Biological Forum – An International Journal **14(2): 1076-1079(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Functional and Nutritional Study of Himalayan Rice

Faruk Ansari[1], Devina Vaidya[1], Manisha Kaushal[1*], Neerja Rana[2], Anil Gupta[1], Sanjay Patidar[1], Priyanka Chauhan[1] and Dileep K.C.[1]

[1]Department of Food Science and Technology, YSP UHF Nauni, Solan (Himachal Pradesh), India.
[2]Department of Basic Science (Biochemistry and Microbiology), YSP UHF Nauni, Solan (Himachal Pradesh), India.

(Corresponding author: Manisha Kaushal)*
(Received 24 March 2022, Accepted 22 May, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTARCT: Rice is one of the most well-known cereal foods, has been a primary food for many people around the world. Prescribed methods were used to evaluate the results at YSPHFU, Solan, Himachal Pradesh. The ash content of white paddy (Raw rice, flour and parboiled) was found between 0.54±0.015, 0.53±0.015 and 0.86±0.010 whereas in red paddy (Raw rice, flour and parboiled) 1.52±0.015, 1.53±0.015, and 2.03±0.021 respectively. Fat content in red rice was found higher as compared to white rice. The crude fibre content of white rice mainly in raw rice, flour and parboiled rice found 0.24±0.015, 0.23±0.015 and 0.29±0.015 respectively, whereas, 2.72±0.015 (raw rice), 2.72±0.015 (flour), 2.78±0.015 (parboiled rice) in red rice. Crude protein content in both white rice and red rice was recorded as 6.90±0.015, 6.89±0.026, 8.17±0.020 and 9.10±0.100, 9.54±0.020, 11.54±0.020 respectively in raw rice, flour and parboiled rice. Total carbohydrate content in white rice was recorded as 79.97±0.015 in raw rice, 80.90±0.015 in flour and 77.54±0.020 in parboiled rice whereas, 71.93±0.020 (raw rice), 72.98±0.010 (flour) and 69.03±0.020 (parboiled rice) in red rice. Energy values in raw rice, flour and parboiled rice were found to be less in white rice and more in red rice respectively. Amylose content of white rice was found to be 20.20±0.015 in raw rice, 21.17±0.020 in flour and 17.57±0.015 in parboiled rice whereas, 2.72±0.015 (raw rice), 2.72±0.015 (flour), 2.78±0.015 (parboiled rice) found in red rice. Amylopectin content in both white rice and red rice was recorded as 59.88±0.015, 59.61±0.020 and 60.82±0.015 and 61.80±0.020, 63.06±0.020 and 59.60±0.020 respectively in raw rice, flour and parboiled rice. Total sugar of white rice was found to be 17.60±0.020 in raw rice, 25.84±0.020 in flour and 33.29±0.020 in parboiled rice whereas, 60.47±0.346 (raw rice), 178.32±0.015 (flour) and 169.45±0.020 (parboiled rice) found in red rice. The water activity of white and red rice was found to be 0.83±0.002, 0.72±0.003, 0.62±0.001 and 8.26±0.002, 0.68±0.117 and 0.70±0.100 respectively in raw rice, flour and parboiled rice.

Keywords: Raw rice, flour, parboiled, white and red rice.

INTRODUCTION

For centuries, rice (*Oryza sativa* L.), one of the most well-known cereal foods, has been a primary food for many people around the world and is known to feed half of the population (Sun *et al.,* 2010). Therefore the role of rice as a staple food in providing nutrition to populations has been acknowledged.

There are more than 8000 varieties of rice, which have different types of quality and nutritional content. After the post-harvest process, all the varieties of rice can be categorized as either white or brown rice (Zareiforoush *et al.* 2016).

The world's rice production is reported to be 755.47 million tonnes from an area of 162.06 Mha (FAO, 2019). India ranks as the second largest producer of rice in the world next to China followed by Indonesia and Bangladesh. Red rice is especially grown abundantly in the region to endowed traditional red rice cultivars rich in nutritional values, cultural values, fine aroma and medicinal properties.

In rice, protein has gained great attentions due as to its relatively well-balance amino acid profile, which is superior in lysine content as compared to wheat, corn, millet and sorghum (Hegsted, 1969) which has a great potential to improve human nutrition in rural population of Asia.

