AJHS
Asian Journal of Home Science
Volume **15** | Issue 1 | June, 2020 | 33-37

DOI: 10.15740/HAS/AJHS/15.1/33-37
ISSN : 0973-4732 ■ Visit us: *www.researchjournal.co.in*

Research Paper

Estimation of glycemic index of traditional paddy varieties through on farm trial (2018-2019)

■ **P. Karuppasamy and M.R. Latha**

Received: 19.02.2020; **Revised:** 06.03.2020; **Accepted:** 20.04.2020

■ **ABSTRACT :** The rising prevalence of diabetes is closely associated with industrialization, urbanization, socio-economic development and changes in the life style. The rice varieties namely TRY-3, Black Kavuni and Karungkuruvai were selected for the study based on their popularity, nutritional characteristics and other specific characteristics in Tamil Nadu. Initially the non-diabetic participants were screened by conducting glucose tolerance test by administering glucose powder available in the market dissolved in potable water containing 50g of glucose as reference carbohydrate. For the intervention rice varieties *viz.*, TRY-3, Black Kavuni and Karungkuruvai containing 50g of carbohydrate in the form flakes and provided to the healthy participant. The blood glucose level of the participants before administering test food and during 15th, 30th, 45th, 60th, 90th and 120th minutes were noted and taken for calculating the glycemic index. The Carbohydrate and crude fibre content of TRY-3, Black Kavuni and Karunkuruvai were 70.23g and 0.99g, 62.89g and 1.70g and 63.09g and 2.01g, respectively. The Consumer acceptability of TRY-3 was high than Black Kavuni and Karunkuruvai with values are 8.7, 8.1 and 7.8, respectively. The recovery percentage of Black Kavuni was high than Karunkuruvai and TRY-3 with values are 58 per cent, 55.2 per cent and 53.5 per cent, respectively. In the present study the Glycemic index of black kavuni (53.10) is lesser than karunkuruvai (55.50) which are in the low Glycemic foods. TRY 3 has a G.I. of 68.20 which is higher Glycemic index than traditional varieties.

■ **KEY WORDS:** Traditional rice, Nutritional characteristics, Glycemic Index

■ **HOW TO CITE THIS PAPER :** Karuppasamy, P. and Latha, M.R. (2020). Estimation of glycemic index of traditional paddy varieties through on farm trial (2018-2019). *Asian J. Home Sci.*, **15** (1) : 33-37, **DOI: 10.15740/HAS/AJHS/15.1/33-37.**

See end of the paper for authors' affiliations

P. Karuppasamy
ICAR-KVK, Vamban, Pudukkottai (T.N.) India
Email : samysks@gmail.com

Dietary Diabetes mellitus is the third most common and significant chronic endocrine disorder affecting millions of people worldwide. It has a profound effect on health, quality of life and financial burden of both the individual and society. India ranks first in the diabetic population in the world (Kowsalya and Preethi, 2008). The rising prevalence of diabetes is closely associated with industrialization, urbanization, socio-economic development and changes in the life style (Premakumari *et al*., 2009). Modifications for control of type II diabetes mellitus includes a diet high in complex carbohydrates, protein, fibre and low in fat which do not cause a rapid rise in blood glucose levels. Slower the rate of carbohydrate absorption, lower is the rise in blood

glucose level and the glycemic index value. Major alterations in the glycemic index and dietary fibre content of meals had been known to include small but significant changes in the glucose profile (Vijayalakshmi and Radha, 2006 and Thilagavathy and Muthuselvi, 2010).

Under utilization of traditional rice varieties and Therapeutic properties of traditional rice varieties not known. Rice is the leading crop produced and consumed as a stable food on a large scale in the state of Tamil Nadu. The traditional varieties with desirable traits were ignored and are cultivated in a minimum area. The demand for traditional rice varieties has been increasing year by year with an increased awareness of health benefits popularly eaten white rice contains higher amount of available carbohydrate and very low level of essential micronutrients, leading to the development of Insulin Dependent Diabetes Mellitus (IDDM) and micronutrient deficiency. Traditional pigmented rice varieties are rich in dietary fibre, resistant starch, minerals, carotenoids, flavonoids and polyphenols. Hence, consumption of these pigmented rice varieties help in improving human health. The present study has made use of glycemic index to evaluate the health benefits of two traditional grown rice cultivars (Black Kavuni and Karungkuruvai) as against one rice variety TRY 3.

