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Anuprialashmi KS
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Malarmathy M
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Priya P
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Loganathan K
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Mohamed Niyas M
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Shivashakthivel T
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Yuvaraj SC
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Yenugula Pravalika
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Theradimani M
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Kanimoli Mathivathana M
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Correspondence
Kanimoli Mathivathana M
College of Agricultural Technology, Gullapuram, Theni, Tamil Nadu, India

Studies on biochemical characterization of traditional rice varieties

Anuprialashmi KS, Malarmathy M, Priya P, Loganathan K, Mohamed Niyas M, Shivashakthivel T, Yuvaraj SC, Yenugula Pravalika, Theradimani M and Kanimoli Mathivathana M

Abstract
Rice is the stable food for most of the developing countries while majority of the people are suffering from minerals and vitamin deficiency. In order to reduce malnutrition, focus on the development of nutrient dense rice for value addition is required. The traditional coloured rice varieties are rich in dietary fibre, minerals, carotenoids, flavonoids and polyphenols. Whereas the consumption of pigmented rice varieties helps to improve human health. Hence an experiment is being analyse for phenolic and peroxidase activity. Nearly, thirteen traditional rice varieties like karupukavuni, kalanamak, seeraga samba, poongar, kuthiraivaal samba, kudavaazhai, ilupaipoo samba, navara, karudan samba, kattuyanam arisi, mappilai samba, karupu kavni and red rice were collected from Tamil Nadu. Among 13 varieties Kala namak rice showed highest phenolic content. Hence, kala namak pigmented rice variety had comparatively high phenol as well as less peroxidase activity and it warrants conservation to preserve its precious genome information.

Keywords: Traditional rice varieties, biochemical, phenolic and peroxidase activity

Introduction
Rice (*Oryza sativa* L.) is a vital agricultural produce and leading food crop of the world. Moreover it serves as a staple food for more than half of the world's population who relies on rice as the major daily source of calories and protein. It contributes about 21% of global dietary energy, 14% of protein and 2% of fat (Kennedy and Burlingame, 2003) [4]. Presently continuous consumption of polished white rice leads to the development of higher insulin resistance and dyslipidemia (low-high density lipoprotein) among the Asian population. Though the traditional varieties are known to be rich in dietary fibre, resistant starch, minerals, carotenoids, flavonoids, polyphenols and consumption of grains of these pigmented rice help in improving human health in attenuating the incidence of non-communicable diseases *viz*., cardiovascular diseases, diabetes, cancer and stroke (Vichapong *et al*, 2010, Hanhineva *et al*, 2010; Jae *et al*, 2010; Hudson *et al*, 2000; Rao *et al*, 2010) [10, 1, 3, 2, 6].
Traditional rice varieties shows a new perception with potent sources for various agronomic traits including medicinal properties, aroma as well as stress resistance. These traditional rice varieties were ignored and cultivated rarely due to introduction of high yielding, semi-dwarf rice varieties during first green revolution (Rekha *et al*, 2011) [7]. Hitherto is to bring back the traditional rice varieties for several advantages *viz*., sustainability towards adverse climatic conditions like flood, drought, therapeutic properties and nutritional value (Singn and Kalra 2002) [9]. The present study focus on the characterization of biochemical in traditional rice varieties were assessed by estimating peroxidase and total phenols.

Materials and Methods
Experimental material
The experimental materials of Traditional rice varieties comprising fourteen. These varieties were obtained from farmers of various places around Tamil Nadu *viz*., Kuthiraival samba, Karudan samba, Navara, Thooyamalli, Kalanamak, Poongar, Red rice, Mappillai samba, Thanga samba, Kudavazhai, Seeraga samba, Moongil arisi, Karupu kavuni and Kattuyanam. The present investigation of biochemical characterization from grains of each sample were ground to a fine powder using pestle and mortar and the analysis were carried out in Department of Plant Breeding and Genetics, College of Agricultural Technology, Theni, Tamil Nadu.

