Indian J. Plant Genet. Resour. 30(2): 165-167 (2017)
DOI 10.5958/0976-1926.2017.00024.9

SHORT COMMUNICATION

'Te.pattang' [*Haematocarpus validus* (Miers) Bakh. f. ex Forman] – The Lesser-Known Promising Fruit of Garo Hills, Meghalaya

KC Momin[1], AN Sangma[1], CP Suresh[1], YS Singh[1], A Ojha[2] and SR Rao[2]*
[1]*Department of Horticulture, North Eastern Hill University, Tura Campus, Chandmari-794002, Meghalaya, India*
[2]*Department of Biotechnology Bioinformatics, North Eastern Hill University, Shillong Campus, Shillong-793022, Meghalaya, India*

(Received: 26 October 2015; Revised: 10 February 2016; Accepted: 22 July 2016)

Haematocarpus validus, commonly known as blood fruit, is a promising fruit of the Menispermaceae family and is found in the hilly tracts of Garo hills region of Meghalaya. The fruits are highly valued by the locals as a medicine and ripe fruits consumed fresh. It is a dioecious evergreen perennial woody climber which is found growing wild in West, East and North Garo hills. It is one of the rare plants and its germplasm needs to be collected and conserved for its potential horticultural value. The present paper deals with the phenological and genomic information on blood fruit.

Key Words: Antioxidant, Fruit diversity, Genetic Information, Morphology, Resource Utilization

Meghalaya is popularly known as the cradle of plant species amongst the botanists. It is home to several plants and diverse animal groups. This is an important part of the Indo-Myanmar global biodiversity hot-spot (one of the 34 global biodiversity hot-spots of the world). The Garo Hills region of Meghalaya has a rich diversity of underutilized plant species. Many of these species have a great horticultural value. Amongst various species of wild plants available here, blood fruit [*Haematocarpus validus* (Miers) Bakh. f. ex Forman], locally known as '*Te.pattang*' is a promising, anti-oxidant rich and medicinally important fruit. In the Garo Hills region, it is a rare plant species and natural populations are disappearing at an alarming rate. This is due to illegal exploitation, deforestation, soil degradation and loss of biodiversity. It therefore needs special attention from the conservation point of view. It is naturally found growing in the dry land in the hilly regions in India, Bangladesh, Sri Lanka, Indonesia and Thailand (Khatun *et al*., 2014). The fruit is rich in iron and it is highly valued by the local people for treating anaemia and other blood related disorders. The plant takes around seven years to mature and flower if grown from seeds and around four years when it is vegetatively propagated from cuttings. This species has a well established local market and a bunch of fruits costs around Rs.100 per bunch (10-15 fruits in a bunch). The moisture content of the fruit is 90.12% of fresh weight. It has a pH of 2.77, TSS of 21% and the total sugar content of the fruit of 11.07 % (Rahim *et al*., 2015).

Blood fruit is native to South East Asia and is mainly distributed in India (Khatun *et al.*, 2014; Kar *et al*., 2013), Bangladesh (Rahim *et al*., 2015; Khatun *et al*., 2014), Indonesia (Khatun *et al.*, 2014), Singapore (Khatun *et al*., 2014) and Sri Lanka (Singh *et al*., 2014). In India, the species is found growing wild in Andaman & Nicobar Islands (Singh *et al.*, 2014; Khatun *et al.*, 2014), Assam (Khatun *et al.*, 2014), Mizoram (Kar *et al.*, 2013) and Meghalaya (Jeeva, 2009; Khatun *et al.*, 2014). The plant is found growing wild in the hilly tracts of West, North and East Garo Hills region of Meghalaya, where it grows under harsh conditions. The climate of the East Garo Hills district is hot and humid during the summer followed by cool and dry weather during the winter. The West Garo Hills district experiences a fairly high temperature for most part of the year with an average rainfall of 330 cms. The district has mostly dense tropical mixed forest and a small patch of temperate forest in the higher parts of Tura range. The climatic condition of North Garo Hills is sub-tropical with adequate rainfall. In all the three districts the temperature ranges from 5°-36°C. Despite its multifaceted importance, the population is declining in its natural stands. Neither *in-*

**Author for Correspondence: Email- sureshcp2112@gmail.com*

vivo (sanctuaries, national parks, gene banks, etc.) nor *in vitro* (plant tissue cultures, cryopreservation, etc.) efforts have been made for its conservation and recovery. Not a single report is available dealing with either of these aspects for *Haematocarpus validus*. Attempts were made to identify few plants in three different districts of Garo hills where it was commonly found; the growing areas have been presented in Table 1.

