



P-ISSN: 2349-8528
 E-ISSN: 2321-4902
 IJCS 2018; 6(2): 374-377
 © 2018 IJCS
 Received: 11-01-2018
 Accepted: 12-02-2018

Rachna Kumari
 M.Sc (FT) Scholar, WCDT,
 SHUATS, Allahabad, Uttar
 Pradesh, India

Anamika Das
 Assistant Professor, WCDT,
 SHUATS, Allahabad, Uttar
 Pradesh, India

Prafull Kumar
 PhD (DT) Scholar, WCDT,
 SHUATS, Allahabad, Uttar
 Pradesh, India

Studies on preparation of ready to cook idli mix powder by incorporating black rice

Rachna Kumari, Anamika Das and Prafull Kumar

Abstract

The present investigation was carried out to develop black rice based ready to cook idli mix by addition of different levels of black rice. Treatment T0, T1, T2, T3, T4 and T5 were formulated in which idli mix powder was prepared using White Rice:Black Rice (WR:BR) was in the ratio of 100:00, 80:20, 60:40, 40:60, 20:80, 00:100. It was found that treatments T5 scored highest in body and texture 8.30, overall acceptability 8.25 as compared to other treatments. The Total solid, fat, protein, carbohydrate, ash, crude fibre per cent was found to be 94.59, 11.06, 14.05, 68.32, 1.14, 6.22 respectively. The antioxidant value (expressed as trolox equivalent) was found to be 32.56 whereas the titratable acidity per cent was found to be 0.28. The wettability value was found to be 10.00 seconds and flow ability value was observed to be 1.27.

Keywords: Black rice, White rice, Idli-mix powder, Flow ability, Wettability, Composition

Introduction

Idli is a traditional cereal-legume based indigenous fermented food highly popular and widely consumed in India especially in the Southern states as a snack, breakfast or dinner food and is usually served with chutney, sambhar or other accompaniments. Traditionally idli was prepared by soaking rice and black gram separately. After draining the water, rice and black gram were grinded separately with occasional addition of water during grinding process. Rice and black gram batters were mixed together along with a little salt. The mixture was allowed to ferment overnight at room temperature and the fermented batter was dispersed in special idli pans and allowed to steam for 5-8 min (Balasubramaniam *et al.*, 2006) [1].

Now a days consumers are more aware about their health and therefore they purchase those products which contains functional ingredients that will benefit the human physiological system. The world is witnessing a population which shows the trend of gaining weight. Consequently a large mass is avoiding consumption of fats and oil. They are inclining towards steamed food which contains minimal or trace quantity of oil. Idli is one such product which doesn't contribute to any adverse health problems associated with consumption of fat.

In this era, people are having busy life style and they want food products which takes less time and little effort for preparation. Traditional products like idli takes more time and hence now a days consumers are preferring ready to cook idli mixes which not only minimizes their effort, time for preparation but imparts an equally palatable product when compared to traditional product.

Consumers are showing an increasing trend towards consumption of functional foods as this product contains certain ingredients which will specifically benefit or target the human body. Black rice with its increased anthocyanin content is an emerging functional ingredient.

Black rice is an especially economical important rice species and derived its name from its rich natural anthocyanin compounds such as cyaniding 3-glucoside and peonidin 3-glucoside which possess anti-oxidative and anti-inflammatory activities (Hu, Zawistowski, Ling, and Kitt, 2003) [2]. In addition, black rice contains many beneficial components including polyphenolics, flavonoids, vitamin E, phytic acid and c-oryzanol. These antioxidant compounds eliminate reactive oxygen species such as lipid peroxide and superoxide anion radicals and lower cholesterol content (Ichikawa *et al.*, 2008) [3]. The crude anthocyanins-rice extracts of black rice bran improve serum triglyceride levels, which contributes to the suppression of atherosclerosis and protects against insulin resistance, alcoholic liver injury and light-induced retinal damage (Yukihiro *et al.*, 2012) [4].

Correspondence
Rachna Kumari
 M.Sc (FT) Scholar, WCDT,
 SHUATS, Allahabad, Uttar
 Pradesh, India

This is because black rice has a double function namely as a source of staple food with good taste, fluffier and fragrance as well as an efficacious medicine to cure various illness (Kristamtini, 2009)^[5].

Till date no studies have been undertaken for studying a feasibility for incorporation of black rice in idli mix. The present study has been undertaken to access the levels of black rice that can be incorporated into ready to cook idli mix powder without adversely affecting the organoleptic properties of the product.

Materials and Methods

Preparation of idli mix powder by incorporation of black rice and white rice.

