



## SHORT COMMUNICATION

### ANTHOCYANIN AND ITS CO-RELATION WITH GRAIN LIPID IN RED GRAIN DEEP WATER RICE AND SCENTED RICE LAND RACES OF ASSAM

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**Red colouration of rice kernel has been found to be due to anthocyanin pigments in varied concentration in diverse groups of paddy viz. deep water rice (Bao dhan ) and scented rice (Joha). Study has revealed that anthocyanin content has a strong positive co-relation ( $r = + 0.918$   $p > r_{0.01}$ ) with lipid content. No such co-relation was found with the crude protein and total carbohydrate. However, even normal white kernels of both deep water rice and scented rice contain small but measurable amount of anthocyanin.**

**Key words:** Anthocyanin, deep water rice, lipid, nutritive value, red rice, scented rice.

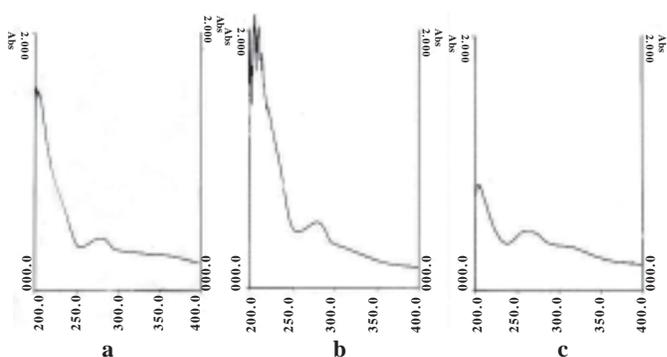
Till recently anthocyanins were of limited academic interest as they have no major physiological function except imparting colourations like purple, reddish purple etc. to flower, fruit, leaf and stem. However, interest on them revived and intensified following discovery of their possible role as dietary antioxidant in scavenging free radicals (Tiwari 2001). They can considerably reduce the emergence of cardiovascular diseases (Wang 2005); can reduce age associated oxidative stress and have cancer chemo-preventive property (Bagchi *et. al* 2004). In Assam about 0.48 million hactre land are under deep water paddy cultivation (Sarma and Borgohain 1998), mostly in the Upper and Middle Assam districts of Brahmaputra valley. Red kernel is fairly common among the land races of deep water paddy although it is occasionally found in paddy of other categories. Not much information is available about the pigments found in red rice. We report here probably for the first time that the red colouration of some deep water paddy as well as low land scented rice land races is due to anthocyanin pigment in different concentration.

Seven indigenous land races of deep water paddy with red kernel (locally known as Bao dhan), viz. Negheri, Jool, Bamkokua, Do-kokua, Kolioi, Gotha and Bawla were taken for the study. Two other land races, viz. Ronga and Adolia were taken for comparison since they had white kernel and considered to be pigmentless. Peel of the Apple variety "Red Delicious" with scarlet red peel was also taken for comparison since it is known to contain anthocyanin (Salisbury and Ross 1986). One indigenous scented rice land race Naga Joha (Joha is the common term to mean scented rice) was also taken for the study since it had red kernel. Against this two other scented rice land races, viz. Kola and Hung, with white kernel were taken for comparison. The paddy grains were manually dehusked and 200 mg finely grounded samples were extracted with 80% methanol containing 0.3% HCl. It was homogenized and centrifuged to obtain the supernatant. The residue was washed twice with the extraction medium and the supernatants were pooled. Absorbance pattern was initially observed in both UV and VIS range in a Hitachi

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U 3201 spectrophotometer. Sharp peak was observed at 280 nm in UV range although flat peak was also observed covering the wavelength range 550 – 570 nm. Among the major nutritional components of the grain, analysis were carried out for crude protein, total carbohydrate and lipid, which contribute to the calorific value to explore possible co-relation with anthocyanin. Crude protein was estimated by working out the total nitrogen in the sample by microkjeldahl method. Total carbohydrate was estimated by anthrone method (Clegg 1956). Lipid content was estimated by solvent extraction in soxhlet apparatus. Calorific values were computed as per the formula of Sherman (Sherman 1952).