Haematocarpus validus is a large woody climber which spread on tall trees. Leaves are simple, alternate, non-peltate, elliptic and 3 veined. The bark is light grayish brown and rough. The branches are stout and the wood consists of consecutive layers of thin radiating plates. The inflorescences are cauliflorous, axillary, extra-axillary, terminal panicle or racemes. It is dioecious. The male flowers have 12-15 sepals, imbricate in 3 series, usually inner series is larger. Of the 6 petals, 3 of the inner series are auriculate at the base. The 6 stamens are free, with the enlarged connectives projecting inwards. Calyx and the corolla of the female flowers are similar to the male flowers. There are 6 minute staminodes, and 6 carpels with reflexed styles. Fruits are drupes, ellipsoid, narrow near the base (Fig. 1). There is a style scar near the base and a smooth exocarp. Seeds are curved, non-endospermic, with a short radicle, and thick and long cotyledons. Seeds may be dispersed by barochory (gravitational dispersal), zoochory (dispersal by birds or animals), anthropochory (dispersal by humans).

Under Garo hills condition, the vine comes into flowering from October to December and fruits are available in the local markets from last week of March till June. Fruits are dark red, full of copious blood red juice when ripe and have a densely fibrous mesocarp. Preliminary investigations revealed that the average fruit weight is around 21.14g, fruit length 3.67cm, fruit girth 22.24mm, having a TSS of 12.7 %. Fruits are single seeded, weighing 5.52g, having a seed length 2.61cm, seed girth of 12.35mm, rind thickness of 2.83mm and rind weight of 8.17g.

Even though *Haematocarpus validus* is a less-known promising edible fruit, yet it has a lot of potential uses. Fruits of *H. validus* are slightly acidic, sweet when fully ripe and are eaten raw. The fruits have high anthocyanin content which gives true blood red colour which can be used as a colouring agent and as a natural dye for food products (Singh *et al*., 2014). Fruit extracts can also be used in colouring soft drinks and desserts (Rahim *et al*., 2015). Moreover, use of natural dye from this fruit will be very much helpful in avoiding health risk in human. The local people of Garo hills also use this fruit for preparing wines.

Ripe fruits are a good source of iron, anti-oxidants and Vitamin C and are used by the locals for treatment of anaemia and other blood disorders. Fruits have a vitamin C content of 13.15 mg/100gm, carotenoids 1170 µg and β-carotene 9.0 µg. Ripe fruits are sliced and soaked in a glass of water overnight and taken as medicine the next morning.

Sequence information of important nucleic acid organellar genes play an essential role in the evolution and phlyogentic status of any organism. However, there are only few reports available for the genetic characterization of *Haematocarpus vaildus.* The 1048 bp, 26S ribosomal RNA gene (partial sequence) has been reported by Hoot *et al.* (2015). Similarly the conserved maturase K (*mat*K) with the nucleotide sequence of 1617 bp has also been sequenced by Wefferling *et al.*

Table 1. Identification of growing areas in Garo hills, Meghalaya

District	Collection locality	Latitude	Longitude	Altitude
East Garo Hills, Meghalaya	Kusimkolgre-B	N23°30'58.0''	E090°35'58.0''	281 m
	Kusimkolgre-B	N25°31'00.1''	E090°36'00.0''	278 m
	Kusimkolgre-B	N25°30'54.6''	E090°35'48.3''	259 m
	Kusimkolgre-A	N25°30'57.2''	E090°35'56.8''	258 m
North Garo Hills, Meghalaya	Resu Bakrapara	N25°54'751''	E090°36'091''	158 m
	Resu Bakrapara	N25°54'816''	E090°35'978''	162 m
	Resu Bakrapara	N25°54'912''	E090°35'827''	191 m
	Resu Songma	N25°54'458''	E090°36'456''	083 m
West Garo Hills, Meghalaya	Balsrigittim	N25°31'601''	E090°13'623''	297 m
	Allotgre	N25°31'807''	E090°12'532''	435 m
	Chitoktak	N25°31'501''	E090°13'797''	339 m
	Stadium	N25°32'124''	E090°12'469''	433 m

a. Fruit bearing plants **b. Ripe fruits**

c. Female flowers **d. Longitudinal section of fruit**

Fig.1. *Haematocarpus validus*

(2013). The NADH dehydrogenase subunit F (*ndh*F) chloroplast gene of 2022 bp nucleotides has also been sequenced and was reported by Wang *et al.* (2012). Similarly ATPase beta subunit (*atp*B) a conserved region of chloroplast of *Haematocarpus vaildus* has been sequenced for 1407 bp long nucleotide and was reported by Wang *et al.* (2012). tRNA-Leu (*trn*L) and *rbc*L gene of *Haematocarpus vaildus* have been also sequenced and published by Wang *et al.* (2012). Such critically important genomic information will enable us to assess the quantum and range of genetic variability within the species and help to select the appropriate genotypes for conservation purpose.

With the growing concern and commitment to hill area development and poverty alleviation, there has been an increasing interest in untapped and underutilized wild bio-resources that contribute to the household food and livelihood security. The value and importance of the wild edible plants and fruits of *Haematocarpus validus* in particular, is least worked out. This plant is a rich source of anti-oxidants, vitamins, minerals, good source of natural dye and has a good medicinal value. An emphasis needs to be given to identify more areas to explore the potential pockets for cultivation which can bring in more economic benefits to the local communities if harnessed properly.