In the present study, idli mix powder was prepared by incorporating white rice and black rice in different ratios, black gram flour, refined oil (Sun Pure brand), salt, baking soda, mustard seed and curry leaves. All the ingredients were procured locally from Allahabad. Dahi used for preparation of idli from idli mix powder was procured from Amul.

In this study there were six treatments viz., T₀, T₁, T₂, T₃, T₄, T₅ which contained white rice: black rice in the proportion of 100:00, 80:20, 60:40, 40:60, 20:80, 00:100 respectively.

Black rice and white rice were gelatinized by subjecting the rice to heat treatment at 85°C/15min and then dried in hot air oven. The dried rice was grounded and was taken according to the different ratios as mentioned above. For preparation of 100 gm idli mix, 66gm rice flour (combination of black rice and white rice in given ratio as mentioned above), 22 gm black gram flour, 7 gm refined oil, 2 gm salt, 2 gm baking soda, 0.5 gm mustard seed and 0.5 gm curry leaves were taken. Mustard seeds and curry leaves were roasted. The refined oil was heated and all the ingredients were dry blended and was roasted for two minutes.

Idli mix powder was standardized by preparing idli from the idli mixes of different treatments and then subjecting the idli to organoleptic evaluation before a trained panel of judges. The idli that received highest score for flavor, colour and appearance, body and texture and overall acceptability was considered as the optimized treatment.

Physico-chemical, organoleptic and microbiological characteristics of idli mix powder prepared by incorporation of black rice and white rice

Total solid content of idli mix powder was determined as per procedure of AOAC (1990)^[6]. Fat was determined as per procedure of Soxhlet extraction method AOAC (1990)^[6]. Protein content was determined as per procedure of Micro Kjeldahl. Total carbohydrate was estimated as per procedure of hydrolysis method as described in AOAC (1990)^[6]. Ash content was determined as per procedure of Rangana (1986)^[7]. Crude fibre was determined as per procedure of AOAC (1984)^[8]. Antioxidant was determined as per procedure followed by (Iqbal *et al.*, 2005)^[9]. Acidity was determined as per procedure of AOAC (1986)^[10]. Wettability was determined as per procedure of Hunziker (1949)^[11]. Flow ability was determined as per procedure followed by (Suliaman *et al.*, 2014)^[12]. Idli mix powder was subjected to organoleptic evaluation to trained panelists who evaluated the products for flavor, colour and appearance, body and texture and overall acceptability using 9 point hedonic scale. Idli mix powder was analyzed for different microbial parameters. Standard plate count was determined as per procedure given in APHA Standard methods for examination of Food Products

(1992). Coliform count was determined as per procedure given in 'APHA Standard methods for examination of Food Products' (1992). Yeast and mould count was determined as per procedure given in ISO Standard.

Statistical analysis

The data obtained were statistically analyzed for ANOVA using MS Excel software, 2007.

Results and discussion

Effect of addition of black rice on organoleptic score of idli prepared from different treatments

The idli mix powder samples were subjected to organoleptic evaluation before a panel of trained judges using a 9 point hedonic scale. The samples were evaluated for flavor, colour & appearance, body & texture and overall acceptability. The organoleptic scores are presented graphically in Fig 1. From the figure, it can be observed that idli prepared from treatment T₃ scored significantly higher values for body & texture and overall acceptability as compared to other treatments including control. Therefore idli mix powder of T₃ treatment containing white rice: black rice ratio of 00:100 has been considered as the optimised product.

Effect of addition of black rice on physico-chemical, microbiological quality of Idli mix powder samples

The total solid percentage of different treatments increased with increase in the level of black rice. The total solid of idli mix samples of treatment T₀, T₁, T₂, T₃, T₄ and T₅ was found to be 94.56%, 94.56%, 94.57%, 94.56%, 94.56% and 94.59% respectively. There is no significant difference (P>0.05) between the treatments for total solid percentage. The fat percentage of idli mix powder samples of different treatments viz., T₀, T₁, T₂, T₃, T₄ and T₅ was found to be 11.57%, 11.46%, 11.34%, 11.24%, 11.17% and 11.06% respectively. There is significant difference (P<0.05) between the treatments for total solid percentage. It can be seen that with the increase in addition of black rice, the fat percentage in different treatment decreased significantly (P<0.05) which can be attributed to the fact that the black rice contributed minimal quantity of fat to the idli mix powder. Ling *et al.*, (2002)^[13] reported that rice is free of gluten, free of cholesterol, low in sugar, salt and fat.

