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Poisonous insects of Kolhapur, India and their treatment

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ABSTRACT

Kolhapur is located between 15° to 17° North Latitude and 73° to 74° East Latitude with uneven rainfall ranging from 700 mm to 6000 mm and with several types of water bodies and hence with rich biodiversity including poisonous insects. Poisoning from insects is increasing in recent years. Therefore, poisonous insects of Kolhapur region, India have been reported with respect to morphological features, life cycle pattern, poison source, nature of poison, control of poisonous insects and treatment to patients against poisoning. In all, 27 poisonous insects have been reported belonging to the orders Hymenoptera, Lepidoptera, Coleoptera, Hemiptera and Dictyoptera. Hymenoptera and Lepidoptera were dominant orders in the region. Hymenoptera represented by 11 species and Lepidoptera 9 while, Coleoptera, Hemiptera and Dictyoptera orders represented by 3, 2 and 2 species respectively. The insects were controlled by spraying 0.15% Carbaryl or 5% Diazinon or 0.5% Dichlorvos or 1.5% Baygon Symptomatic treatment has been advised with antiallergic drugs and ayurvedic plant juices of tulsi, marigold and periwinkle as wound healing component.

Key words: Poisonous insects, poison source & nature, Insect control, poison treatment.

INTRODUCTION

Insects not only act as pests of human property but also lead fatal problems to humans by transmitting certain diseases and causing direct poisoning. In USA, on the basis of death certificates more humans are died due to insect poisoning than to snake venoms. Two to three million people in the United States are severely allergic to the venom of shinging insects (Sitroth, 1985). In India, no records are available on insect poisoning and death occurred. Therefore, present study is aimed to report the diversity of poisonous insects with respect to their identifying features, life cycle pattern, source and nature of poison and control including treatment to poisoning. Review of literature indicates that poisonous insects have been attempted by Lefroy & Howlett (1909), Strother (1985), Southcott (1978, 1987), Shrivastava (1993), Floater (1998), Sathe (1998,2007,2014,2015), Isbister & Whelan (2000), Whelan (2010), Kochler & Diclaro (2011), Bhoje *et al*., (2014), Sathe & Jadhav (2014) etc.

MATERIALS AND METHODS

Poisonous insects have been collected from various ecosystems of Kolhapur region, India. The district Kolhapur is located between 15° to 17° North latitude and 73° to 74° East longitude acquiring 1, 46,575 hectares of land with uneven rainfall ranging from 700 mm to 6000 mm. The survey of poisonous insects was made during the years 2012 to 2014. Life cycles and food plant record was studied by spot observations and also in the laboratory conditions (27±1°C, 75-80% R.H. and 12 hr photoperiod). Morphological features have been noted with the help of compound microscope and insects were identified consulting experts and appropriate literature cited under references. The sources of poisons in insects have been detected by dissecting the body parts and taking the chemical tests. The persons suffering from insect poisons were treated by antiallergic drugs and ayurvedic treatment by extracting juice from leaves of marigold and tulsi and from flowers of periwinkle.

RESULTS

Results are recorded in table - 1 and figs. 1 to 11 indicates that 27 species of poisonous insects belonging to the orders Hymenoptera, Lepidoptera, Coleoptera, Dictyoptera and Hemiptera have been reported from the region of Kolhapur, India. The orders Hymenoptera and Lepidoptera were dominant (table-1) over others. Hymenoptera represented 11 species and Lepidoptera 9 species while, Coleoptera, Dictyoptera and Hemiptera represented by 3, 2 and 2 species respectively (Table-1). Morphological features, life cycle pattern, source of poison and nature of poison are represented in table-1.

Control and Treatment :

- Poisonous insects be carefully collected with the help of insect net and containers and killed in dipping into kerosinised water
- Caterpillars have been controlled by 0.15% Carbaryl spray and by using parasitoids & predators (Sathe, 2014).
- Bees and Wasps have been controlled by 0.5% dichlorvos or 1.5% Baygon spray.
- Ants have been controlled by 5% Diazinon and destroying their nests.

Treatment :

i) Sting apparatus be removed from body immediately.
ii) Apply juice of flowers of periwinkle and juice of leaves of marigold or tulsi to wounds.
iii) Anti allergic drugs like - Cetrizin be advised.
iv) Treat the wound with Ice and Sodium bicarbonate.
v) Against caterpillar venomous wound, baking soda, carbolated vaseline, ammonia or calamine lotion be treated.
vi) Against cockroach poisoning smooth lotion and antiallergic drugs be used.

DISCUSSION

According to Shrivastava (1993) insect venoms are introduced into the body of man and animals in one of the following three ways :

i) by the bite ii) by the sting and iii) by the contact. There are three categories of insects that are poisons namely stinging, biting and vesicating. In bees, wasps and ants the ovipositor was modified to function as stinging apparatus. In bees, stinging apparatus has 3 major components, a piercing shaft or dart composing a pair of stylets and a pair of lancets, and distally barbed structure, two pairs of layers to which the y-shaped arms of the shaft are attached and worked by powerful muscles and a pair of glands, a long and slender acid gland opening on top of a large poison sac into poison gland. A small alkaline poison gland is located at the base of the poison sac which also opens into poison duct. Due to the barbed tips of the piercing shaft, the sting gets stuck into the wound and then detached, continuing to operate even in the detached condition. Wasps, ants and bees showed sting.

In most of the insects poison glands were modified from accessory glands (Shrivastava, 1993). According to Shrivastava (1993) bees were divided into two groups namely, those that sting to kill and those that sting to paralyze. The former posses two poison glands, the acidic and alkaline glands. The poison of this group was the combination of the acid and alkaline fluids which resulted in death or caused extreme pain and reactions in man. In bee venom the chief components were a protein called melittin that has powerful haemolytic allergic actions in humans. The enzymes such as lecithinase (Phosphotipase-A) and hyaluronidase have also played a very important role in poisoning reactions. Lecithinase inhibited lactic dehydronages and citric acid cycle substrates leading to intense pain in the victim while, the enzyme hyaluronidase helped to spread other components to the tissues. According to Strother (1985) Hymenopterous insects like ants, bees, hornets and yellow jackets caused more severe allergic reactions than other insects. The imported fire ant inflicted a very painful sting resulting in postulation at the sting site.

Table-1: Poisonous insects from Kolhapur region including Ghats.

Sr. No.	Insect	Features	Life cycle	Poison source	Nature of poison
1	2	3	4	5	6
1	Wasp *Vespa orientalis* Linn. (Vespidae : Hymenoptera)	Larger, deep brown with yellow band across abdomen, with petiolate abdomen	Several generations completed in a single year	Sting and sting gland	Serotonin, can kill man, cause swelling.
2	*Vespa ducalis* Smith (Vespidae : Hymenoptera)	Large, rust red and hairy with transparent wings with conical nest	Several generations completed in a year	Sting and sting gland	Serotonin, can kill man, cause swelling
3.	*Polistes hebraeus* (Fab.) (Vespidae : Hymenoptera)	Medium sized, uniformly yellow with petcolate abdomen and with rounded nest	Several generations completed in single year	Sting and sting gland	Serotonin, can kill man, cause swelling
4.	*Apis dorsata** (Apidae : Hymenoptera)	Largest bee, 1.5 cm long hives 6 ft long, yield 36 kg honey/comb.	Life cycle completed within 15-20 days	Sting & poison glands Acid & alkali glands	Melitin Can kill man, Cause irritation and swelling, Enzymes Lecithinase & hyaluronidase
5.	*Apis indica* * (Apidae : Hymenoptera)	Medium sized, 1 cm long, Make parallel comb, Yield 1.5 to 4.5 kg honey / comb.	Life cycle completed in about 18 days	Sting & sting gland	Melitin & enzymes Cause swelling & irritations
6	*Apis mellifera*	Small sized. Make about 500 colonies, honey yield 45-181 kg.	Several generations completed in a single year. Life cycle completed in 16 days	Sting & sting gland	Melitin
7	*Camponotus compresus* (Fab.)* (Formicidae -	Black, large, wingless, polymorphic,	Queen can survive for several years	Mandible poison glands	Formic acid, create wounds when bite cause irritations

