum was used. Beaker was rinsed with hot water. Filtrate in the crucible was rinse with 50 ml HCL, then washed with warm water until it was acid free and finely with 50ml acetone two times. The crucible was then dried in an oven at 100C over night, cooled in dessicator and weighted. The crucible which have dried residue was put into the muffle furnace and incinerated for two hours at 550C, cooled in the dessicator and then weighted. Crude fiber was determined by using the following formula.

$$\text{Crude Fiber (\%)} = \frac{\text{(wt. of crucible + dried residue)-(wt. of crucible + ashed residue)}100}{\text{(wt. of crucible + sample)-(wt. of empty crucible)}}$$

Nitrogen Free Extract (%)

Nitrogen free extract (NFE) of the sample was calculated by difference.

NFE = 100-(moisture % + protein % + crude Fat % + ash %)

Sensory Evaluation

All the samples (biscuits) were sensory evaluated for color, texture, flavor and overall acceptability by train judges using nine points (1-9) hedonic scale of Larmond (1977). The samples were offered to 15 judges in randomized form for evaluation. The judges were provided the scale during evaluation.

Statistical Analysis

Data obtained was analyzed by using Completely Randomized Design (CRD). All the analysis was done by using MSTATC software. The means were separated by using least significant difference (LSD) test at 5% level of probability (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

For a new product biscuit preparation with supplementation of wheat and rice bran a research was designed to study the effect of these bran's along with other fibrous material i.e. carboxy methyl cellulose (CMC) and guar gum on physicochemical and sensory properties of biscuits. In the first two phases wheat flour was supplemented with wheat bran and rice bran at two different levels i.e. 4% and 8%. In the first phase wheat flour was mix with wheat bran, while in second phase defatted rice bran was replaced with wheat flour. The best treatment of this study was selected for analysis based on the overall acceptability by a trained panel of judges. Other fibrous materials carboxy methyl cellulose (CMC) and guar gum were mixed to each best treatment of phase No. 1 and 2. Biscuits were analyzed for physicochemical and sensory evaluation.

Chemical composition of wheat bran, defatted rice bran and wheat flour

The chemical composition of wheat flour, wheat bran and defatted rice bran is given in the table 1. A significant difference was noted in wheat flour, wheat bran and defatted rice bran. Results showed that wheat bran contained moisture 11.30%, fat 3.79%, protein 12.61%, ash 4.78%, crude fiber 12.7% and NFE 67.52%. Rice bran contained moisture 7.00%, fat 2.295, protein 14.80%, ash 9.96%, crude fiber 14.2% and NFE 65.95%. The chemical composition showed that the rice bran contain maximum protein content i.e. 14.80%, ash 9.96% and crude fiber 14.2% while wheat bran contain maximum fat 3.79% and moisture content 11.30%. The chemical composition of wheat flour showed moisture 12.61%, fat 1.92%, protein 7.19%, ash 0.365%, crude fiber 1.53% and NFE 75.95%. The findings of this study is supported by the research work of Sidhu *et al*. (2001), while working on the chemical composition of wheat flour, defatted rice bran and wheat bran.

Table 1. Chemical composition of wheat flour, wheat bran and rice bran

	Moisture%	Fat %	Protein %	Ash %	Crude fiber %	NFE %
Flour	9.0 ± 0.200	1.92 ± 0.040	7.19 ±0.060	0.36 ±0.040	1.53 ±0.050	75.95 ±0.850
Wheat bran	11.30 ±0.200	3.79 ±0.170	12.61 ±0.390	4.78 ±0.220	12.7 ±0.300	67.52 ±1.190
Rice bran	7.00 ±0.300	2.29 ±0.100	14.80 ±0.850	9.96 ±0.090	14.2 ±0.950	65.95 ±0.260

Values are the mean of three replications ± is the standard deviation

Calcium, iron and phosphorous content of flour wheat bran and rice bran

Table 2 shows the calcium, iron and phosphorous content of wheat bran, rice bran and whole wheat flour which contain 1320, 760 and 180 ppm calcium, 138, 194 and 9.8 ppm iron and 9750, 13860 and 1240 ppm phosphorous respectively. These results are similar with the findings of (Sharma and Chauhan, 2002) who reported that on an average wheat bran, rice bran and wheat flour contain 172, 1290 and 695ppm calcium, 8.2, 126 and 182 ppm iron and 9710, 13750 and 1215 ppm phosphorous respectively.

