TOTAL MONOMERIC ANTHOCYANIN COMPOSITION OF SOME UNDEREXPLOITED FRUITS USED BY *KANI* TRIBAL COMMUNITY OF AGASTHYAMALAI BIOSPHERE RESERVE.

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Absrtact : Total monomeric anthocyanin (CGE) composition of 10 underutilized fruits used by *Kani*s, an ethnic community of Agasthyamalai Biosphere Reserve was quantified using pH-differential method. The values obtained were ranged from 23.32 mg/L for *A. lindleyana* to 304.26 mg/L for *R. glomeratus*. 5 of the 10 fruits studied showed level of above 150 mg/L. The result proves that, these fruits are rich in anthocyanin, which is even comparable to the commercially cultivated counterparts known to be good sources of this pigment.

Keywords : Agasthyamalai Biosphere Reserve, Anthocyanin, *Kani*s, Wild fruits.

INTRODUCTION

Anthocyanins, belonging to major flavonoid classes are the natural water soluble pigments which are responsible for the blue, purple, violet, and red colours of fruits, (Wu and Prior, 2005; Seeram *et al*., 2001a, b; Mazza and Miniati, 1993; Gross J, 1987). Cyanidin is the most common anthocyanidin, and the 3 glucoside is the most active antioxidant anthocyanin (Wang et al., 1997). The major known sources of anthocyanins in edible plants are families Vitaceae (grape) and Rosaceae (cherry, plum, raspberry, strawberry, blackberry, etc) (Lohachoompol *et al*., 2004). There is intense interest in the anthocyanin content of foods and nutraceuticals as the study reports on its health benefits such as the reduction of coronary heart disease (Bridle and Timberlake, 1996), improved visual acuity (Timberlake and Henry, 1988), antioxidant activities (Wang *et al*., 1997; Takamura and Yamagami, 1994) and anticancer activities (Kamei *et al*., 1995; Karaivanova *et al*., 1990) has been frequently coming out and it creates a need for an inexpensive, but effective method to quantify the total anthocyanin content of a sample, while allowing results to be compared among laboratories (Lee, Durst, & Wrolstad, 2005).

Indian forests are vast storehouses of natural resources which make the country 12th mega diversity hot spot in the world. They provide a large number of Non Timber forest products, of which edible plant species; especially fruits occupy a significant part. Mostly, wild edible fruits are smaller in size, but richly coloured with pigments such as anthocyanin which contribute greatly to blue, red and purple colour of fruits. A majority of them are still remained under exploited as they are utilized only by various tribal communities who live across the hilly, tropical forest regions in the country. Scattered all over the country, ethnic communities constitute around 8.8 per cent of the total population and with a few exceptions; and mostly are forest dwellers (Jyotikumari, 2003).

*Kani*s is one of such forest dwelling, and nomadic communities by tradition. They now lead a primarily settled life in the forests of the Agastyamalai Biosphere Reserve of the Western Ghats, in the Thiruvananthapuram, Kanyakumari, Thirunelveli districts in the southern most Peninsula of India (Reddy, 2006; Mashelkar, 2001). Their population size is 16,181,1 which is approximately 1.8 per cent of the total population of the district, Thiruvananthapuram (D.C.O, Kerala, 1991). *Kani*s are the traditional collectors of non-timber forest products (Mashelkar, 2001). Living close to nature, they have acquired unique knowledge on the use of the resources, particularly the raw food products around them.

It is observed that, these wild edible fruits are valued as supplementary diet and also help to overcome the deficiency of nutritional components in the ethnic communities. Although, tribal men collect these fruits in excess of their requirements, huge quantities are often wasted uncollected (Nazarudeen, 2010). The economical and nutraceutical benefits they provide do not get sufficient compensation that they deserve. This is because of the fact that, its potential as a subsidiary food source is practically unknown to the common village and urban communities. Eventhough, there are some information available on their edibility and data on the nutritional composition to a limited extend (Gopalan *et al*, 1996; Asolkar, 1992), studies on the Anthocyanin, the pigment with enormous neutraceutical potential is negligible in

number (Suganyadevi *et al*., 2011; Sahu *et al*. 2010). Keeping this factor in mind, the present study analyses the anthocyanin composition of 10 richly coloured wild edible fruits widely consumed in the *Kani* settlements of Agasthyamala biosphere Reserve. A general account of the selected fruit plants is presented in Table 1.

MATERIAL AND METHOD

Plant Materials

The fruits of the following 10 plants, *Alangium salviifolium* subsp. *Salviifolium*, *Antidesma ghaesembilla* Gaertn., *Aporusa lindleyana* (Wight) Baillon, *Bridelia retusa* (L.) Spreng., *Carissa congesta* Wight, *Flacourtia montana* J. Graham, *Physalis angulata* L., *Rubus glomeratus* Blume, *Schleichera oleosa* (Lour.) Oken and *Syzygium caryophyllatum* (L.) Alston were collected from various regions in the Agashthyamalai biosphere reserve during the years 2009-2011. Freshly collected and well ripe fruits were washed thoroughly to remove any attached dirt and were blotted dry.

Estimation of Total monomeric anthocyanin

The pH differential method was carried out to estimate the total monomeric anthocyanin. This is applicable to the determination of monomeric anthocyanins in fruit juices within the range of 20–3000 mg/L as cyanidin-3-glucoside equivalents (CGE). Here, 2 dilutions of fruits extracts are prepared with 2 buffer solutions, pH 1.0 (potassium chloride) and pH 4.5 (sodium acetate) as it is based on the principle that, the anthocyanin pigments reversibly change colour with a change in pH; the colored oxonium form exists at pH 1.0, and the colorless hemiketal form predominates at pH 4.5. The test portion is prepared from 2 gm of fruit tissue in distilled water. The appropriate dilution factor is determined by diluting the test portion with pH 1.0 buffer, until absorbance at 520 nm is within the linear range of the spectrophotometer. The absorbency of test portion diluted with pH 1.0 and pH 4.5 buffers, at both 520 and 700 nm is measured. The diluted test portions are read against a blank of distilled water. The anthocyanin pigment concentration, expressed as CGE is calculated following the formula proposed by Lee *et al*., 2005.