	Hymenoptera)	mandibles with more than 5 teeth, unarmed	(3-15 years)		
8.	*Monomorium gracillimum* (Formicidae - Hymenoptera)	Propodeum unarmed, evenly rounded, pronotal dorsum convex	Many generations in a single year	Sting apparatus	Formic acid/ Iridomyrmecin
9.	*Oecophylla smaragdina* * (Formicidae - Hymenoptera)	Palp formula 5, 4; Mandible with 10 or more teeth; petiole reduced	Many generations completed in a single year	Sting apparatus	Iridomyrmecin
10.	*Formica* sp.* (Formicidae - Hymenoptera)	Apical margin of mandible with 8 teeth. 3rd tooth of mandible is smaller, shorter than fourth	Many generations completed in a single year	Sting apparatus	Formic acid
11.	Blister beetles *Lytta* spp.* (Moloidae : Coleoptera)	Metallic shining greenish or bluish, or brownish	Hypermetamorphosis, one generation in a single year	Accessory glands, blood	Acidic substance cantharidin
12	*Mylabria pustulata*	Blackish with yellow or red zigzag bands on elytra, elongated	Hypermetamorphosis, one generation in a single year	Accessory glands, blood	Acidic substance cantharidin
13	*Mylabria phalerata* (Moloidae : Coleoptera)	Black with sigzag marking.	Hypermetamorphosis, one generation in a single year	Accessory glands, blood	Acidic substance cantharidin
14.	*Tritoma* sp. (Ruduviidae : Hemiptera)	Head longer, subcylindrical or convex above, antennae inserted at or near the middle of anteocular portion	Life cycle completed in one year	Salivary gland	Toxin aenesthetic, anticoagulin.
15.	Caterpillars *Ceryx godarti* (Syntomidae : Lepidoptera)	Larva light brown, hairy; moth with 6 and 3 clear transparent spots on fore and hind wings respectively.	Life cycle completed within 47-48 days	Hairs	Formic acid
16.	*Amata passalis* (Amatidae : Lepidoptera)	Larva dull whitish brown, hairy, with shiny head. Moth with 7 & 4	Life cycle completed within 50 days	Hairs	Formic acid

		transparent spots on fore and hind wings respectively			
17.	*Amsacta moorei* Butler (Arctiidae - Lepidoptera)	Larva reddish amber to olive green, hairy	Life cycle completed within 20 days	Hairs	Formic acid
18.	*Amsacta albistriga* Wlk.	Larva hairy	Life cycle completed in 30 days.	Hairs	Formic acid.
19.	*Natada velutina* Koll.* (Limacodidae : Lepidoptera)	Larva beautiful coloured with green, blue and pink spots and with 8 branched spines, 4 anteriorly and 4 posteriarly. Moth is red, brown with wing expanse of 3 inch.	Life cycle completed on mango.	Spines	Formic acid extremely irritant.
20.	*Thosea cana* Wlk.* (Limacodidae : Lepidoptera)	Larva green, branched spiny with double row of tubercles bearing spines. Moth is dull brown.	Life cycle completed on castor.	Spines	Formic acid irritant.
21.	*Euproctis* Sp.* (Limantriidae : Lepidoptera)	Larva blackish brown, hairy.	Life cycle completed in about 30 days.	Hairs	Formic acid irritant.
22.	*Parasa lipida* Cram. (Limantriidae : Lepidoptera)	Larva segmented above and bears spinous tubercles.	Life cycle completed on castor and mango leaves.	Spines	Formic acid produces dermatitis.
23.	*Cricula trifenestrata* Helf.* (Saturnidae : Lepidoptera)	Larva clothed with spines.	Life cycle completed on leaves of mango.	Spines	Unidentified toxin body decay as in leprosy.
24.	*Periplanta americana* Linn. (Blattidae : Dictyoptera)	Flat bodied, brownish, with filiform antenna and cerci.	One generation completed in a single year.	Glands.	Allergic substance, cause linear dermatitis, edema of eye, urticaria.
25.	*Blattella orientalis* (Blattidae : Dictyoptera)	Flat bodied, brownish, shorter than *P. americana*.	Life cycle completed in 6 weeks.	Glands	Allergic substance, cause linear dermatitis, edema of eye, urticaria.

26.	*Cimex lectularius* Linn. (Cimicidae : Hemiptera)	Flat bodied, mahogany brown, suck blood of man.	Life cycle completed in 20-30 days. 4 generations produced in a single year.	Glands	Itching, inflammatory wale.
27.	*Ampulex compressa* (Ampulicidae : Hymenoptera)	Bluish metallic shining, about one inch long with ovipositor.	Life cycle completed on cockroach body.	Ovipositor / Sting	Unidentified toxin cause itching, swelling.

* = also found in Western Ghats

Reactions to insect stings may be immediate, within two hours or delayed, after two hours. The most common type was immediate local reaction consisting immediate pain, swelling and redness which was supposed to be a normal reaction. The reaction may become very large, involving entire arm, but not considered serious unless the reaction occurred on head, face or neck (Strother, 1985). In sensitive persons swelling of eyes and lips, hives breaking out on the body, tightness in the chest, faintness and difficulty in breathing, etc were possible.

