

BIODIVERSITY WITH A NEW PERSPECTIVE OF CYANOGENIC PLANTS

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Biodiversity in the plants exists due to certain genetic characters. Cyanogenesis i.e., production of HCN by plants is also a genetic character. In the present work a survey of some cyanogenic plants particularly from Marathwada region is being conducted and the plants are categorised on the basis of presence of cyanogenic glycoside & enzyme either, or both or absence of both. The study cannot be used for chemotaxonomic and phylogenetic relation among the plants, but can be used as a distinguishing feature of diversity among cyanogenic plants.

Introduction

Keywords : Biodiversity; Cyanogenesis.

At least 2700 species of higher plants and some micro-organisms have been shown to contain one or more of nearly 32 compounds capable of producing hydrogen cyanide (HCN) or prussic acid under certain conditions of stress. The process is known as cyanogenesis^{1,2}. Sorghum species specially hybrids, Flax and Prunus species are common cyanogenic plants. The process of cyanogenesis is very simple. The cyanogenic glucosides present in the plant are converted to sugar and an aglycone with the help of β -glucosidase enzyme and in the next step the aglycone is converted to HCN and an aldehyde or Ketone. As the process is enzymatic it is governed by genes as shown in white clover *Trifolium repens* L.^{3,4}.

A plant can be cyanogenic or non-cyanogenic. Cyanogenesis is actually thought to be a defence mechanism by plants against micro organisms and herbivore⁵.

There are simple tests by which a cyanogenic plant can be identified but the cyanogenic plant always do not response to the test due to certain conditions. Cyanogenic plants can be classified in to two categories, one with glycoside and enzyme and the other with glycoside only.

In the present study a survey of some cyanogenic plants of Marathwada is conducted and they are classified on the basis of above criteria. *Cuscuta reflexa* L. is being used as source of β -glucosidase enzyme.

Material and Methods

Forty seven Angiospermic plants from Marathwada region are collected and correctly identified. Preliminary test of cyanogenic plants was conducted with a piece of filter paper impregnated with sodium picrate suspended in a vial over plant material to which dil. HCl or distilled water or a source of β -glucosidase enzyme has been added. A color change from yellow to brick red indicates a positive test^{6,7}.

In three sets of experiment first experiment was testing of the plant extract using dil.HCl. If positive than

to test it further second experiment was conducted where only distilled water was used. The positive result indicates presence of glycoside as well as β -glucosidase enzyme⁶. In the third experiment all negative plants in the last test were treated with centrifuged extract of fresh *Cuscuta reflexa* L. plant with a pH 6.5 to 7.0. The *Cuscuta* extract contains β -glucosidase enzyme⁶ and if now they gave a positive test probably they are having glycoside but no β -glucosidase enzyme.

Result and Discussion

Preliminary test with HCl shows that out of 47 plants tested 24 were positive so they belong to cyanogenic category of plants (Table-1) and remaining 23 were probably non cyanogenic (NGE). Out of 24 plants 12 plants show positive test with distilled water. So they must be cyanogenic (GE) category means they contain the glycoside as well as the enzyme. Out of remaining 12 plants all showing negative test with distilled water but have shown positive test with *Cuscuta* extract, so probably they belongs to (G) category means they have glycosides but not the enzyme (Table 2).

The present study is significant because, ultimately the plants can be categorized into the three groups as stated above i.e., NGE, GE and G to indicate their genetic diversity, because production of enzyme ultimately shows presence of a gene and now a days the cladistic studies are being conducted on gene analysis of plants⁸.

References

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Table 1. HCN test for plants by using HCl.

