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Short Communication

Evaluation of indigenous land races of deep-water paddy of North East India for nutraceutical value

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Deep water paddy is a nature's marvel for many ethnic communities living in flood prone river basins of some Asian and African countries. In recent times there is resurgence in interest on local land races in view of alarming depletion of agro-biodiversity and the urgency to preserve them. In Assam, the north eastern state of India, deep water paddy is being cultivated since time immemorial by several ethnic communities living in the Brahmaputra river basin. Although not properly enumerated, it is known that more than 70 land races of *Bao Dhan*exists. Moreover, recent works have revealed that contrary to general perception deep water paddy are rich in nutritional and nutraceutical values with 9% to 13% protein. Further interest on deep water paddy got a boost with the report that land races with red kernel (red rice) are rich in dietary antioxidant anthocyanin and study showed that they have impressive anti-oxidative activity in vitro. Deep water paddy or floating paddy popularly referred to as Bao dhan in Assam, represent a unique crop capable of withstanding diverse stress and man's ingenuity to co-exist with hostile nature and weather condition. Owing to their antioxidant capacity and the associated health benefits, anthocyanins have gained increased attention in recent years, hence the study was initiated.

The study material for the present study comprised of five indigenous deep water land races of paddy from ethnic sources of flood riverine areas of Assam and sixth one were collected from Manipur. The paddy grains were collected from progressive farmers who are maintaining the germplasm as per traditional practices. All the varieties had red kernel with Surabhi being the darkest red of all. One land race Chakhao was collected from Imphal Valley, Manipur. The paddy grains were manually dehusked and the grains with respective dehusked.The dehusked grains were finely grounded in morter and pestle and then oven dried at 55°C ± 1°C till constant weight was recorded. The samples were preserved in refrigerator till use. Analysis for nutraceutical value was carried out on dry weight basis and with respect to phenolics and anthocyanin: Total phenolics were extracted and quantified as per the method of Chang *et al.,* (2001).The values of phenolics were expressed as mg/g dry matter against Gallic acid equivalent (GAE)and catechol equivalents (CE). Analytical procedures Anthocyanin estimation was carried out as per the protocol of Gusti (1999).

Total phenolics were quantified using gallic acid stanrdard and catechol standard separately for comparision. There were practically no or negligible difference between both. Total phenolics did not exhibit much variation. Lowest phenolics content (0.097 mg g^{-1}) was observed in Buruli (Table 1). On the other hand, highest phenolics were recoded in Surabhi (0.116 mg g^{-1}) (Fig. 1)**.**

Table 1: Total phenolics and anthocyanin for the six land races of paddy

CULTIVAR	GAE (mg g^{-1})of dry wt.	CE(mg g^{-1}) of dry wt.	Total anthocyanin (mg g^{-1}) of dry wt.
DAL	0.111 ± 0.003	0.110 ± 0.003	1.77 ± 0.029
CHAKHAO	0.108 ± 0.0	0.107 ±0.005	1.37 ± 0.019
KAHI JOOL	0.112 ± .004	0.111 ± 0.0	1.39 ± 0.022
KAKUA	0.113 ± .004	0.112 ± 0.0	2.47 ± 0.030
SURABHI	0.116 ±0.002	0.115± 0.002	2.05 ± 0.021
BURULI	0.097 ± 0.003	0.096± 0.003	2.01 ± 0.023
CD (p- 0.05)	0.0416	0.037	0.110

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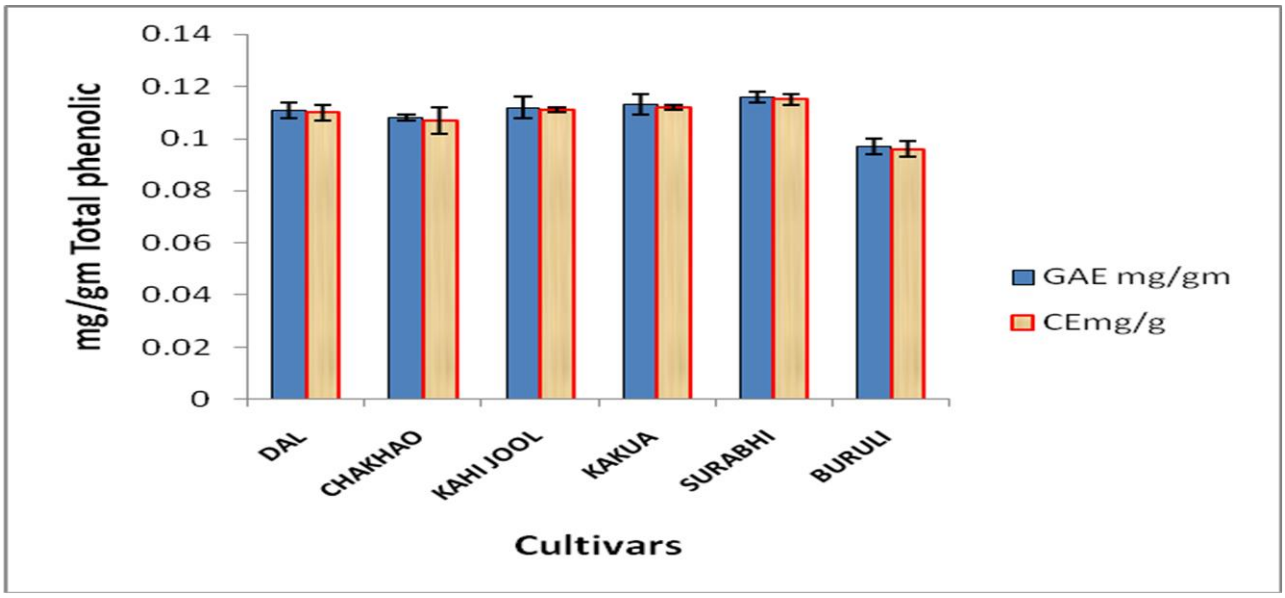