■ RESEARCH METHODS

As per the action plan on farm trial (OFT) 2018-2019, the rice varieties namely TRY 3, Black Kavuni and Karunkuruvai were selected for the study based on their popularity, nutritional characteristics and other specific characteristics in Tamil Nadu. The TRY 3 variety purchased from the ICAR - KVK, Needamangalam, Tiruvarur district of Tamil Nadu, Black Kavuni and Karunkuruvai from Pudukkottai Organic Producer Company (P) Ltd. The Glucometer, Gluco strips and Electronic weighing balance were used in the present investigation for the assessment of best variety. The chemical composition or nutrients of the paddy varieties like carbohydrate (Dubois *et al*., 1956) and crude fibre (IS 12711: 1989 Reaff, 1994) were analyzed. The procured paddy varieties were processed into flakes and it was stored in air tight container. The processed flakes were subjected to sensory evaluation for their organoleptic properties by a panel of 25 members using a nine point hedonic scale (Watts *et al*., 1989). The score card was used for the evaluation and the mean score was obtained for all the characters. The human study protocol was followed as per the ethical committee of TNAU, Coimbatore. The data collected from all experiments were replicated two times and all the values were expressed as mean ± SED.

The Subjects between the age group (25-40) were selected randomly from Miratunilai Village, Arimalam Block, Pudukkottai. Initial screening was done by studying their general profile and written informed consent was obtained. A detailed questionnaire was developed with the help of nutrition experts. The data was collected by personal interview method. The questionnaire included various aspects such as general, Disease history, Dietary pattern and food habits. Food consumption pattern was assessed by 24 hours recall method. Biochemical parameters like blood glucose level was observed before and after the intervention period using prodigy preferred glucometer with blood glucose test strips. In the present trial the glycemic index of rice varieties were assessed in the healthy volunteers containing 50g of available carbohydrate. Initially the participants were screened by conducting glucose tolerance test by administering glucose powder available in the market dissolved in potable water containing 50 g of glucose as reference carbohydrate. For the intervention one popularly eaten rice (TRY 3) and two traditional rice varieties *viz.*, Black kavuni and Karungkuruvai containing 50g of carbohydrate in the form of flakes and provided to the healthy participant. The blood glucose level of the participants before administering test food and during 15^{th}, 30^{th}, 45^{th}, 60^{th}, 90^{th} and 120^{th} minutes were noted and taken for calculating the glycemic index.

■ RESEARCH FINDINGS AND DISCUSSION

The Sensory Characteristics of the rice flakes are presented in Table 1. The colour and appearance of TRY-3, Black Kavuni and Karunkuruvai were 9.0, 9.0 and 8.0, respectively. The flavor and texture of TRY-3, Black Kavuni and Karungkuruvai were 9 and 9, 9 and 9 and 8 and 8, respectively. The taste and overall acceptability of TRY-3, Black Kavuni and Karunkuruvai were 9 and 9, 9 and 9 and 8 and 8, respectively. Feeding trials of paddy flakes are given in Table 2. The Glycemic index is defined as the incremental area under the blood glucose response curve of a 50g carbohydrate portion of test food expressed as a per cent of the response to the same

amount of carbohydrate from a standard food taken by the same subject. The glycemic index (GI) is a ranking of foods based on the postprandial blood glucose response compared with a reference food, *e.g.* white bread or glucose (Foster-Powell *et al.*, 2002).

The nutritional compositions of the paddy varieties are presented in Table 3. The Carbohydrate content of TRY-3, Black Kavuni and Karunkuruvai were 70.23g, 62.89g and 63.09g, respectively. The crude fibre content of TRY-3, Black Kavuni and Karunkuruvai were 0.99g, 1.70 g and 2.01g, respectively. Five trials were conducted for each variety. The consumer acceptability, recovery percentage and benefit cost ratio of the paddy varieties are presented in Table 4. The Consumer acceptability of TRY-3 was high than Black Kavuni and Karunkuruvai with values are 8.7, 8.1 and 7.8, respectively. The Recovery Percentage percentage of Black Kavuni was high than Karunkuruvai and TRY-3 with values are 58 per cent, 55.2 per cent and 53.5 per cent, respectively. The benefit cost ratio of Black Kavuni was high than TRY-3 and Karunkuruvai with values are 1.29, 1.16 and 1.05, respectively.

The glycemic index of paddy varieties is given in Table 5. The glycemic index of traditional rice black kavuni (53.10) is lesser than the other traditional rice karunkuruvai (55.50) which are in the low glycemic index food. On the other hand TRY 3 popularly consumed rice in Tamil Nadu has a glycemic index of 68.20 which is higher glycemic index than traditional varieties. Higher is the GI index for rice under study, higher the chance of developing Type II diabetics. The low GI indexed food is ideal for Type II diabetic patients. The Pre prandial

Table 1 : Mean value for sensory evaluation of rice flakes

Variety	Sensory characteristics				
	Colour and appearance	Flavor	Texture	Taste	Overall acceptability
TRY 3	9	9	9	9	9
Black kavuni	9	9	9	9	9
Karunkuruvai	8	8	8	8	8