Sr. No.	Name of plants	Plant part	HCl
1.	<i>Nerium indicum</i> Hill (Apocynaceae)	leaves	+ve
2.	<i>Brassica compestris</i> L. (Brassicaceae)	Seeds	-ve
3.	<i>Passiflora edulis</i> Sims (Passifloraceae)	leaves	+ve
4.	<i>Acacia leucophloea</i> (Roxb.)Willd (Mimosaceae)	Fruit	+ve
5.	<i>Sorghum vulgare</i> Pers. (Poaceae)	leaves	+ve
6.	<i>Ricinus communis</i> L. (Euphorbiaceae)	seeds	+ve
7.	<i>Trigonella foenum-graecum</i> L. (Fabaceae)	seeds	+ve
8.	<i>Lantana camara</i> L. (Verbenaceae)	leaves	+ve
9.	<i>Linum usitatissimum</i> L. (Linaceae)	seeds	+ve
10.	<i>Terminalia bellirica</i> (Gaertn) Roxb. (Combretaceae)	seeds	+ve
11.	<i>Calotropis procera</i> (Ait)R.Br. (Asclepiadaceae)	leaves	-ve
12.	<i>Ailanthus excelsa</i> Roxb. (Simaroubiaceae)	leaves	-ve
13.	<i>Cocculus hirsutus</i> (L.)R.Br. (Memispermaceae)	leaves	-ve
14.	<i>Dodonaea viscosa</i> aut. (Sapindaceae)	leaves	-ve
15.	<i>Ipomoea obscura</i> (L.)Ker.Gaw (Convolvulaceae)	leaves	+ve
16.	<i>Morinda citrifolia</i> L. (Rubiaceae)	leaves	+ve
17.	<i>Garuga pinnata</i> Roxb. (Burseraceae)	fruit	-ve
18.	<i>Sterculia urens</i> Roxb. (Sterculiaceae)	seeds	-ve
19.	<i>Cassia fistula</i> L. (Caesalpinaceae)	seeds	-ve
20.	<i>Abrus precatorius</i> L. (Fabaceae)	seeds	-ve
21.	<i>Sebastiania chamaelea</i> (L.)Muell. (Euphorbiaceae)	seeds	+ve
22.	<i>Erythrina suberosa</i> Roxb. (Fabaceae)	leaves	-ve
23.	<i>Guizotia abyssinica</i> (L.f)Cass (Asteraceae)	seeds	-ve
24.	<i>Gliricidia maculata</i> H.B & K. (Fabaceae)	seeds	+ve
25.	<i>Typha angustifolia</i> Sibthet.Sm. (Typhaceae)	leaves	-ve
26.	<i>Datura inoxia</i> Mill (Solanaceae)	seeds	-ve
27.	<i>Acacia catechu</i> (Roxb.ex.Rottl.) Willd. (Mimosaceae)	seeds	+ve
28.	<i>Mimosa hamata</i> Willd . (Mimosaceae)	seeds	-ve

Sr. No.	Name of plants	Plant part	HCl
29.	<i>Agave americana</i> L (Agavaceae)	leaves	-ve
30.	<i>Ficus amplissima</i> J.E. Sm. (Moraceae)	leaves	-ve
31.	<i>Prunus amygdalus</i> var. <i>amara</i> Batsch. (Rosaceae)	seeds	+ve
32.	<i>Prunus amygdalus</i> var. <i>dulcis</i> Batsch. (Rosaceae)	seeds	-ve
33.	<i>Arachis hypogaea</i> L. (Fabaceae)	leaves	-ve
34.	<i>Sesamum orientale</i> L. (Pedaliaceae)	leaves	-ve
35.	<i>Abutilon indicum</i> (L.) Sweet (Malvaceae)	leaves	-ve
36.	<i>Polyalthia longifolia</i> (Sonner.)Thw. (Annonaceae)	leaves	+ve
37.	<i>Cleome viscosa</i> L. (Cleomaceae)	leaves	+ve
38.	<i>Terminalia catappa</i> L. (Combretaceae)	seeds	-ve
39.	<i>Croton bonplandianum</i> Baill (Euphorbiaceae)	leaves	-ve
40.	<i>Ceiba pentandra</i> (L.) Gaertn. (Malvaceae)	leaves	+ve
41.	<i>Heliotropium supinum</i> L. (Boraginaceae)	leaves	-ve
42.	<i>Hybanthus inaeaspermus</i> (L.) F. Muell. (Violaceae)	leaves	+ve
43.	<i>Mitragyna parvifolia</i> (Roxb) Korth. (Rubiaceae)	leaves	+ve
44.	<i>Acacia farnesiana</i> (L.) Willd (Mimosaceae)	seeds	+ve
45.	<i>Canthium coromendalicum</i> (Brum.f.) Alston. (Rubiaceae)	fruit	+ve
46.	<i>Chrozophora rotleri</i> (Geis.) Juss. ex Spreng. (Euphorbiaceae)	leaves	+ve
47.	<i>Biophytum sensitivum</i> (L.) DC (Oxalidaceae).	leaves	+ve