The protein percentage of idli mix powder samples of different treatments viz., T₀, T₁, T₂, T₃, T₄ and T₅ was found to be 13.53%, 13.64%, 13.78%, 13.85%, 13.92% and 14.05% respectively. It can be seen that with the increase in addition of black rice, the protein percentage in different treatment increased significantly (P<0.05). Ichikawa *et al.*, (2001)^[14] observed that nutrient such as protein, minerals (Ca, P, Fe and Zn) and dietary fibre contents are higher in black rice compared to white and brown rice. The carbohydrate percentage for idli mix powder samples of T₀, T₁, T₂, T₃, T₄ and T₅ treatments was found to be 68.83%, 68.73%, 68.64%, 68.51, 68.41 and 68.32% respectively. The carbohydrate percentage decreased significantly (P<0.05) with the increased quantity of black rice. The ash percentage for idli mix powder samples of T₀, T₁, T₂, T₃, T₄ and T₅ treatments was found to be 0.65%, 0.72%, 0.84%, 0.96%, 1.07% and 1.14% respectively. The ash percentage increased significantly (P<0.05) with the increased addition of black rice. The crude fibre percentage for idli mix powder samples of T₀, T₁, T₂, T₃, T₄ and T₅ treatments was found to be 4.34%, 4.66%, 4.96%, 5.43%, 5.82% and 6.22% respectively.

The crude fibre percentage increased significantly ($P < 0.05$) with the increased addition of black rice. The antioxidant value (expressed as $\mu\text{mol Trolox per gm}$) for idli mix powder samples of T0, T1, T2, T3, T4 and T5 treatments was found to be 2.66, 9.42, 15.90, 21.12, 29.85 and 32.56 respectively. The antioxidant value increased significantly ($P < 0.05$) with the increased quantity of black rice. Rui, (2010) [15] analysed the phenolic content and antioxidant activity of 12 diverse varieties of black rice and found that antioxidants were about six times higher in black rice than in common brown/white rice. Goffman and Bergman (2004) [16] found that black rice contains several classes of antioxidants, including phenolic compounds, tocopherols and γ -oryzanol. Antioxidants reportedly are protective against oxidative damage, which has been implicated in a range of diseases including cancer and cardiovascular disease.

The acidity of idli mix powder samples of different treatments were analyzed and it was found that idli mix powder samples of T0 treatment was found to be 0.28 % citric acid. Idli mix powder samples of T1, T2, T3, T4 and T5 treatments exhibited acidity of 0.29%, 0.29%, 0.28, 0.29 and 0.28% citric acid respectively. There was no significant differences ($P > 0.05$) between the acidity values of different treatments. The wettability for idli mix powder samples of T0, T1, T2,

T3, T4 and T5 treatments was found to be 9.50, 9.50, 10.00, 9.50, 9.50 and 10.00 seconds respectively. There was no significant differences ($P > 0.05$) between the wettability values of different treatments. The flow ability for idli mix powder samples of T0, T1, T2, T3, T4 and T5 treatments was found to be 1.25, 1.26, 1.26, 1.26, 1.27 and 1.27 respectively. The flow ability increased with the increased quantity of black rice but there was no significant differences ($P > 0.05$) between the flow ability values of different treatments. Sulieman *et al.*, (2014) [12] reported that a hunsner ratio of 1 to 1.25 indicate the powder had free flowing. Hausner ratio of 1.25 to 1.4 indicate fairly free flowing and greater than 1.4 are cohesive and do not flow well.

Standard plate count of idli mix powder samples of treatments viz., T0, T1, T2, T3, T4 and T5 was found to be 4.63 cfu/gm, 4.59 cfu/gm, 4.64 cfu/gm, 4.49 cfu/gm, 4.52 cfu/gm and 4.59 cfu/g respectively. There were significant difference ($P < 0.05$) among the SPC of different treatments. The coliform count of different samples were found to be absent. The yeast and mold count of different samples of treatments viz., T0, T1, T2, T3, T4 and T5 was found to be 1.01 cfu/gm, 1.02 cfu/gm, 1.02 cfu/gm, 1.02 cfu/gm, 1.02 cfu/gm and 1.02 cfu/g respectively. There were no significant difference ($P > 0.05$) among the yeast and mould count of different treatments.