Table2. Minerals (calcium, iron and phosphorous) composition of whole wheat flour, wheat bran and rice bran

	Calcium ppm	Iron ppm	Phosphorous ppm
Flour	180 ± 4.00	9.8 ± 0.600	1240 ±30.00
Wheat bran	1320 ± 20.00	138 ± 5.00	9750 ± 23.094
Rice bran	760 ± 20.00	194 ± 4.00	13860 ± 210.0

Values are the mean of three replications ± is the standard deviation

Overall Acceptability

The mean score of judges for overall acceptability of biscuits prepared with different levels of wheat and rice bran and fibrous material (CMC and guar gum) were 7.85, 7.07, 6.15, 7.65, 7.25, 6.09, 4.85, 6.07 and 5.32 for treatments B_0 to B_8 respectively.

There was a significant difference ($p<0.05$) in the overall acceptability of biscuits when different levels of wheat and rice bran (4 and 8%) were added in wheat flour (Appendix XVI). Maximum mean score for overall acceptability of biscuits was recorded in treatment B_0 (7.85) followed by B_3 (7.65), while minimum was recorded in B_2 (6.15) followed by B_1 (7.05), (Table 6).

Table 6.Color, texture, flavor and overall acceptability of control and supplemented biscuits (9-Point Hedonic Scale).

Treatments	Color	Texture	Flavor	Overall acceptability
B_0 = Control	7.35 a	7.75 a	7.52 a	7.85 a
B_1 = 96% WWF + 4% Wheat bran	6.55 a	7.17 ab	7.0 ab	7.05 a
B_2 = 92% WWF + 8% Wheat bran	5.37 ab	6.35 bc	6.12 bc	6.15 bc
B_3 = 96% WWF + 4% Rice bran	7.55 a	7.35 ab	7.07 ab	7.65 a
B_4 = 92% WWF + 8% Rice bran	5.55 a	7.05 b	6.85 abc	7.25 a
B_5 = 96% WWF + 4% Wheat bran +0.14% CMC	6.37 ab	6.65 abc	6.16 bcd	6.09 c
B_6 = 92% WWF + 4% Wheat bran + 0.14% guar gum	4.45 c	5.0 d	5.45 d	4.85 d
B_7 = 96% WWF + 4% Rice bran +0.14% CMC	6.32 ab	5.67 cd	5.72 cd	6.07 bc
B_8 = 92% WWF + 4% Rice bran+0.14% guar gum	5.52 bc	4.65 c	4.85 bc	5.32 c
C.V (%)	**14.16**	**12.48**	**13.66**	**12.05**

Values are the mean of three replications.

Means in the columns having superscripts are significantly different at ($p<0.05$)

The samples in which 0.14% CMC was added along with the supplementation of 4% wheat and rice bran showed overall acceptability score 6.09 and 6.07 for treatments B_5 and B_7, while the sample in which 0.14% guar gum was added along with the supplementation of 4% wheat and rice bran showed overall acceptability score 4.85 and 5.32 for treatments B_6 and B_8 respectively. Maximum mean score was recorded in B_5 (6.09) followed by B_8 (5.32), while minimum was recorded in B_6 (4.85) followed by B_8 (5.32), (Table 6).These results are similar with the findings of (Collins and Falasinnu, 1997) who reported that food made with wheat and rice

bran considerably enhanced food value and palatability.
The scores given to the different sensory parameters of supplemented biscuits remained within the acceptable ranges, indicating acceptance of biscuits with wheat bran, rice bran and these fibrous material determined by the trained panel of judges.