Table 2. HCN test for plants by using *Cuscuta reflexa* extract & Distilled water.

Sr. No.	Name of plants	Plant part	Cuscuta extract	Distilled Water	Category
1.	<i>Nerium indicum</i> Hill (Apocynaceae)	leaves	-ve	+ve	GE
2.	<i>Passiflora edulis</i> Sims (Passifloraceae)	leaves	+ve	-ve	G
3.	<i>Acacia leucophloea</i> (Roxb.) Willd (Mimosaceae)	Fruit	+ve	+ve	GE
4.	<i>Sorghum vulgare</i> Pers. (Poaceae)	leave	+ve	+ve	GE
5.	<i>Ricinus Communis</i> L. (Euphorbiaceae)	seeds	+ve	+ve	GE
6.	<i>Trigonella foenum-graecum</i> L. (Fabaceae)	seeds	-ve	+ve	GE

Sr. No.	Name of plants	Plant part	Cuscuta extract	Distilled Water	Category
7.	<i>Lantana camara</i> L. (Verbenaceae)	leaves	+ve	-ve	G
8.	<i>Linum usitatissimum</i> L. (Linaceae)	seeds	+ve	+ve	GE
9.	<i>Terminalia bellirica</i> (Gaertn) Roxb. (Combretaceae)	seeds	-ve	+ve	GE
10.	<i>Cocculus hirsutus</i> (L.)R.Br. (Memispermaceae)	leaves	+ve	-ve	G
11.	<i>Ipomoea obscura</i> (L.)Ker.Gaw) (Convolvulaceae)	leaves	+ve	+ve	GE
12.	<i>Morinda citrifolia</i> L. (Rubiaceae)	leaves	+ve	-ve	G
13.	<i>Sebastiania chamaelea</i> (L.)Muell. (Euphorbiaceae)	seeds	-ve	+ve	GE
14.	<i>Gliricidia maculata</i> H.B & K. (Fabaceae)	seeds	+ve	-ve	G
15.	<i>Acacia catechu</i> (Roxb.ex.Rottl.) Willd. (Mimosaceae)	seeds	+ve	-ve	G
16.	<i>Prunus amygdalus</i> <i>var.amara</i> Batsch. (Rosaceae)	seeds	+ve	+ve	GE
17.	<i>Polyalthia longifolia</i> (Sonner.)Thw. (Annonaceae)	leaves	+ve	-ve	G
18.	<i>Cleome viscosa</i> L. (Cleomaceae)	leaves	+ve	-ve	G
19.	<i>Ceiba pentandra</i> (L.)Gaertn. (Malvaceae)	leaves	+ve	+ve	GE
20.	<i>Hybanthus inneaspermus</i> (L.) F.Muell. (Violaceae)	leaves	+ve	+ve	GE
21.	<i>Acacia farnesiana</i> (L.) Willd. (Mimosaceae)	seeds	+ve	-ve	G
22.	<i>Canthium coromendalicum</i> (Brum.f.) Alston. (Rubiaceae)	fruit	+ve	-ve	G
23.	<i>Chrozophora rottleri</i> (Geis.) Juss.ex Spreng. (Euphorbiaceae)	leaves	+ve	-ve	G
24.	<i>Biophytum sensitivum</i> (L.)DC. (Oxalidaceae).	leaves	+ve	-ve	G

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