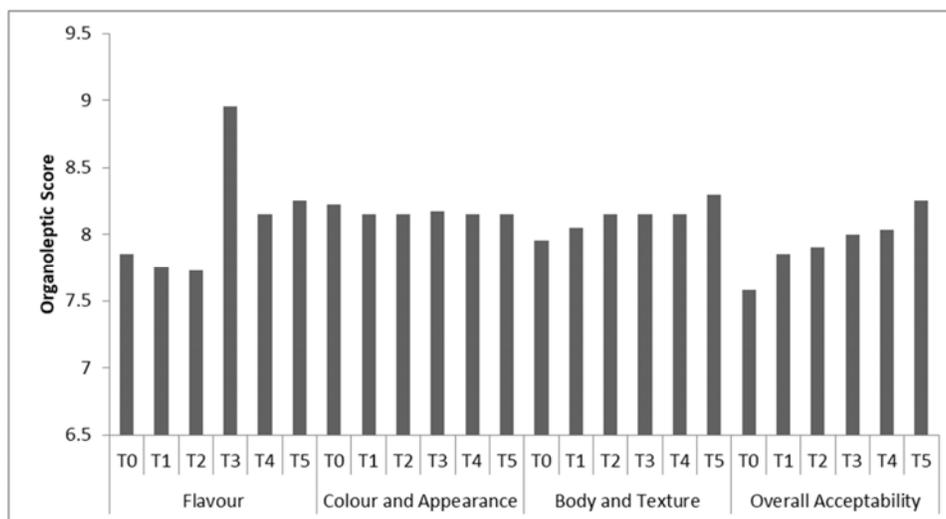


Fig 1: Graph showing the organoleptic scores of idli prepared from idli mixes of different treatments.

Conclusion

Idli is a highly popular traditional cereal-legume based indigenous fermented food highly widely consumed in India. Black rice has high nutritional value including iron. Anthocyanins are the flavonoid pigments of black rice are the source of antioxidants that have the ability to inhibit the formation or to reduce the concentrations of reactive cell damaging free radicals. The present study indicates that the beneficial effects of black rice can be delivered through this widely accepted product. It was found that among all the treatments T5, 66% of black rice could be used for preparation of idli along with 22% of black gram powder. Idli mix prepared from black rice had more protein, increased carbohydrate, mineral, antioxidant and crude fibre as compared to idli mix prepared with combination of white rice and black rice.

References

1. Balasubramaniam S, Singh N, Ilyas SM, Wanjari OD. Effect of selected decorticated legumes protein on

rheology of maize extrudate pastes. *Journal of Food Science and Technology*. 2006; 43:590-594.

- Hu C, Zawistowski J, Ling W, Kitts DD. Black rice (*Oryza sativa L. indica*) pigmented fraction suppresses both reactive oxygen species and nitric oxide in chemical and biological model systems. *J Agric Food Chem*. 2003; 51:5271-7.
- Ichikawa H, Ichiyonagi T, Xu B, Nakajima M, Konishi T. Antioxidant activity of anthocyanin extract from purple black rice. *Journal of Medicinal Food*. 2008, 211-218.
- Yukihiro Y. Different localization patterns of anthocyanin species pericarp of black rice revealed by imaging mass spectrometry. *Food Science and Technology*, 2012; 54:476-481.
- Kristantini. Mengenal beras hitam dari bantul. *Tabloid Sinar Tani*, 2009, 13. Mei.
- AOAC. Official methods of analysis of the Association of Official Analytical Chemistry, 1990.
- Rangana S. Handbook of analysis and quality control for fruit and vegetable products (second edition). Tata

McGraw-Hill publishing company Ltd., Okhala, New Delhi, 1986.

8. AOAC. Association of Official Analytical Chemists, Washington, USA. 1984, 1094.
9. Iqbal S, Bhanger IM, Anwar F. Antioxidant properties and components of commercially available varieties of rice bran. *Journal of Food Chemistry*. 2005; 93:265-272.
10. AOAC. Official methods of analysis of the Association of Official Analytical Chemistry, 1986.
11. Hunziker OF. Text book of Condensed milk and milk powder. The author, La Grange Illinois, 1949; (7):261-283.
12. Sulieman EMA, Elamin MO, Elkhalfi AE. Comparison of physicochemical properties of Spray-dried camel's milk and cow's milk powder. *International journal of Food Science*. 2014; 4(1):15-19.
13. Ling WH, Wang LL, Ma J. Supplementation of the black rice outer layer fraction to rabbit's decreases atherosclerotic plaque formation and increases antioxidant status. *J Nutr*. 2002; 132:20-26.
14. Ichikawa H, Ichiyangi T, Xu B, Yoshii Y, Nakajima M, Konishi T. Antioxidant activity of anthocyanin extract from purple black rice. *J Med Food*. 2001; 4(4):211-218.
15. Rui HL. Black Rice Bran High In Antioxidants. *Journal of Agricultural and Food Chemistry*. 2010; 58(13):7580-7587.
16. Goffman FD, Bergman CJ. Rice kernel phenolic content and its relationship with antiradical efficiency. *Journal of Food Science and Agriculture*. 2004; 84:1235-1240.