Determination of Peroxidase Activity

200 mg plant sample was taken and homogenized with 10 ml of Phosphate buffer 0.1 M (pH 6.0). It was centrifuged at 10,000 rpm at 4 C for 30 minutes. The supernatant collected and stored at low temperature. The supernatant was used for enzyme assay and estimated the enzyme activity as given below. Shake the mixture well and keep it at 37° C on water bath for 10 minutes for the formation of purpurogallin. Measure the activity at 430 nm and express result as enzyme unit per gram fresh weight or per gram protein basis.

Determination of total phenolic content

Total phenolic content was assayed by Folin–Ciocalteu colorimetric method with gallic acid as a standard (Shanmugam, 2010) [8]. Briefly, 200 µL of the appropriate dilutions of crude extracts was reacted with 1.8 mL of 10-fold diluted Folin–Ciocalteu reagent, (freshly prepared). The mixture was then neutralized with 1.8 mL of sodium carbonate (60 g/L). The absorbance was measured at 725 nm after 90 min of reaction at room temperature (RT). Results expressed as mg per 100 g of dry weight of the rice grain.

Results and Discussion

Determination of Peroxidase Activity

In this estimation the level of peroxidase production in Karudan samba, Poongar and Mappillai samba increased under salt stress, as presented in Table 1. In the present study, production of peroxidase was observed to be higher in the salt sensitive cultivars than in the salt tolerant. Peroxidase activity play an important role in plant adaptation to stress conditions (Misra and Gupta. 2006) [5]. The results revealed that the peroxidase activity were found to increase in rice varieties subjected to salinity stress, but increased levels of their activities did not contribute to the extent of enhanced salt resistance.

Determination of total phenolic content

Thirteen traditional rice varieties were investigate for total phenolic content. This estimation leads a way for pharmacological functions, since phenols are a group of natural antioxidants. Among the phenolic acids, ferulic and ρ-coumaric acids are abundant in grains with light brown pericarp, whereas red and black pericarp rice contain mainly the anthocyanins cyanidin-3-O-β-d-glucoside and peonidin-3-O-β-d-glucoside (Zhou *et al*, 2004; Yawadio. 2007) [12, 11]. Higher total phenolic was observed for Kala namak 44 mg/100g, Karupu Kavni 43 mg/100g, Mapillai samba 39.56 mg/100g, and the lowest was with Poongar variety 13 mg/100g (Table 1). Between the rice varieties tested the pigmented varieties showed statistically significant values for total phenolic content compared to that of non-pigmented varieties like Seeragasambha, Thuyamalli and Thanga samba. Similar report was given by for Kala namak rice showed highest phenolic content. Reported that among pigmented rice from Sabah, Malaysia, red rice variety contained the highest quantity of phenolic acids than the black rice, brown rice and the white rice variety.

Table 1: Determination of phenolic and peroxidase activity in TRV

S. No.	Traditional Rice Varieties	Estimation of Phenolic (mg/g)	Estimation of Peroxidase activity
1.	Seeraga samba	14.00	0.04
2.	Thooyamalli	20.00	0.08
3.	Red rice	15.00	0.25
4.	Kattuyanam	15.00	0.19
5.	Navara	22.00	0.16
6.	Karudan samba	25.00	1.46
7.	Kudavazhai	15.00	0.23
8.	Thanga samba	18.00	0.16
9.	Kala namak	44.00	0.18
10.	Poongar	13.00	1.39
11.	Mappillai samba	39.00	1.51
12.	Kuthiraival samba	17.00	0.31
13.	Karupu kavuni	43.00	0.30
	Mean	22.69	0.48

Conclusion

The phenolic and peroxidase activity in traditional rice seeds is an important biochemical trait, affecting both yield and nutritional quality. Thus, an understanding of the Results obtained in this study are expected to be useful for preparation of novel rice based food products, based on the individual requirements among population. Regarding the significance of consumer preference of such traditional rice varieties could aid in the conservation and propagation using conventional and unconventional breeding programmes. Since India being the diabetic as well as stress in rice crop begins a hub, the outcome of the present study will serve good to the human society.

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