CONCLUSION

It may be concluded from the present research work that wheat and rice bran addition to flour (4 and 8%) gave best results. It is recommended from the study that 4 -8%. So it can be successfully used for supplementation in flour.

It is obvious from the findings of this research that it improved the nutritional status of community the product so it may combat malnutrition problems. From the results of present research work, it is recommended that such supplementations should be carried out commercially. So that consumers may get benefits.

RECOMMENDATIONS

It is recommended that further study should be conducted using various percentages of bran in other bakery products by the addition of other fibrous materials.

It is recommended from the present study that the nutritional qualities of the supplemented bakery products should be evaluated.

LITERATURE CITED

Anderson, J.W. and A.E. Siesel. 1990. Hypocholesterolemic effect of oat products. In new developments of Dietary Fiber: Physicochemical and Analytical Aspects (I. Furda and C. Brine. Ed.) : 17-36.

AOAC. 1984. Official methods of analysis. Association of Official Analytical Chemists. 14th Ed. Washington, D. C.

Bingham, S.A., D.R.R. Willams and J. H. Cummings. 1985. Dietary fiber consumption in Britian: new estimates and their relation to large bowel cancer mortility. Br. J. Cancer. 52: 399. Bran and Germ Fractions on Chemical Composition of High Fiber Toast Bread. J. Food Qual. 24(3): 235-237. (CAB, 1996-2001/1999).

Bushuk, W. and V.F. Rasper. 1994. Wheat production, properties and quality. Blackie Academic and Profesional, Glasgow, UK. : 17.

Collins, J. L. and G.A. Falasinnu. 1997. Dietary Fiber as an Ingredient in Cookies. Tennessee Farm and Home Sci. No. 101-21-24.

Farrel, D.J. 1994. Utilization of rice bran in diets for domestic fowl and ducklings. World Poult. Sci. J. 5:116-131.

Hoseney, R.C. 1994. Principles of cereal Sci. Tech. Am. Assoc. Cereal Chem. Inc., St. Paul., Minnesota, USA.

Knet, N.L. and A. D. Evens. 1994. By products of rice milling. Kent's Technology of Cereals: 4th Ed. BPC Wheatson Ltd. Exeter. : 191.

Larmond, E. 1977. Laboratory Methods of Sensory Evaluation of Foods. Res. Branch Canada Deptt. of Agri. Pub.1637

Mckee, L.H. and T.A. Latner, 2000. Underutilized sources of dietary fiber: A review Plant Foods Hum. Nut. 55: 285-304.

Pomeranz, Y. 1988. Wheat: Chemistry and Tech. vol. 2. St-Paul, Minnesota: American Association of cereal Chemists.

Schneeman, B.O. & J. Tietyen. (1994) Dietary fiber. In: Modern Nutrition in Health and Disease. 8th Ed. 89–100.

Shenoy, A.H. and J. Prakash. 2002. Wheat bran (Triticum Astivum): Composition, Functionality and Incorporation in unleavened bread. J. Food Quality. 25: 197-211.

Sidhu, J.S., A.L. Hoti, J.M. Saqer and A. Alothman. 2001. Effect of Adding wheat bran in different food products. Plants Foods Hum. Nut. 52(3): 137-50.

Steel, R.G.D. and J.H. Torrie. 1980. Principles and procedures of statistics McGraw Hill Co. New York, USA. 2nd Ed. : 137-175.

Vetter, J.L. 1988. Commercially available fiber ingredients and bulking agents. Am. Inst. Baking Res. Deptt. Tech. Bull. 10: 5-8.

Wade, P. 1988. Biscuit, Cookies and Crakers.Vol. 1. The principles of the Craft.
Elsevier, Applied Sci. London.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Academic conference: http://www.iiste.org/conference/upcoming-conferences-call-for-paper/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar