British Journal of Research

www.britishjr.org

Original Article

A Preliminary Survey of Cyanogenic Plants of Family Euphorbiaceae from Chandrapur District of Maharashtra (India)

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A B S T R A C T

Objective: The purpose of this preliminary survey to document the cyanogenic plants of Euphorbiace family from Chandrapur district of Maharashtra.

Methods: Preliminary survey of cyanogenic plants of Euphorbiaceae family from Chandrapur District of Maharashtra carried out and total 22 plant species analyzed. The semi quantitative estimation of HCN was done by standard Sodium Picrate Paper Test.

Results: Out of 22 plant species tested, 19 plant species give positive for presence of HCN. Maximum amount of HCN 800 ppm tested in Tuber and Root of *Manihot esculenta* Crantz. Three plant species *Euphorbia hirta* L, *Euphorbia milli* Des. Moul, and *Phyllanthus emblica* L. shows negative test.

Conclusion: In present preliminary survey 19 cyanogenic plants of euphorbiaceae family documented from the Chandrapur district of Maharashtra. *Manihot esculenta* Crantz.(Cassava) shows the maximum amount of HCN as compared with other Euphorbiaceae member. These cyanogenic plants now a days playing an important role in the cancer research. Cyanogenic plants protect itself from pest attack and herbivores.

Keywords: Cyanogenic plants, Euphorbiaceae family, Chandrapur District, Maharashtra.

INTRODUCTION

At least 2700 species of higher plants have shown to contain compounds capable of producing hydrogen cyanide (HCN) or prussic acid[21]. About 100 families of flowering plants posses cyanogenic glycosides. Some ferns, fungi and bacteria species also posses cyanogenic glycosides[16,17]**.** Economical important plants

like Almond, Bamboo, Cherries, Linum, Sorghum, Cassava, Cotton, Beans, White Clover and Rubber tree are highly cyanogenic[4,13,27]**.** The ability of plants to produce HCN from a parent substance was reported in 1803 by a German pharmacist[24]. In case of plants, Cyanogenic glucosides stored in the plant cell vacuoles[30]**.** Cyanogenic plants study and its distribution studied around the word[19,25,26,28] as it helps in chemo-taxononomic evaluation of genera[14].

In India particularly in Marathwada region of Maharashtra lot of work has been done on cyanogenic plants[5,23]. The chemical detection of HCN was thought to be useful as a chemotaxonomic character but it was well established fact that HCN production by plants under certain conditions is a defense mechanism of plants against microbes, insects and herbivores[18]. Cyanogenic plants can also be used in cancer research[1,6,7,12]. Recently 35 angispermic plants reported as cyanogenic plants from Marathwada region of Maharashtra[8]. After rice, wheat and corn, Euphorbiaceae member Cassava (*Manihot esculenta* Crantz.) is the fourth most important staple food crop in the world[2]. Many euphorbiaceae members posses medicinal properties. Leaves and seeds of *Ricinus communis* L. used as anti swelling and Leaves, fruits and seeds of *Phyllanthus emblica* L. for vitamin deficiency[3]. Leaves of *Phyllanthus amarus* Schumach. and Thonn. used orally to cure epilepsy[11]**.**

STUDY AREA

The district Chandrapur is situated between 78^0-48′ East longitude and 18^0-41′ to 20^0 - 51′ North latitude. The greater part of it consists of undulating hill ranges 150 m – 450 m above M.S.L. District Bastar of Madhya Pradesh lies to its East and to District Adilabad of Andhra Pradesh lies on its south. The district is quite hot in summer, and there is general dryness in other months, but not in monsoons. The rainfall is due to South West. monsoons and also due to return monsoons and from the Bay of Bengal. It is well distributed. The average annual rainfall for the district is 1420 mm. December is the coldest month, when the temperature goes to 28-2^0C (82.8^0F). The mean daily minimum temperature is 11.6^0C (52.9^0F). Daily mean maximum temperature in the Southern half of the district is 29.8^0C. It rises rapidly after February, and May is the hottest month 43^0C (109^0F), and the minimum to 28.9^0C (82.4^0F). Summer is intense. Occasionally the temperature rises to 48^0C (118^0F). There is a secondary peak rise in temperature in October. In December temperatures fall rapidly. The highest temperature at Chandrapur was noticed in May 1912 to be 118.9^0F or 48.6^0C. At Chandrapur they go down to 7.8^0C (48^0F). Other places have similar temperature. Humidity during monsoons S. W. and N.E. is pretty high, even in the post-monsoon period. Thunder storms occur in all weather. In December the temperature at Chandrapur is 27.2^0C (80.9^0F). The daily maximum temperature 94^0F and minimum 93^0F or 23^0C. The heat is very severe in May, but the nights are much cooler. In the late May and in June there are thunder storms. They are due to depressions coming over from the Bay of Bengal and crossing the district. It is obvious that the flora here is very rich containing dry deciduous, semi-evergreen and some moist evergreen species. The well known tiger and wild game Reserve, *Tadoba* Sanctuary, lies in Chandrapur. Special features of Chandrapur are six Forest Division in the single District of Chandrapur. The teak (*Tectona grandis*) and other timber species grow here very luxuriantly and yield highest revenue to the State[20]. (Fig: 01).

METHODOLOGY

Total 22 plant species of family Euphorbiaceae were collected from Chandrapur district and indentified with the help of available flora[22,29,31]. A preliminary test of cyanogenic plants of was conducted with a piece of filter paper impregnated with sodium picrate suspended in vial over plant material to which dilute HCL or distilled water or a source of β-glycosidase enzyme is added. A colour change from yellow to brick red within 24 hours indicates a positive test[9,13].

Sodium Picrate paper preparation: The strip of Whatman filter paper No.1 (05×01cm) were soaked in an aqueous solution of 0.05M picric acid, previously neutralized with sodium bicarbonate and filtered. The impregnated paper was left to dry at normal temperature.

The semi quantitative estimation of HCN was done by standard method .This standard method described by Bradburry[1] using picrate paper kit involves the use of immobilized linamerase enzyme in a small paper disc loaded with phosphate buffer at PH 06.The disc was placed in a small glass vial along with 100mg plant material and 0.5ml of distilled water was added to it .A strip of yellow sodium picrate paper was inserted and vial capped. The vial was left for 24 hours at 25^0C to 35^0C till the colour of picrate changed from yellow to red. The colour was matched against a colour chart provided in kit. The amount of HCN can be approximately estimated on the basis of colour ranging from nil to 800ppm.

RESULTS

The result of occurrence and amount of cyanide in plants are represented in Table.No.01.Out of total 22 plants taken in this study,19 plants were tested positive for HCN and 03 plants shown the negative test suggest the absence of cyanogenic glycosides. *Manihot esculenta* Crantz. shows the maximum amount of HCN in its Tuber and Root of 800 ppm and Stem posses200 ppm HCN and Leaf posses 100 ppm.The leaves of *Chrozophora rottlerii* (Geis)Spreng. shows the 50 ppm of HCN. *Euphorbia hirta* L, *Euphorbia milli* Des. Moul,and *Phyllanthus emblica* L. shows the absence of HCN in their leaves.

The leaves of *Acalypha wilkesiana* Mull-Arg., *Chrozophora prostrata* Dalz. in Dalz and Gibbs., *Codium variegatum* L., *Jatropa curcus* L., *Jatropa gossypifolia* L. and *Sebastenia chamaelea* (L.) Muell Arg. shows 20 ppm HCN and fruits of *Jatropa curcus* L., *Jatropa gossypifolia* L.also shows 20 ppm HCN.

The roots of *Chrozophora rottlerii* (Geis)Spreng., *Croton bonplandianum* Baill. shows the presence of 10 ppm HCN. The leaves of *Acalypha indica* L., *Cleistanthus collinus* Benth., *Euphorbia cyathophora* Murray., *Euphorbia tirucalli* L., *Phyllanthus amarus* Schumach. and Thonn., *Phyllanthus maderaspatensis* L., *Riccinus communis* L.and *Tragia plukentii* A.R.Sm. shows 10 ppm HCN.The fruits of *Riccinus communis* L.and *Tragia plukentii* A.R.Sm.also shows the 10 ppm HCN. Some plants also shows the negligible amount 05 ppm HCN like *Euphorbia pulcherrima* Willd.ex Klotz.and *Euphorbia heterophylla* L.This is the first report of cyanogenic plants from Chandrapur district of Maharashtra.

DISCUSSION

Manihot esculenta Crantz.(Cassava) shows the maximum amount of HCN as compared with other euphorbiaceae member in all of its plant parts Leaf (100 ppm), Stem(200 ppm) Root and Tuber(800 ppm).The leaves of *Chrozophora rottlerii* (Geis)Spreng. shows 50 ppm HCN and roots shows comparatively less 10 ppm HCN. All remaining 18 members of euphorbiaceae shows comparatively less HCN.

The negative results are however to be reconsidered as the HCN production depends upon several internal and external factors as genes and environment[18]. The level of cyanogenic glycosides produced is dependent upon the age and variety of the plant, as well as environmental factors[10,30]**.** Thus, cyanogenesis may act as plant defense against generalist herbivores, but the effectiveness depends on many factors on both sides of the plant-animal interaction[15]. Cyanogenesis, however cannot be considered as a chemotaxonomic parameter, but it is probably an interaction of plants against pest.

CONCLUSIONS

In present preliminary survey 19 cyanogenic plants of euphorbiaceae family documented from the Chandrapur district of Maharashtra. *Manihot esculenta* Crantz. (Cassava) shows the maximum amount of HCN as compared with other euphorbiaceae member. These cyanogenic plants now a days playing an important role in the cancer research. Cyanogenic plants protect itself from pest attack and herbivores.

ACKNOWLEDGMENT

The authors are specially thankful to Dr. Howard Bradburry's Division of Botany and Zoology, Australian National University, Canberra, Australia. Authors are thankful to the Secretary, CSPM, Chandrapur & Principal, J.M.V., Chandrapur for providing facilities and encouragement.

Source of support

Nil

Conflict of interest

None declared

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Table 1: Cyanogenic plants of family Euphorbiaceae from Chandrapur District of Maharashtra

S.N.	Botanical name of plant	Plant part used	TEST (+ve or –ve)	Amount of HCN in PPM
01	*Acalypha wilkesiana* Mull-Arg..	Leaf	+ve	20
02	*Acalypha indica* L.	Leaf	+ve	10
03	*Chrozophora rottlerii* (Geis)Spreng.	Leaf Root	+ve +ve	50 10
04	*Chrozophora prostrata* Dalz. in Dalz and Gibbs.	Leaf	+ve	20
05	*Cleistanthus collinus* Benth.	Leaf	+ve	10
06	*Codium variegatum* L.	Leaf	+ve	20
07	*Croton bonplandianum* Baill.	Leaf Root	+ve +ve	10 10
08	*Euphorbia heterophylla* L.	Leaf	+ve	05
09	*Euphorbia cyathophora* Murray.	Leaf	+ve	10
10	*Euphorbia hirta* L.	Leaf	-ve	00
11	*Euphorbia milli* Des. Moul.	Leaf	-ve	00
12	*Euphorbia pulcherrima* Willd.ex Klotz.	Leaf	+ve	05
13	*Euphorbia tirucalli* L	Leaf	+ve	10
14	*Jatropa curcus* L.	Leaf Fruit	+ve +ve	20 20
15	*Jatropa gossypifolia* L.	Leaf Fruit	+ve +ve	20 20
16	*Phyllanthus amarus* Schumach. And Thonn.	Leaf	+ve	10
17	*Phyllanthus emblica* L.	Leaf	-ve	00
18	*Phyllanthus maderaspatensis* L.	Leaf	+ve	10
19	*Manihot esculenta* Crantz.	Leaf Stem Root Tuber	+ve +ve +ve +ve	100 200 800 800
20	*Riccinus communis* L.	Leaf Fruit	+ve +ve	10 10
21	*Sebastenia chamaelea* (L.) Muell Arg.	Leaf	+ve	20
22	*Tragia plukentii* A.R.Sm.	Leaf Fruit	+ve +ve	10 10

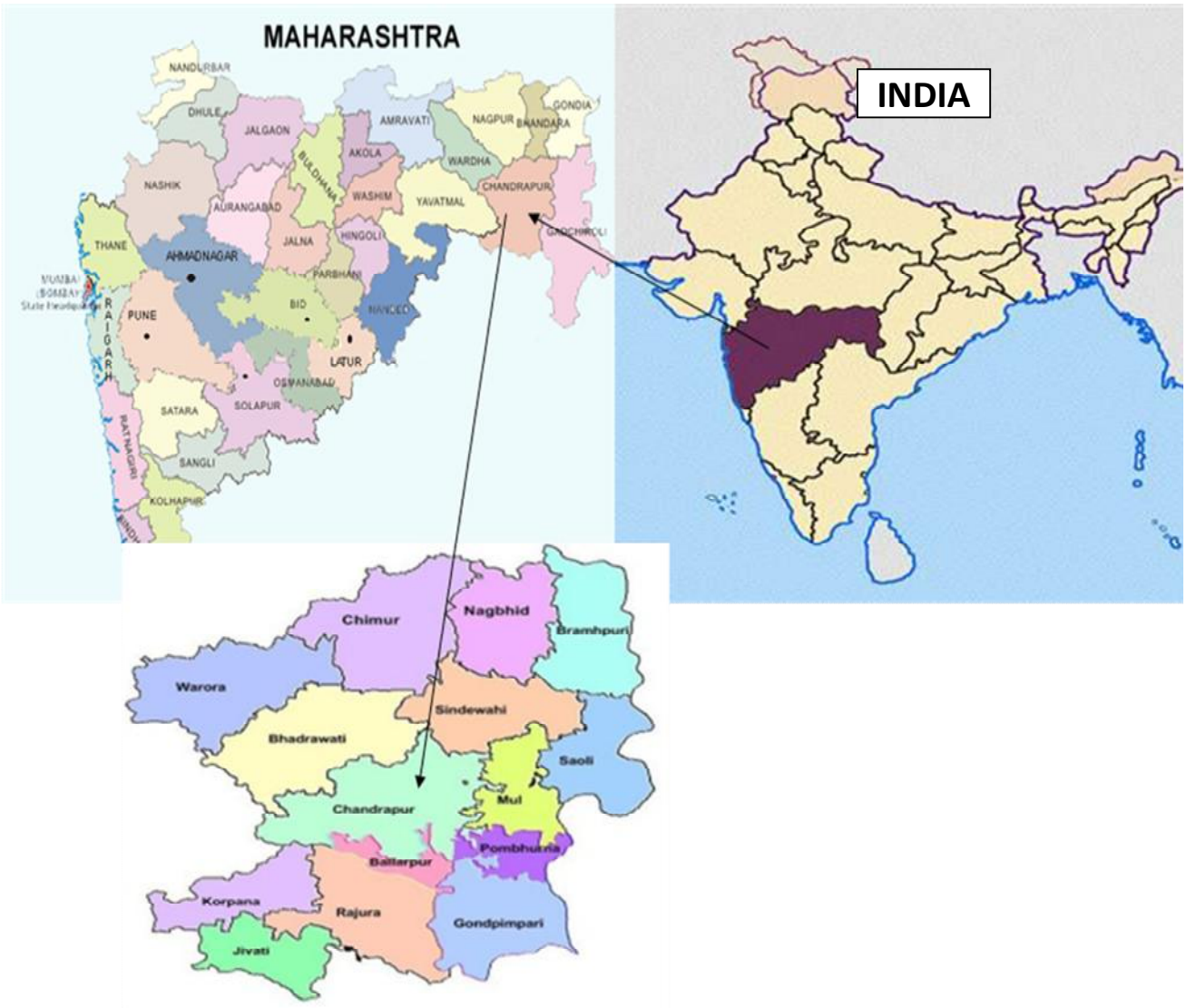

Figure 1: Location of study area