Pigmented rice is a well-known source of antioxidant compounds including flavonoid, anthocyanin, phytic acid, proanthocyanidin, tocopherols, tocotrienols, γ-oryzanol, and phenolic compounds (Butsat and Siriamornpun, 2010; Goufo and Trindade, 2014). Apart from cytotoxic effects against hepatocellular cell lines (HEPG2) (Revilla *et al*., 2013). It is also mentioned in

Ayurveda that red rice is best for health, skin, eyesight, diuretic and improves voice and fertility.

Parboiled red rice also releases glucose more slowly than raw red rice, parboiled white rice and raw milled white rice this might be due to the protein-anthocyanin complex migrate into starch gel by unknown mechanism that results in inhibition of enzymatic starch hydrolysis (Parera and Jansz 2000).

MATERIALS AND METHODS

Raw material. Raw material such as red rice and white were procured from KVK Almora, Uttarakhand and then brought to the Department of Food Science and Technology, UHF, Nauni, Solan (Himachal Pradesh) for conducting the studies.

Determination of chemical characteristics of Himalayan rice:

Moisture content (%). The moisture content of the sample was determined by using moisture meter. HE53 230V Model (Japan). Ash %, Crude Fibre (%), Crude fat (%), Total carbohydrate (%) content as per cent dry weight basis was determined by Ranganna, (2009).

Energy value (Kcal/100 g). In a bomb calorimeter, the energy value was calculated. Microprocessor bomb calorimeter automatic system KC01 khera (India).

Amylose and Amylopectin content (%). Amylose was determined by using the method of Williams *et al*., (1970).

Total sugars (%). The amount of total sugar in the sample was determined by Rasouli *et al*., (2014).

Water activity (%). The water activity of the sample was estimated by a computer digital water activity meter as per (AOAC, 2009).

Statistical analysis. Statistical studies were Analyzed of Variance (ANOVA) using statistical package WINDOWSTAT 8.0. The obtained data were interpreted 29 and compared at 5% level of significance ($P \leq 0.05$)

RESULTS AND DISCUSSIONS

A. Nutritional characteristics of rice

Moisture content (%). The moisture content of the paddy varieties namely white (Raw rice, flour and parboiled) was found 12.11±0.015, 11.02±0.015, and12.04±0.010 and red paddy varieties (Raw rice, flour and parboiled) 11.92±0.015, 10.45±0.010 and 12.49±0.010 respectively. The moisture content of all samples was recorded almost the same at the time of the study. The moisture content found can help to suggest the stability in the storage of paddy. Similar findings have been reported by Vargas *et al.* (2017) and Raghuvanshi *et al.* (2017).

Ash content (%). The ash content of white paddy (Raw rice, flour and parboiled) was found between 0.54±0.015, 0.53±0.015 and 0.86±0.010 whereas in red paddy (Raw rice, flour and parboiled) 1.52±0.015, 1.53±0.015, and 2.03±0.021 respectively. The ash content was higher in red paddy and lower value found in white paddy variety. Similar findings have been reported by Pavia *et al.* (2015).

Fat content(%). The fat content of white rice and red rice mainly in raw rice, flour and parboiled ranged between 0.28±0.015, 0.27±0.010, 0.68±0.015 respectively in white rice and 2.82±0.015, 2.87±0.015, 1.90±0.015 respectively in red rice. Fat content in red rice was found higher as compared to white rice. Similar results have been observed by Sompong *et al.*, (2011) and Paiva *et al.* (2015).

Crude fibre(%). Red rice is a rich source of fibre as compared to Bajra, wheat as well as vegetables like spinach, amaranth, cucumber and carrot (Gopalan *et al.*, 2007). The crude fibre content of white rice mainly in raw rice, flour and parboiled rice found 0.24±0.015, 0.23±0.015 and 0.29±0.015 respectively, whereas, 2.72±0.015 (raw rice), 2.72±0.015 (flour), 2.78±0.015 (parboiled rice) in red rice. Similar findings have been reported by Kumar & Prasad (2017).

Crude protein (%). Crude protein content in both white rice and red rice was recorded as 6.90±0.015, 6.89±0.026, 8.17±0.020 and 9.10±0.100, 9.54±0.020, 11.54±0.020 respectively in raw rice, flour and parboiled rice. Similar results have been observed by Reddy *et al.* (2017).

Total carbohydrate (%). Total carbohydrate content in white rice was recorded as 79.97±0.015 in raw rice, 80.90±0.015 in flour and 77.54±0.020 in parboiled rice whereas, 71.93±0.020 (raw rice), 72.98±0.010 (flour) and 69.03±0.020 (parboiled rice) in red rice. Similar results have been observed by Raghuvanshi *et al.*, (2017).