Figure 1: Total phenolics content for the six land races of paddy

In terms of actual quantity the highest anthocyanin was recorded in Surabhi (2.47 mg g^{-1}) followed by Kakua (2.05 mg g^{-1})(Fig. 2). Lowest amount of anthocyanin was recorded in Chakhao (1.37mg g^{-1}). There was a positive relationship between anthocyanin content and total phenolics (r = 0.716). Phenolics came to the attention of researcher with the discovery that they can scavange reactive oxygen species (ROS) and other reactive species when enzymatic or nonenzymatic endogenous antioxidants are inadequate to remove ROS from the body (Callcott, *et al.* 2018).

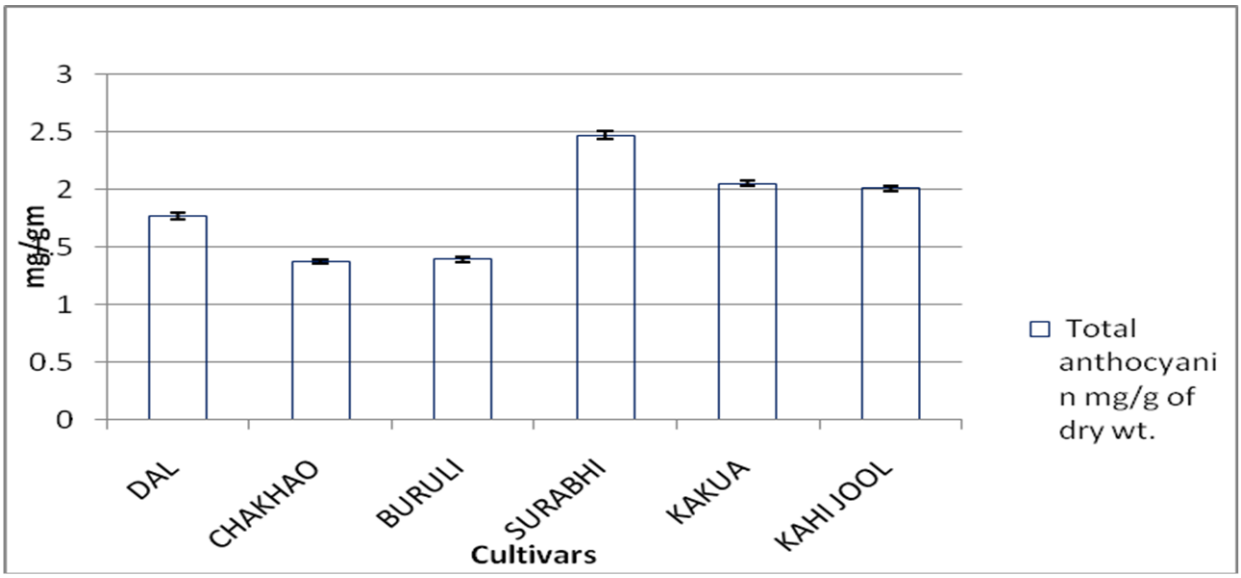

Figure 2: Total anthocyanin content for the six land races of paddy

Thitipramode *et al.*(2016) working with brown red rice of Thailand recorded total polyphenol compound in the range from 1.018 to 0.069 mg GAE g^{-1}. Previous studies suggested that pigmented rice contains higher TPC than that of non pigmented rice (Chen *et al.,* 2012). Deep water paddy with red kernel and anthocyanin came into prominence when it was reported that red rice are nutritionally very rich (Loying *et al.* 2010) as well as contain high amount of anthocyanin. Presence of anthocyanin make red rice nutraceuticaly rich too since it was established that anthocyanin is a strong anti oxidant (Tiway 2001) and anthocyanin of red rice

are efficient and two fold stronger than that of antioxidant activities of blueberries . The antioxidant activity of anthocyanin is attributed to their peculiar chemical structure as they have strong affinity to ROS because of their electron deficiency.

Based on results it may be concluded that Bao dhan (Deep water paddy) appears very promising in terms of nutraceutical values. In view of the growing interest in trade circles coupled with its promising nutritive values further study on deep water paddy needs resurgence.

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