Any combination of above symptoms need consult of physician. However, delayed local reaction to an insect sting generally consists of a large local swelling which need consultation and treatment from physician.

The wasp venom was rich in serotonin (5-hydroxy-tryptamine) and hyaluronidase and in some cases acetylecoline also (Shrivastava, 1993). The mermicine ants showed iridomyrmecin in the poison which interacted with human like DDT while, the formicine ants like *Camponotus* spp. and *Formica* spp. have showed rich formic acid in their venom. A few stings can cause a toxic reaction even in a non-sensitive person. Young children were more susceptible since they cannot brush off the swarming insects (Ants). In biting insects like fleas, stable flies, *Tritoma* bugs thrips the salivary glands were the source of venom. Such toxins contained anticoagulin and anesthetics. Blister beetles *Mylabris* spp. produced a toxic substance named cantharidin, which was anhydride of cantharidic acid and responsible for forming blisters on human body. In the present study *M. postulata* and *M. phalerata* have been reported as cantharidin and blister producing insects. They mostly attracted to light and rush in to the bed when windows kept open and light kept on and crushed on the human body during the sleep (Sathe, 2014).

Vesicating insects have ability to produce some kind of skin eruption due to venom. Articarial caterpillars and blister beetles come under this category. According to Srivastava (1993) urticarial caterpillars have been reported in about 10 families and over 50 species in order Lepidoptera. The important families refer to Saturnidae, Noctuidae, Lymantridae and Nymphalidae. The cocoons and moths showed urticating hairs containing toxins, by contact through wind they caused severe dermatitis. An intense burning pain with papules, first white and then red that spread to several inches around the affected area. Such things were more dangerous to children leading to fever, nausea and nervous symptoms. Serious disturbances were recorded by inhalation or ingestion of poison hairs in children and adult humans. According to Strother (1985), in venomous caterpillars, poison glands are associated with stiff and hollow spines which penetrate the skin upon contact, release the toxins and cause reddened skin and inflammation spreading several inches around the contact site. Such effects are produced by the puss caterpillars. In some persons, the leg or arm became noticeably swollen and tender and was accompanied in some cases by severe headaches. Similarly, the larva of hag moth showed nine pairs of lateral

Fig 1. ***V. orientalis***

Fig 2 . ***A. dorsata***

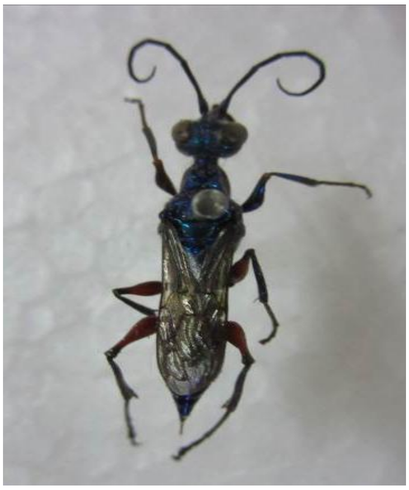

Fig 3. ***A. compressa***

Fig.4. ***Tetraponera rufonigra***

Fig. 5 ***M. indicum***

Fig. 6. ***Polyrachis sp.***

Fig.7 ***A. passalis***

Fig.8. ***A. albistriga***

Fig. 9. ***N. velutina***

Fig. 10. ***A. moorei***

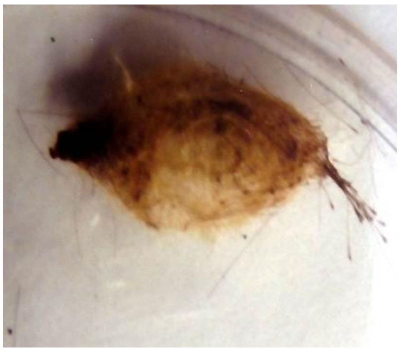

Fig. 11. Cocoon of moth

processes from which the stinging hairs were borne. The longer processes were curved and twisted, suggesting the descended look of a hag. Similarly, in present study *N. velutina* caterpillars showed branched processes of poisoned spines which were highly inflematory. Likely, *C. trifenestrata* larvae also showed poisonous spines although the larvae were used in silk industry for production of golden silk in Indonesia. In India, this silk worm is neglected (Sathe, 2007 and Pawara et al, 2014), probably due to its poisonous nature. Therefore, correct identity, life cycle pattern, poison source, intensity of damage to humans, control of poisonous insects and treatment against infected persons are useful aspects of human health care and present work will add great relevance.

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