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Potential Antiophidian Botanicals from the Canning Sub-division of the District South 24 Parganas, West Bengal, India

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Abstract: Canning is one of the five subdivisions of district South 24 Parganas, West Bengal, India. It is again comprised of four blocks. Snakebite is a major cause of mortality and morbidity in this part of West Bengal. To explore the alternative treatment of snakebite, a survey was carried out in the four blocks of the subdivision in search of potential plants reported in ethnomedicine and/or pharmacology as antivenin. On the basis of the floristic exploration and available literature, plants with anti ophidian property were identified. A total number of 12 plants belonging to10 families were collected, identified and documented. Family aocynaceae represents the maximum number (3) of plant species followed by other 9 families (all having one species each). The aim of the present study is to enumerate the potential of botanicals as antiophidian from the said area.

Key words: Antiophidian, snakebite, canning, West Bengal, pharmacology

INTRODUCTION

Natural product based medicine is used worldwide and being popularized worldwide due to lesser side effects and lack of developing drug resistance in the causal organism. Crude extracts of the plants as well as the isolated biomolecules have proven to be useful in several traditional, complementary and alternative medicinal systems. Ethnobotany provides the basic healthcare needs to a vast majority of people against fever, gastrointestinal diseases, pediatric disorders, skin infections, wound healing and others (Dey and De, 2011a; Dey *et al*., 2012). Botanicals have been reported to possess healing ability which has been attributed to their diverse pharmacological properties such as antibacterial, antioxidative, antiophidian, cytotoxic, antidiabetic, aphrodisiac and other activities (Dey and De, 2011b; Dey *et al*., 2011; Mukherjee *et al*., 2012).

In each year several people die of snakebite worldwide. Out of 5 million venomous snake bite cases worldwide, 100000 people die and most of the incidents are reported from Asia (Adukauskiene *et al*., 2011). The post snakebite symptoms include tetanus, gangrene, amputation, neurogical and nephrological disorders and even death. In rural areas of third world countries snake-bitten people die because of unavailability of conventional antivenin, ineffectiveness of the same, poor treatment of the quacks, remoteness of occurrence etc. Antivenin immunotherapy seems to be the only available effective treatment in this medical exigency. However, due to certain limitations regarding the availability and effectiveness of this, alternative treatments approved by pre-clinical and clinical trials may also be encouraged.

The blocks surveyed in the present investigation house a number of poisonous snakes. Due to forest covering and ample water body, the area is a natural dwelling place of many notorious snakes. In the current survey, a venture is being made to explore certain antiophidian botanicals which is used in other parts of the world as antiophidian ethnomedicine and some of which are considered pharmacologically to possess anti snake venom efficacy. The present study not only focuses on the possible usefulness of the medicinal plants as traditional phytotherapy and with pharmacologically potential, it also indicates a future research perspective where crude herbal formulations and isolated compounds may be used as alternate snakebite phytotherapy. Many of the said botanicals have been tested for pharmacological efficacy (Dey and De, 2012c, d, e) with potentials to be used as alternative antivenin in future drug discovery programs.

MATERIALS AND METHODS

Study area: South 24 Pargana, one of the districst of West Bengal is located between the latitude 20°20′N and 22°06′S

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and longitude 88°20'E and 88°6'W with an area of 8165.05 km^2. Canning is one of the 5 subdivisions of the district having 4 blocks. The study was carried out in the rural areas of the 4 blocks such as Basanti, canning-I, Canning-II and Gosaba.

Survey: To explore the possible anti snake venin remedies of this snake prone distict, the flora of several villages of 4 blocks of the Canning subdivision of South 24 Pargana district was investigated. Being a local of the district, one of the authors had ample opportunity to visit the villages to survey the medicinal plants with potential anti venin properties. A survey was already carried out in the 7 blocks of Baruipur sub division in order to explore the potential antiophidian plants. The authors have reported 18 such plants with possible anti venin principles which have been supported by significant ethnomedicinal and pharmacological data (Dey and De, 2011a). Although, the authors have encountered all the 18 plant species reported in the previous investigation, in the present report only the new 12 plants are documented. Extensive literature survey was conducted to correlate the available data with the pharmacological and ethnobotanical relevance of the antiophidian medicinal plants.

During the survey, the plants were collected, primarily identified and documented in their natural place of occurrence. The habit, habitat, locality of collection, environmental and edaphic factors, floral morphology and other relevant information were recorded and with the help of a standard key, the plants were identified. Photographs of the habit, flowers etc. were taken and common plants were collected to prepare herbarium specimens. Less common plants were left. Conservation status of the plant species were considered while harvesting.

RESULTS

In the present investigation, a number of plant species were documented to have possible therapeutic value as antiophidian botanicals. Plants are enumerated alphabetically with their scientific names, family, habit, surveyed villages and reports on antiophidan ethnomedicine and pharmacology.