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Plant Germplasm Registration Notice*

The Plant Germplasm Registration Committee of ICAR in its XXXIII[rd] meeting held on December 7[th], 2015 at the ICAR-National Bureau of Plant Genetic Resources, New Delhi approved the registration of following 30 germplasm lines out of 68 proposals considered. The information on registered germplasm is published with the purpose to disseminate the information to respective breeders for utilization of these genetic stocks in their crop improvement programmes. Upon request, the developer(s)/author(s) is/are obliged to distribute the material for crop improvement programme of National Agricultural Research System.

1. Mainagali (IC0390780; INGR15037), Rice (*Oryza sativa* L.) Germplasm with Long Sterile Glume

AK Sarawgi*, GR Sahu, RK Rao and Jitendra Tiwari
Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur-492012, Chhattisgarh, India
*(*Email: sarawgi1@yahoo.co.in, hodgpbigkv@gmail.com*)

Chhattisgarh has a wide variability of rice germplasm. Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur maintains a huge collection of 23,250 rice germplasm accessions. The registered germplasm Mainagali (IC0390780, INGR15037) with long sterile glume was collected from Dharmjaigarh Block of Raigarh District of Chhattisgarh.

Morpho-agronomic characteristics: The lemma palea colour of registered germplasm is brown and kernel colour is white with long slender grains. Its spikelets look like flying birds.

Associated characters and cultivation practices: In this accession spikelets are found with long sterile glumes. Length of sterile glume is nearer to lemma length. Long sterile glumes prevent infestation of insect pests in spikelets. This accession is planted normally in mid land condition of Chhattisgarh Plains.

Morphological descriptions and mean agronomic traits are presented below

Characteristics	Mainagali (IC0390780, INGR15037)
Basal leaf sheath colour (BLSC)	Green
Leaf blade colour (LBC)	Green
Collar colour (CC)	Green
Auricle colour (AC)	Light Green
Culm internode colour (CmlC)	Green
Apiculous colour (ApC)	Light Green
Stigma colour (SgC)	White
Awning (An)	Absent
Days to maturity (DM)	132.5
Plant height (PH) cm	161.7
Tiller No. (Til No.)	5.5
Lemma palea colour (LmPC)	Brown
Seed coat colour (ScC)	White
100 grain weight (TW) gm	3.31
Grain length (GRL) mm	9.0
Grain breadth (GRB) mm	2.9
Grain ratio (L/B)	3.1
Grain type	Long Slender

Note: Quantitative data given based on the mean of 4 years.

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**Compiled and edited by: Anjali Kak and RK Tyagi, Division of Germplasm Conservation, ICAR-National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi–110012.*

2. Nariyal Phool (IC0390772; INGR15038), a Rice (*Oryza sativa* L.) Germplasm with Clustered Spikelets in the Range of 2-10

AK Sarawgi*, GR Sahu, RK Rao and Jitendra Tiwari
Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur-492012, Chhattisgarh, India
*(*Email: sarawgi1@yahoo.co.in, hodgpbigkv@gmail.com*)

Chhattisgarh is blessed with a wide variability of rice germplasm accessions. IGKV, Raipur has a huge collection of 23,250 rice germplasm accessions. The registered germplasm Nariyal Phool **(**IC0390772, INGR15038) with clustered spikelets was collected from Saraipali block of Mahasamund district of Chhattisgarh.

Morpho- agronomic characteristics: The lemma palea colour of the germplasm is gold and gold furrows on straw and kernel colour is white and translucent. Due to clustering habit, spikelets look like the flower of coconut, so it is called Nariyal Phool by local inhabitants.

Associated characters and cultivated practices: In this accession clustering of spikelet recorded in broad range i.e. 2 to 10 grains amongst all clustered accessions available in IGKV rice germplasm. Whereas, clustering of 3 grains was found in large frequency (35.4%) followed by 4 grains (20%). A minimum frequency of clustering observed was 10 grains (2.55%). This germplasm accession is cultivated in low land condition of Chhattisgarh Plains.

Morphological description and mean agronomic traits are presented below

Characteristics	Nariyal Phool (IC 0390772, INGR 15038)
Basal leaf sheath colour (BLSC)	Green
Leaf blade colour (LBC)	Green
Collar colour (CC)	Green
Auricle colour (AC)	Light Green
Culm internode colour (CmlC)	Green
Apiculous colour (ApC)	Light Green
Stigma colour (SgC)	White
Awning (An)	Absent
Days to maturity (DM)	145.8
Plant height (PH) cm	138.6
Tiller No. (Til No.)	10.7
Lemma palea colour (LmPC)	Gold and gold furrows on straw
Seed coat colour (ScC)	White
100 grain weight (TW) gm	1.91
Grain length (GRL) mm	8.4
Grain breadth (GRB) mm	2.4
Grain L/B ratio	3.5
Grain type	Medium Slender

Note: Quantitative data given based on the mean of 4 years.

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