Energy value (Kcal/100g). Energy values in raw rice, flour and parboiled rice were found to be 348.88±1.548, 346.67±1.528 and 367.33±1.155 in white rice and 368.67±1.528, 368.00±2.000 and 370.67±1.528 in red rice respectively. Similar results have been observed by Raghuvanshi *et al.* (2017) and Kumar & Prasad (2017).

Amylose. Amylose content of white rice was found to be 20.20±0.015 in raw rice, 21.17±0.020 in flour and17.57±0.015 in parboiled rice whereas, 2.72±0.015 (raw rice), 2.72±0.015 (flour), 2.78±0.015 (parboiled rice) found in red rice. Similar results have been reported by Kumar & Prasad (2017).

Amylopectin. Amylopectin content in both white rice and red rice was recorded as 59.88±0.015, 59.61±0.020 and 60.82±0.015 and 61.80±0.020, 63.06±0.020 and 59.60±0.020 respectively in raw rice, flour and parboiled rice. Similar results have been reported by Kumar & Prasad (2017).

Total Sugar (µg/100 µg). Total sugar of white rice was found to be 17.60±0.020 in raw rice, 25.84±0.020 in flour and 33.29±0.020 in parboiled rice whereas, 60.47±0.346 (raw rice), 178.32±0.015 (flour) and 169.45±0.020 (parboiled rice) found in red rice. A

similar finding has been reported by Kumar & Prasad (2017).

Water activity (%). The water activity of white and red rice was found to be 0.83±0.002, 0.72±0.003, 0.62±0.001 and 8.26±0.002, 0.68±0.117 and 0.70±0.100 respectively in raw rice, flour and parboiled rice. Similar results have been reported by Ozbekova and Kulmyrzaev (2019) Table 1.

Table 1: Chemical characteristics of rice, flour and parboiled rice.

Parameter	Mean ±SD					
	White paddy			Red paddy		
	Rice	flour	Parboiled rice	Rice	flour	Parboiled rice
Moisture (%)	12.11±0.015	11.02±0.015	12.04±0.010	11.92±0.015	10.45±0.010	12.49±0.010
Ash (%)	0.54±0.015	0.53±0.015	0.86±0.010	1.52±0.015	1.53±0.015	2.03±0.021
Crude fat (%)	0.28±0.015	0.27±0.010	0.68±0.015	2.82±0.015	2.87±0.015	1.90±0.015
Crude fibre (%)	0.24±0.015	0.23±0.015	0.29±0.015	2.72±0.015	2.72±0.015	2.78±0.015
Crude protein (%)	6.90±0.015	6.89±0.026	8.17±0.020	9.10±0.100	9.54±0.020	11.54±0.020
Total carbohydrate(%)	79.97±0.015	80.90±0.015	77.54±0.020	71.93±0.020	72.98±0.010	69.03±0.020
Energy value (Kcal/100g)	348.88±1.54	346.67±1.52	367.33±1.15	368.67±1.52	368.00±2.000	370.67±1.528
Amylose(%)	20.20±0.015	21.17±0.020	17.57±0.015	14.62±0.020	10.30±0.020	21.25±0.020
Amylopectin(%)	59.88±0.015	59.61±0.020	60.82±0.015	61.80±0.020	63.06±0.020	59.60±0.020
Total Sugar (µg/100 µg)	17.60±0.020	25.84±0.020	33.29±0.020	60.47±0.346	178.32±0.015	169.45±0.020
Water activity (%)	0.83±0.002	0.72±0.003	0.62±0.001	8.26±0.002	0.68±0.117	0.70±0.100

CONCLUSION

From the findings it was concluded that the white paddy found superior to red paddy, values of crude protein percent was found less in white paddy compared to red paddy in terms of total carbohydrates value of red paddy were found greater than white paddy further more amylopectin % was found at par in both the paddy. In the present study and its suitability are of great significance for the research and development personals and for food processing sector for preparation of various specialty foods.

Acknowledgement. I would like to thank the Department of Food Science and Technology, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh.
Conflict of interest. None

REFERENCES

AOAC International. (2009). Official Methods of Analysis of AOAC International, 18th ed.

Butsat, S. and Siriamornpun, S. (2010). Antioxidant capacities and phenolic compounds of the husk, bran, and endosperm of Thai rice. *Food Chemistry,119*: 606-613.