A total number of 12 plant species from 10 families were reported and collected. Distribution of plant habit is given in Fig. 1. Plant family Apocynaceae (3) represents the maximum number of species followed by Acanthaceae, Amaranthaceae, Amaryllidaceae, Asteraceae, Malvaceae, Menispermaceae, Nyctaginaceae, Piperaceae and Zingiberaceae (1 species from each family) (Fig. 2). A comparative account of total surveyed plant, plants with

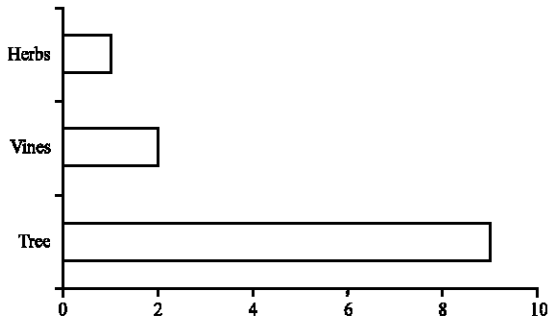

Fig. 1: Habit of the plants

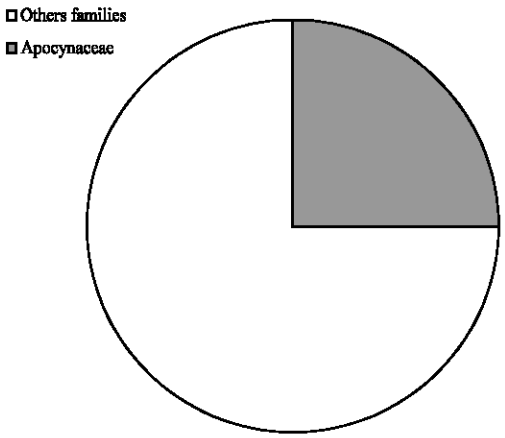

Fig. 2: Distribution of apocynace (3 members) and other families (9) (1 member each)

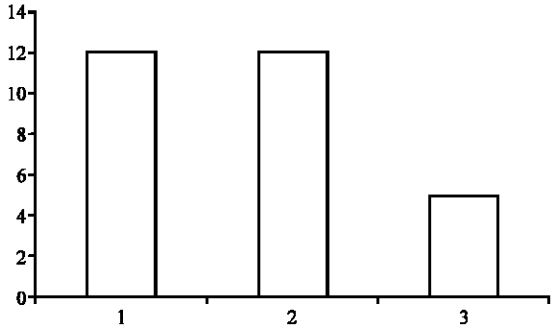

Fig. 3: Estimation of folkloric plants, 1: Total No. of plants surveyed, 2: Plants with reports on antiophidian folkloric use and 3: Plants which are pharmacologically effective against snake venom

ethnobotanical and pharmacological relevanceis provided in Fig. 3. The surveyed reports of the plants were verified by their ethnobotanical and pharmacological reports as antiophidinan. Out of the 12 plants, 5 genera have been pharmacologically evaluated for antiophidian efficacy. All

Table 1: The plant's scientific names, families, habit and the surveyed villages

S. No.	Scientific name	Family	Habit	Surveyed villages
1	*Adhatoda vasica* Nees (*Justicia adhatoda* L.)	Acanthaceae	Herb	Jalghata, Netra, Mukherjee Para, Voleya
2	*Allium cepa* L.	Amaryllidaceae	Herb	Daria, Uttar Battala, Sastakhali, Naliakhali
3	*Amaranthus viridis* L.	Amaranthaceae	Herb	Netra, Uttar Redokhali, Daria, Sastakhali
4	*Boerhaavia diffusa* L.	Nyctaginaceae	Herb	Uttar Battala, Kharimachan, Bhupendrapu, Hatiamari
5	*Calotropis gigantea* (L.) R.Br.	Apocynaceae	Herb	Uttar Redokhali, Naliakhali, Kharimachan, Bhupendrapur
6	*Cissampelos pareira* L.	Menispermaceae	Woody vine	Naliakhali, Kharimachan, Hatiamari, Sastakhali
7	*Curcuma longa* L.	Zingiberaceae	Herb	Uttar Battala, Naliakhali, Kharimachan, Bhupendrapur
8	*Eclipta alba* (L.) Hassk.	Asteraceae	Herb	Sastakhali, Kharimachan, Bhupendrapu, Dakshin Narayantala
9	*Piper nigrum* L.	Piperaceae	Vine	Uttar Redokhali, Daria, Uttar Battala, Kharimachan
10	*Plumeria rubra* L.	Apocynaceae	Tree	Sastakhali, Bhupendrapu, Hatiamari, Dakshin Narayantala
11	*Sida cordifolia* L.	Malvaceae	Herb	Uttar Redokhali, Sastakhali, Naliakhali
12	*Tylophora indica* (Burm. f.) Merr.	Apocynaceae	Herb	Daria, Uttar Battala, Sastakhali, Hatiamari

