



Detection And Quantitative Estimation Of Prussic Acid In The Members Of Family- Acanthaceae

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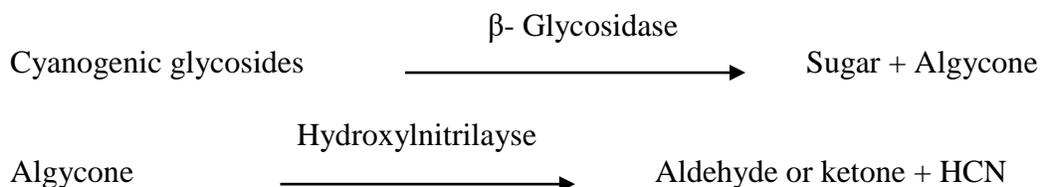
ABSTRACT

Cyanide exists various forms in nature as a salts of Sodium, Potassium and Calcium beside these, hydrogen cyanide or hydrocyanic acid or prussic acid is produced by number of plants of the World flora. In plants Cyanogenesis is a bio-chemical defense mechanism to protect themselves from microbes as well as from herbivore. Amygdalin, Dhurrin, Prunasin Linamarin, Lotaustaralin Cardoispermin etc. are the cyanogenic glycosides present in plants. On hydrolysis these glycosides release hydrogen cyanide. In the present study the quantitative estimation of total cyanide in some of the members of the Acanthaceae family from Nanded district of Marathwada region of Maharashtra state has been reported.

Key Words:- Cyanogenesis, Cyanogenic glycosides, Prussic acid, Microbes, Toxicity etc..

INTRODUCTION:

Hydrocyanic acid or Hydrogen Cyanide (HCN) or better known as prussic acid is produced by number of plants of the World flora. At least 2700 species of higher plants have been shown to contain one or more nearly thirty-two compounds capable of producing hydrogen cyanide (HCN) or prussic acid from amino acids (Seigler 1976, Moller and Seigler 1999, Jones 1998). Cyanogenesis is a bio-chemical defence mechanism in plants to protect themselves from microbes as well as from herbivore. Amygdalin, Dhurrin, Prunasin Linamarin, Lotaustaralin Cardoispermin etc. are the cyanogenic glycosides present in cyanogenic plants. After hydrolysis these glycosides release hydrogen cyanide. In the first step, with the help β -glycosidase enzyme the cyanogenic glycoside present in some of the plants can be converted into sugar and an algycone. In the next step with the help of another enzyme this algycone is changed to aldehyde or ketone along with release of hydrocyanic acid.



Conversion of Cyanogenic Glycoside into HCN

Poisoning of prussic acid can be dangerous to the animals that eat cyanogenic plants but also to the plants themselves, to prevent this self poisoning the plants store cyanogenic glycosides in a vacuole of the cell and the enzyme that act to produce hydrogen cyanide in a separate compartments, when a cell is damaged the compartments walls are broken and the reaction takes place and HCN is released.

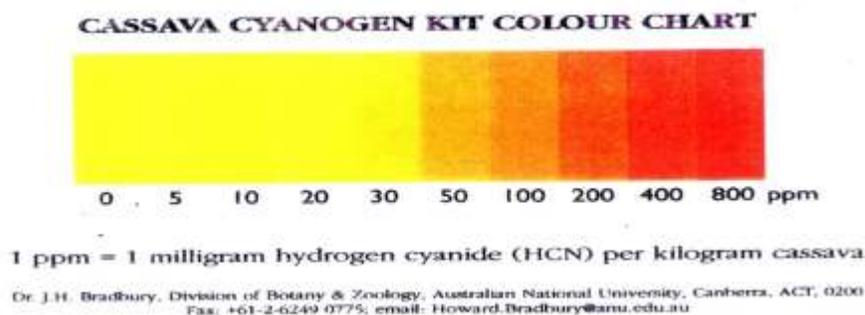
Many Agriculturally and Horticulturally important plants known to contain quite a good amount of hydrocyanic acid in them. The Grazing animals when they consume the cyanogenic plants, they suffer from the cyanide poisoning. The cyanide-poisoned animals shows an increased rate of respiration, increased pulse rate, gasping, muscular twitching or nervousness, trembling, foam from the mouth, blue colouration of the lining of the mouth and spasms or convulsions, death occurs from respiratory paralysis. Often blood passes from the nostrils and from the mouth near the time of death.

The specific survey of cyanogenic plants in angiospermic families and genera was thought to be significant from the taxonomic point of view (**Satish Patel et.al.**) as the chemical variation exhibited by the plants, like any other facts of diversity, is therotically a source of character useful in taxonomy (**Smith 1978**). In fact, in earlier days HCN production by plants was considered as an important chemotaxonomic character (**Gibbs 1974, Hegauner 1958, 1959 a, 1961a**).