It has been found that all the land races with red kernel contain varied amount of anthocyanin and their UV absorption spectra were similar to that of the peel of apple variety “Red Delicious” (Fig.1). The intensity of redness was proportionate to the concentration of anthocyanin. The scented paddy land race Naga Joha



**Fig. 1.** UV spectra for anthocyanin extract from (a) Apple "Red Delicious" (b) Negheri Bao (red kernel) (c) Ranga Bao (white kernel)

has kernel with deep reddish colour and its anthocyanin content was found to be among the highest with an absorbance value of 0.798. Similar is the case for Gotha, among the deep water paddy land races (Table 1). The notable aspect of the present study was that all the land races with red kernel irrespective of deep water or

**Table 1.** Anthocyanin content in deep water and scented paddy land races of Assam and its co-efficient of co-relation with major nutritional components, viz. crude protein, carbohydrate and lipid (values are % dry weight)

Paddy land races	Category	Kernel colour	Anthocyanin (Abs. $\lambda_{280}$ )	Crude protein	Carbohydrate	Lipid	Calorific value
Negheri	Deep water	Red	0.770	12.08	71.37	3.80	368.00
Jool	„	„	0.627	9.63	69.68	3.13	345.41
Bam-Kokua	„	„	0.609	12.35	76.03	3.47	384.75
Do-Kokua	„	„	0.581	13.22	74.58	3.37	381.53
Kolioi	„	„	0.774	10.73	74.06	3.30	368.86
Gotha	„	„	0.849	11.12	82.68	3.23	404.27
Bawla	„	„	0.730	10.37	81.56	3.03	394.99
Ranga	„	White	0.246	11.51	83.17	2.33	399.69
Adolia	„	White	0.264	9.63	77.64	2.40	370.68
Naga	Scented	Red	0.798	7.39	70.50	3.73	345.13
Kola	„	White	0.255	8.35	72.62	2.06	342.42
Hung	„	„	0.248	7.63	72.31	2.16	339.20
			r =	0.283	(-) 0.056	0.918	0.256
				NS	NS	P>r0.01	NS

scented types had high level of lipid in the range of 3.03 to 3.80%. On the other hand the land races with white kernel had comparatively lower level of lipid, in the range of 2.06 to 2.40%. Thus, a positive co-relation exist between redness of kernel (anthocyanin content) and lipid content ( $r = 0.918$ ,  $p > r 0.01$ ). No such co-relation was found to be associated with total carbohydrate and crude protein, which together with lipid contribute to the calorific value. Land races with white kernel for both deep water paddy and scented fine grained paddy were used as check with the assumption that they are devoid of anthocyanin or any other pigment. Contrary to that all the four white kernel land races were found to contain low but detectable amount of anthocyanin. This suggests that other common cultivars of paddy with white kernel may also contain very low but spectroscopically detectable amount of anthocyanin.

Anthocyanins belong to the flavonoid group. Although more than 2000 compounds of this group are on record yet only few functions were attributed to them like facilitating pollination and fruit dispersal by attracting insect and small animals (Harborne 1976). Anthocyanins do not contribute to nutritive value since they do not yield calorie unlike crude protein, carbohydrate and lipid. However, recent findings show that they have anti-oxidant property and can function as free radical scavengers (Tiwari 2001). Wang (2005) working with anthocyanin from *Malva sylvestris* observed that clearance rate of free radicals was up to 43.46%. Likewise, there were significant reduction in cholesterol and triglyceride level implying that anthocyanins can reduce the emergence of cardiovascular disease. Bagchi *et. al* (2004) working with anthocyanins from six edible berry confirmed that it is effective in reducing age associated oxidative stress; as cancer chemo preventive as well as improve neuronal and cognitive brain function. Thus the implication of the present finding is that red rices may have nutraceutical value. This aspect of paddy deserves further investigation.

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