Table 2: Other folklore reports on antiophidian principles of the surveyed plants

S. No.	Scientific name	Ethnobotanical reports on antiophidian efficacy
1	*Adhatoda vasica*	Ahmad and Javed (2007) and Dey and De (2012a)
2	*Allium cepa*	Kadel and Jain (2008) and Dey and De (2012a)
3	*Amaranthus viridis*	Qureshi *et al.* (2009) and Dey and De (2012a)
4	*Boerhaavia diffusa*	Kadel and Jain (2008) and Dey and De (2012a)
5	*Calotropis gigantea*	Prusti and Behera (2007) and Dey and De (2012a)
6	*Cissampelos pareira*	Chakraborty and Bhattacharjee (2006) and Dey and De (2012a)
7	*Curcuma longa*	Rahmatullah *et al.* (2009)
8	*Eclipta alba*	Jeeva *et al.* (2006) and Dey and De (2012a)
9	*Piper nigrum*	Tiwari and Pande (2004) and Dey and De (2012a)
10	*Plumeria rubra*	Deshmukh *et al.* (2011)
11	*Sida cordifolia*	Jain *et al.* (2009) and Dey and De (2012a)
12	*Tylophora indica*	Prashantkumar and Vidyasagar (2006) and Dey and De (2012a)

Table 3: Pharmacological relevance of antiophidian efficacy of the surveyed plants

S. No.	Scientific name	Plant part/active compound assayed	Anti ophidian activity (biological and/or anti enzymatic)	Reference
1	*Calotropis gigantea*	Latex	Pro-coagulent, fibrinolytic	Rajesh *et al.* (2005)
2	*Cissampelos pareira*	Plant	Anti-hemorrhagic, antiproteolytic	Badilla *et al.* (2008)
3	*Curcuma longa*	Ar-turmerone, turmerin	Anti-cytotoxic, anti-edema, Anti-myotoxicity	Ferreira *et al.* (1992) and Chethankumar and Srinivas (2008)
4	*Eclipta alba*	Aerial parts and root	Anti-PLA2	Diogo *et al.* (2009)
5	*Piper* sp.	4-nerolidylcatechol	Anti-PLA2	Nunez *et al.* (2005)

these 12 species have been reported in ethnomedicine as anti snake bite plant remedy in other folk practices. Table 1 represents the plant's habit and surveyed villages. Plants reported as anti snake venin in folk practices are documented in Table 2. The plants with reported *in vitro* and/or *in vivo* anti snake venom efficacy are given in Table 3.

DISCUSSION

The plants reported in the present survey were found to be used as anti snakebite ethnobotanical remedy in different parts of the world (Rahmatullah *et al*., 2009; Deshmukh *et al*., 2011; Dey and De, 2012a). Earlier, *Cissampelos pareira* and *Tylophora fasciculata* were reported as a traditional antidote to snakebite from a nearby district, Purulia (Dey and De, 2012b). Common use of herbal antidotes among different inhabitants around the world may be treated as an evidence of efficacy of the preparations which may not be associated to reduce the mortality due to snakebite but could be related to reduce the symptoms and pain associated with poisonous and non-poisonous snakebites.

Five of the reported genera and four of the 12 species are being reported to show antiophidian efficacy in terms of crude extracts or isolated active compounds. *Calotropis gigantea*, *Cissampelos pareira*, *Curcuma longa* and *Eclipta alba* were reported to possess antiophidian principals when tested pharmacologically (Dey and De, 2012c). The plants have exhibited pro-coagulent, fibrinolytic anti-hemorrhagic, antiproteolytic anti-cytotoxic, anti-edema, anti-myotoxicity and anti phospholipase 2 (PLA 2) against a number of poisonous snake venoms and biological symptoms associated with snake bite in different *in vitro* and *in vivo* experiments. The positive correlation between traditional usage and pharmacological efficacy between medicinal plants is encouraging to deal with the problems of unavailability and price of synthetic drugs and unwanted side effects and associated drug resistance of common antibiotics. Considering the toxicological implications of herbs and necessity of clinical investigations prior to

approval, herbal remedy may be treated as an exciting aspect of alternative treatment. Positive clinical assays may incorporate these preparations in future drug discovery programs in order to generate plant based antivenin.

CONCLUSION

In this present survey, some plants have been collected and documented from one of the snake prone districts of West Bengal where snakebite is responsible for huge number of death every year. Poor medical system, unavailability of antivenin, lack of knowledge and interference of local quacks worsen the circumstances. Reported *in vitro* and/or *in vivo* experiments have provided support to the efficacy of certain medicinal plants and isolated herbal compounds. Natural product based anti venin research may lead to discovery of certain alternative products with higher efficacy, affordable and may reach to the poor and underprivileged of the third world countries.

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