Table 2 : Feeding trials of paddy flakes

Group	Product	Non-diabetic volunteers (Nos)	Test carbohydrate (g)
Group I	Standard glucose	5	50.0
Group II	TRY 3	5	71.2
Group III	Black Kavuni	5	79.6
Group IV	Karungkuruvai	5	79.3

Table 3 : Nutrient content of paddy varieties

Technology option	Variety	No. of trials	Carbohydrate (g/100 g)	Crude fibre (g/100 g)
T_1	TRY 3	5	70.23	0.99
T_2	Black Kavuni	5	62.89	1.70
T_3	Karungkuruvai	5	63.09	2.01

Table 4 : Consumer acceptability, recovery percentage and benefit cost ratio

Technology option	Variety	Consumer acceptability	Recovery percentage	BCR
T_1	TRY 3	8.7	53.5 %	1.16
T_2	Black Kavuni	8.1	58.0 %	1.29
T_3	Karungkuruvai	7.8	55.2 %	1.05

Table 5 : The glycemic index of paddy varieties

Technology option	Variety	Pre-Prandial glucose level	Post-Prandial glucose level	Glycemic index
T_1	TRY 3	83.50	128.21	68.20
T_2	Black Kavuni	65.47	114.10	53.10
T_3	Karungkuruvai	68.16	119.73	55.50

glucose level of T_2 and T_3 was 65.47 and 68.16, which was lower than T_1 (83.50), respectively. The Post prandial glucose level of T_2 and T_3 was 114.10 and 119.73, which was lower than T_1 (128.21), respectively. The traditional varieties contained higher dietary fibre which exerts a hypoglycemic effect. The glycemic response was low in black kavuni followed by karungkuruvai and TRY 3.

In clinical trials of diets with low glycemic indices, improved blood glucose control was seen when diet glycemic index was reduced by 12 to 40 per cent (Wolever *et al.*, 1994). Opperman *et al.* (2005) state that the low glycemic index diet reduced total cholesterol and improved the overall metabolic control of diabetes. Diabetic patients have been advised recently to increase their carbohydrate consumption in order to decrease fat intake and hopefully the risk of cardiovascular disease. Sartovelli and Cardoso (2006) stated that eating diet rich in whole grain cereals and low refined grains were beneficial in the prevention of diabetes.

Mitra and Bhattacharya (2006) found that rural diet is diabetogenic in nature, increase in protein content in the diet was easier to comply and more satiating. It caused reduction of abdominal fat in males. Alima *et al.* (2006) indicated that high calorie consumption is associated with the development of disorders in glucose metabolism leading to diabetes mellitus. By the opinion of Ward and Anderson (2007) intake of vitamin-E, a major lipid soluble dietary anti-oxidant reduces risk of type-II diabetes and hypertension and blood pressure which in turn reduced the risk of cardiovascular diseases. Rizkalla and Loromiguiere *et al.* (2007) studied that increased intake of fiber rich foods decrease the prevalence of diabetes mellitus among young adults.

Kalaiselvan and Chelvi (2018) reported that the glycemic index of a food is one of the components which determine the blood glucose level after it is injected in the human system. Initially the participants were screened by conducting glucose tolerance test by administering glucose powder available in the market dissolved in potable water containing 50 g of glucose. For the intervention one popularly eaten rice (BPT, 5204) and two traditional rice varieties *viz.*, Kichilisamba and Mapillisamba containing 50 g of carbohydrate were cooked with salt and provided to the healthy participant. The blood glucose level of the participants before administering test food and during 15^{th}, 30^{th}, 45^{th}, 60^{th}, 90^{th} and 120^{th} minutes were noted and taken for calculating the Glycemic index. In the present study the Glycemic index of traditional rice mapillai samba rice (48.60) is lesser than the other traditional rice Kichili sambas (52.40) which are in the medium Glycemic index food. On the other hand the Glycemic index of BPT 5204 popularly consumed rice in Tamil Nadu has a Glycemic index of 72.10 which is in the higher Glycemic index level.

Vijayakumar and Vijayalakshmi (2018) reported that the traditional rice cultivars were tested for glycemic index and associated attributes against IR 20 as check. Two traditional rice cultivars were identified and subjected to the assessment of GI. They are Red Kavuni rice cultivar and Kaattuvanam rice cultivar. The results shown that the traditional rice cultivars have recorded low GI as compared to that of IR 20. However, Kaattuvanam cultivar has turned out to have the lowest GI (51.82) followed by Red Kavuni (53.48) and IR 20 (71.64). The observed inverse relation between fiber content and GI has further confirmed that Kaattuvanam cultivar has higher fibre (3.1g) content with lower GI than Red Kavuni and IR 20.