FAO (2019). Rice market monitor. http://www.fao.org/3/I9243EN/i9243en.pdf [2.30PM, 8th Jan, 2021].

Gopalan, C., Ramasashtri, B. V. and Balasubramanian, S. C. (2007). Nutritive Value of Indian Foods. National Institute of Nutrition, ICMR: Hyderabad, India, p. 47.

Goufo, P. and Trindade, H. (2014). Rice antioxidants: phenolic acids, flavonoids, anthocyanins, proanthocyanidins, tocopherols, tocotrienols, ϒ-oryzanol and phytic acid. *Food Science and Nutrition, 2*: 75-104.

Hegsted, D. M. (1969). Nutritive value of cereal proteins in relation to human needs. In: Proteinenriched cereal foods for world needs. *American Association of Cereal Chemical,* pp38-48.

Kumar, S. H. I. V., & Prasad, K. (2017). Optimization of flaked rice dry roasting in common salt and studies on associated changes in chemical, nutritional, optical, physical, rheological and textural attributes. *Asian Journal of Chemistry*, *29*(6), 1380-1392.

Paiva, F. F., Vanier, N. L., Berrios, J. D. J., Pinto, V. Z., Wood, D., Williams, T., ... & Elias, M. C. (2016). Polishing and parboiling effect on the nutritional and technological properties of pigmented rice. *Food chemistry*, *191*, 105-112.

Parera, A. S. and Jansz, E. R. (2000). Preliminary investigations on red pigmentation in rice and its effect on glucose release from rice starch. *Journal of National Science Foundation of Sri Lanka, 28*: 185-192.

Raghuvanshi, R. S., Dutta, A., Tewari, G. and Suri, S. (2017). Qualitative characteristics of red rice and white rice procured from local market of Uttarakhand- a comparative study. *Journal of Rice Research,10*: 104-114.

Ranganna, S. (2009). *Hand book of analysis and quality control of fruit and vegetable products*. 4th edn. Tata McGraw Hill, New Delhi 1112p.

Rasouli, A., Ostovar, R. H. and Shokri, A. (2014) Characterization and improvement of phenolsulfuric acid microassay for glucose-based glycogen. *European Review for Medical and Pharmacological Sciences,18*: 2020-2024.

Reddy, B. D., Christina, G. D. A. and Vishala, A. D. (2017). Emerging opportunities for extrusion in millets. *Indian Farming,65*: 79-83.

Revilla, E., Santa, M. C., Miramontes, E., Candiracci, M. and Rodriguez, M.B. (2013). Antiproliferative and immune activatory ability of an enzymatic extract from rice bran. *Food Chemistry,136*: 526-531.

Sompong, R., Ehn-Sisbenhandl, S., Martin, G. L., Berghofer, E. (2011). Physicochemical and antioxidative properties of red and black rice varieties from Thailand, China and Srilanka. *Food Chemistry,124*: 1320-340.

Sun, Q., Spiegelman, D., Van, D. R. M., Holmes, M. D., Malik, V. S., Willett, W. C. and Hu, F. B. (2010). White rice, brown rice, and risk of type 2 diabetes in US men and women. *Archives of Internal Medicine,170*: 961–969.

Vargas, C. G., Costa, T. M. H., Oliveira, R. A. and Flores, S. H. (2017). Comparative study on the properties of films based on red rice (*Oryza glaberrima*) flour and starch. *Food Hydrocolloids, 65*: 96-106.

Zareiforoush, H., Minaei, S., Alizadeh, M. R. and Banakar, A. (2016). Qualitative classification of milled rice grains using computer vision and metaheuristic techniques. *Journal of Food Science and Technology, 53*: 118–131.

Ozbekova, Z. and Kulmyrzaev, A. (2019). Study of moisture content and water activity of rice using fluorescence spectroscopy and multivariate analysis. *Journal of Molecular and Biomolecular Spectroscopy, 43*: 223-128.

Williams, P.C., Kuzina, F.D. and Hlynka, I. (1970). A Rapid Colorimetric Procedure for Estimating the Amylose Contents of Starches and Flours. Cereal Chemistry, 47, 411-420.

How to cite this article: Faruk Ansari, Devina Vaidya, Manisha Kaushal*, Neerja Rana, Anil Gupta, Sanjay Patidar, Priyanka Chauhan and Dileep K.C. (2022). Functional and Nutritional Study of Himalayan Rice. *Biological Forum – An International Journal, 14*(2): 1076-1079.