RESULT AND DISCUSSION

The results of the study show that there are significant differences among the anthocyanin content in all the 10 fruits selected. pH-differential method, the protocol followed is the principal spectrophotometric method, which has been widely used, especially in industry, because it is rapid, easily performable and accurate. The summarized result presented in the table 2 reveals that, 6 of the ten fruits studied have high Monomeric anthocyanin (CGE) content. The aqueous test portions of *Rubus glomeratus* Blume, *Alangium salviifolium* subsp. *salviifolium*, *Antidesma ghaesembilla* Gaertn., *Syzygium caryophyllatum* (L.) Alston, *Bridelia retusa* (L.) Spreng. and *Flacourtia montana* J. Graham were red-purple in colour, and showed high amount of anthocyanin as well. Least values were recorded in slightly coloured extracts of *Schleichera oleosa* (Lour.) Oken, *Aporusa lindleyana* (Wight) Baillon and *Physalis angulata* L. The values obtained are ranged from 23.32 mg/L for *A. lindleyana* to 304.26 mg/L for *R. glomeratus*. These values reveal that most of the wild fruits in this study contain rich concentration of anthocyanin which is comparable to some commercially cultivated counterparts known to be good sources of this pigment. For instance, anthocyanin content showed by *R. glomeratus*, *S. caryophyllatum*, *A. ghaesembilla* and *F. montana* (304.26, 235.77, 202.87 and 188.40 mg/L respectively) are at par with fruits like grapes (201.6 mg/ L), Strawberry (63.6 mg/ L) Raspberry (336.7 mg/ L) (Lee *et al*., 2005), plum (82.2 mg/ L) , sweet cherry (177mg/L) and black berries (353 mg/L) (Wu *et al.*, 2006). A similar work (Karuppasamy *et al*., 2011) carried out in southern Western Ghats also shows that the wild fruits in this region are rich sources of anthocyanin. In fact, its quantity in prominent fruits of Indian diet such as bananas, mangoes, oranges, apples, lemons and pine apple, is either absent or negligible. In this scenario, adding these richly coloured indigenous fruits in the diet could make it healthier.

The present work emphasizes the importance of wild fruit species used by the south Indian tribe, *Kanis* as good source of anthocyanin. Since it play important roles in the food industry and human nutrition, accurate quantification of this pigment is critical. Detailed information on the health promoting components of these lesser known fruits species could lead to a better understanding of beneficial effects and an increased consumption of these fruits, including their utilization in functional foods, as ingredients in nutraceuticals, medicine and pharmaceuticals. Further studies on antioxidant properties and anti nutrient effect of these wild edible fruits would be helpful in selecting nutritious fruits from ethnic resources of the *Kani* tribe of Agasthyamalai Biosphere reserve.

Table 1. **General account of wild edible fruits selected**

Species	**Local name**	**Habit**	**Fruit type**	**Fruit habit**	**Fruiting season**
Alangium salviifolium subsp. *salviifolium*	Thavitta, Ankolam	Small	Drupe	Cluster	May-June

(Alangiaceae)		tree			
Antidesma ghaesembilla Gaertn. (Euphorbiaceae)	Thaali	Shrub	Drupe	Solitary	June-July
Aporusa lindleyana (Wight) Baillon (Euphorbiaceae)	Ponvitty, vitty	Tree	Capsule	Cluster	Mar-June
Bridelia retusa (L.) Spreng. (Euphorbiaceae)	Mulluvenga, mulkkaini	Tree	Drupe	Cluster	Throughout
Carissa congesta Wight (Apocynaceae)	Mulli, Karimulli	Shrub	Berry	Cluster	Throughout
Flacourtia montana J. Graham (Flacourtiaceae)	Kanchi, Thalira	Tree	Drupe	Solitary	May-June
Physalis angulata L. (Solanaceae)	Kuttatakkali,	Herb	Berry	Solitary	Throughout
Rubus glomeratus Blume (Rosaceae)	Nodinjotta	Shrub	Berry	Cluster	Sept – Nov
Schleichera oleosa (Lour.) Oken (Sapindaceae)	Kattumunthiri	Tree	Berry	Cluster	Aug- Sept
Syzygium caryophyllatum (L.) Alston (Myrtaceae)	Poovanam, Poovathu Karinjara, Cherunjara	Tree	Drupe	Cluster	Throughout

Table 2: **Total Monomeric anthocyanin composition of the wild edible fruit selected**

Species	**Anthocyanin (CGE mg/ L)**
Alangium salviifolium subsp. *salviifolium*	157.37 ± 1.04
Antidesma ghaesembilla Gaertn.	202.87 ± 1.50
Aporusa lindleyana (Wight) Baillon	23.32 ± 0.49
Bridelia retusa (L.) Spreng.	59.16 ± 1.30
Carissa congesta Wight	36.32 ± 0.59
Flacourtia montana J. Graham	188.40 ± 0.82
Physalis angulata L.	27.63 ± 0.52
Rubus glomeratus Blume	304.26 ± 1.54
Schleichera oleosa (Lour.) Oken	31.41 ± 1.11
Syzygium caryophyllatum (L.) Alston	235.51 ± 1.70
(Results are mean ± SD; n=6)	

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