Conclusion:

The Glycemic index had positive effect in humans for traditional varieties, which was lower than the TRY 3 Variety. The estimated glycemic index of traditional varieties was lower compared to TRY 3 Variety. The traditional varieties contained higher dietary fibre which exerts a hypoglycemic effect. The glycemic response was low in black kavuni followed by karungkuruvai and TRY 3 variety. The traditional varieties based flakes and their products had good source of nutritious and therapeutic value and involved low cost of production. According to these results, it could be suggested that traditional rice possibly possess beneficial effects for health since they tend to be digested slowly compared to the latest high yielding rice varieties.

Acknowledgement:

Dr. YG. Prasad, Director, ICAR-Agricultural Technology Application Research Institute (ATARI), Zone-X, CRIDA Campus, Santoshnagar, Hyderabad. Dr. M. Jawaharlal, Director of Extension Education, Tamil Nadu Agricultural University, Coimbatore.

Authors' affiliations:
M.R. Latha, ICAR-KVK, Vamban, Pudukkottai (T.N.) India

■ REFERENCES

Alima, Nayberg, F. and Chandranath, S.I. (2006). Effect of high caloric diet on the prevalence of diabetes mellitus in the one humped camel. *Annual Nutrition J. Academic Sci.*, **10**(8): 402-410.

Dubois, M., Gilles, K.A., Hamilton, J.K., Rebers, P.A. and Smith, F. (1956). Colorimetric method for determination of sugars and related substances. *Anal. Chem.*, **28** (3) : 350-356.

Foster-Powell, K., Holt, S. and Brand-Miller, J.C. (2002). International table of glycemic index and glycemic load values. *American J. Clinical Nutri.*, **76** (1) : 5-56.

Indian Standard (IS) 12711: 1989 (Reaffirmed 1994). Bakery products - Methods of Analysis (FAD 16: Food grains, Starches and Ready to Eat Foods). Bureau of Indian Standards Manak Bhavan, 9 Bahadur Shall Zafar Marg, New Delhi- 110002. First Reprint June 1998: UDC 664-66-0161-019:543.

Kalaiselvan, A. and Chelvi, R. (2018). Annual Report 2017-18. ICAR-KVK, Madurai, Tamil Nadu Agricultural University, Coimbatore. pg. 19-20.

Kowsalya, S. and Preethi, A. (2008). Blood glucose levels and antioxidant profile of type 2 diabetics supplemented with antioxidant food mix. *Indian J. Nutr. Dietet.*, **45** (6): 211-220.

Mitra, A. and Bhattacharya, D. (2006). Effect of fatty substances on health particularly to patients suffering from NIDDM and Dyslipidaemia. *J. Interacademicia*, **10**(1): 74-85.

Opperman, M., Venter, V.S. and Oostha vizen, W. (2005). Health benefits of low glycemic index diets. *South Africa J. Clinical Nutri.*, **18**(3) : 3846.

Premakumari, S., Kowsalya, S. Sailaavanya, S. and Majumdar, V.V. (2009). Sub-chronic toxicity of ekanayakam (*Salacia reticulata*) in albino rates. *Indian J. Nutr. Dietet.*, **46** : 1-13.

Rizkalla, S.W. and Loromiguiere, M. (2007). Effect of baking process on post prandial metabolic consequences. *European J. Clinical Nutri.*, **61**(2):175-183.

Sartovelli, D.S. and Cardoso, M.A. (2006). Association between dietary carbohydrates and type-II diabetes mellitus. *Arquise Bras de encocradino Method*, **50**(3): 415-426.

Thilagavathy, S. and Muthuselvi (2010). Development and evaluation of millets incorporated chappathi on glycemic response in type II diabetics. *Indian J. Nutr. Dietet.*, **47**: 42-50.

Vijayakumar, A. and Vijayalakshmi, R. (2018). Annual Report 2017-18. ICAR-KVK, Virudhunagar, Tamil Nadu Agricultural University, Coimbatore.

Vijayalakshi, P. and Radha, R. (2006). Effect of little millet supplementation on hypelipidaemia. *Indina J. Nutr. Dietet.*, **43**:469-474.

Ward, K. and Anderson, J.W. (2007). High carbohydrate, high fibre diets for insulin-treated man with diabetes mellitus. *American J. Clinical Nutri.*, **32** (11) : 312-321.

Watts, B.M., Ylimaki, G.L. Jeffery, L.E. and Elias, L.G. (1989). Basic sensory methods for food evaluation. Ottawa, Ontario, Canada: International Development Research Centre.

Wolever, T.M.S., Nguyan, P.M. Chiasson, J.L., Hunt, J.A., Josse, R.G., Palmason, J., Rodger, N.W., Ross, S.A., Ryon, E.A. and Tan, M.H. (1994). Determinants of diet glycemic index calculated retro, respectively from diet records of 342 individuals with non-insulin dependent diabetes mellitus. *Am. J. Clin. Nutr.*, **59** (6) : 1265–1269.