Materials and Methods:

For experiment some of the members of family asteraceae are collected from different season and Identified by using the Flora of Maharashtra and Flora of Marathwada (; v.n. Naik) and tested for presence of HCN by simple sodium picrate paper test. The leaf \ fruit \ seed extract suspected for the presence of cyanogenic compounds were taken in 0.2M. phosphate buffer pH 7 and centrifuged at 2000 RPM. The supernatant liquid was placed in a test tube. The strip of whatman filter paper No. 1, 5cm x 2cm was soaked in sodium picrate solution and dried, and it was hanged in the test tube containing the extract. The color of the picrate paper was observed, if the color changed from yellow to reddish brown, it confirmed the presence of prussic acid and the test was positive. If the test is negative, the tube should be left at room temperature for further 24 – 48 hours and then re-examined for any non- enzymatic release of hydrocyanic acid.

For quantitative estimation the simple semi-quantitative method described by Bradbury (**Bradbury et al.1999**) is used. The simple semi-quantitative method described by Bradbury using picrate paper kit involves the immobilization of linamarase enzyme in a small filter paper disc. The disc is placed in a small vial, plant material. A strip of yellow picrate paper is inserted and vial is capped. The vial is left for 16-24 hours at 25°C to 35°C. The color is matched against a color chart sheds and the result is summarized in the Photo Plant & Table No.- 1.



Andrographis paniculata (Burm.f.) Wall.
(Acanthaceae)
Leaf-10 ppm

Blepharis repens (Vahl) Roth.
(Acanthaceae)
Leaf-10 ppm

Hygrophila schulli (Buch.Ham.) M.R.
(Acanthaceae)
Stem-10 ppm

Justicia glauca Rottl.
(Acanthaceae)
Leaf-10 ppm

Lepidagathis subarmata (Clarke.)Gamble.
(Acanthaceae)
Leaf-10 ppm

Rungia repens (L.) Nees.
(Acanthaceae)
Leaf-10 ppm

**Picrate Paper Strips Showing Color Change and Comparative Quantitative Estimation of HCN
In Family- Acanthaceae (By Kit).**

Photo Plate No. 1

Table No. 1

Detection and Quantitative Estimation Prussic Acid inn the Some of the Members of Family- Acanthaceae

S. No.	Name of Plant	Plant Part Tested	Test	Amount of HCN in ppm
1	<i>Andrographis paniculata</i> (Burm.f.) Wall. ex. Nees.	Leaf Flower Root	+ve +ve +ve	10 10 10
2	<i>Blepharis repens</i> (Vahl.) Roth, Nov.	Leaf	+ve	10
3	<i>Blepharis maderaspatensis</i> (L.) Roth, Nov.	Leaf	-ve	00
4	<i>Hygrophila schulli</i> (Buch.Ham.) M.R.	Leaf Stem Flower	+ve +ve +ve	10 10 10
5	<i>Justicia diffusa</i> Willd.	Leaf	-ve	00
6	<i>Justicia glauca</i> Rottl.	Leaf	+ve	10
7	<i>Lepidagathis subarmata</i> (Clarke) Gamble.	Leaf	+ve	10
8	<i>Rungia repens</i> (L.) Nees.	Leaf Flower Root	+ve -ve +ve	10 00 10

Results and Discussion:

In this particular study of family- Acanthaceae out of 08 plants tested 6 plants i.e. *Andrographis paniculata* (Burm.f.) Wall. ex. Nees.; *Blepharis repens* (Vahl.) Roth, Nov.; *Hygrophila schulli* (Buch.Ham.) M.R.; *Justicia glauca* Rottl.; *Lepidagathis subarmata* (Clarke) Gamble.; *Rungia repens* (L.) Nees. were found to be positive for HCN with 10 ppm cyanide was released, whereas 02 plants i.e.- *Blepharis maderaspatensis* (L.) Roth, Nov. and *Justicia diffusa* Willd. are negative for HCN test. The study is important to understand the tolerance of plant to the particular environmental condition, attack of microbes and herbivores, toxicity of plants and their mechanism to cure the different types of diseases.

References:

- Almeida M.R. (2001) Flora of Maharashtra Vol.III A.
- Bradbury M.G. Egan S.V. and Bradbury J.H. (1999) "Picrate kit for determination total cynogens in cassava roots and all forms of cyanogens in cassava products." J. Sci. Food Agri 79:593-601.
- Gibbs R.D. (1974) "Chemotaxonomy of Flowering Plants." 4 vols McGill Queens University Press, Montreal.
- Jones D. A. (1998) "Why are so many plants cyanogenic?" Phytochemistry 47:155-162.
- Hegnauer R. (1958) Pharm. Acta. Helv. 33:287-305.
- Hegnauer R. (1959 a) Pharm. Weekbl. 94:241-8.
- Hegnauer R. (1961 a) "Recent Advances in Botany." Vol I:pp 82.
- Satish Patel, Mukesh K. Nag, S.J. Daharwal, Manju R. Singh, Deependra Singh (2013) ' Plant Toxins: An Overview' Research J. Pharmacology and Pharmacodynamics 5 (5): 2013: 283-288.
- Seigler D.S. (1976) "Plants of the North eastern United States that produce cyanogenic compounds." Eco. Bot. 30:395-407.
- Smith P.M. (1978) "Chemical evidence in plant taxonomy in essays in plant taxanomy." Ed. H. E. street. Acad
- Naik V. N. (1998) "Flora of Marathwada" Amrut Prakashan Aurangabad.

