CHAPTER - 1

INTRODUCTION
Between too many people, there's no distinction between being venomous and poisonous. The term venomous means the capability of producing, storing and delivering venom. It is commonly associated with toxins being actively injected and the venom may not have any effect if consumed. The well known venomous animals are snakes, centipedes, bees, spiders and scorpions. Nevertheless, if one examine more closely, most phylum/class possess some venomous or poisonous members. Poisonous means the capability of producing and storing the poison. It is usually not actively delivered, as opposed to venomous animals, and the toxin if consumed is harmful. Dendrobatids (poison arrow frog) fits this definition.

Venom in general serves two purposes; one is to acquire food and secondly is for self-defense. The venom of scorpion causes widespread fear and fascination for scorpions. Some scorpion species venom can be equated to that of the cobra. Still others, matches that of Black Widow spiders, brown recluse and other 'horrors'. However, if taken into context, few would believe that they would not die or indeed suffer serious ill effects from most of the scorpion species stings. Even stings from the supposedly highly dangerous ones are seldom fatal though these definitely are not to be taken lightly. A Scorpion has long been of interest to humans primarily because of their ability to give painful and sometimes life threatening stings. Scorpions are venomous arthropods in the class Arachnida. There are currently 1500 recognized species of scorpions worldwide, out of which 99 of them
are found in India, like *Heterometrus swammardami*, *Mesobuthus tamulus*, *Chaerilus pictus*, *Euscorpiops bhutanensis*, etc, among which *Heterometrus bengalensis* is commonly found in West Bengal (Tikadar and Bastwade, 1983). Scorpions have an elongated body, ranging in a variety of colours and a segmented tail that is tipped with a venomous stinger. Out of 1500 scorpion species, 50 are dangerous to humans.

Scorpion venom is a water-soluble, antigenic, heterogeneous mixture, containing multiple toxins and other compounds. The most important clinical effects of envenomation are neuromuscular, neuroautonomic, or local tissue effects. The primary targets of scorpion venom are voltage-dependent ion channels like calcium (Zamudio *et al.*, 1997) and sodium (Bosmans *et al.*, 2005). A person who has been stung by a scorpion might feel a painful, tingling, burning sensation at the sting site leading to neurologic, respiratory, and cardiovascular collapse. The reaction at the sting site may appear mild; however, a person experiencing a serious reaction might develop severe symptoms throughout the body. These symptoms include numbness, difficulty in swallowing, a thick tongue, blurred vision, roving eye movements, seizures, salivation, and difficulty in breathing and death might also occur.

Scorpion stings are a major public health problem in many underdeveloped tropical countries, especially in a country like India, where not only any specific treatment but also the place providing the symptomatic treatments are not available. For every person killed by a
poisonous snake, a poisonous scorpion kills 10. Children and elderly persons are at the greatest risk for morbidity and mortality. A smaller child, a lower body weight, and a larger ratio of venom to body weight lead to a more severe reaction. A study was conducted of 901 cases of poisoning among 6959 cases of scorpion stings recorded between January 2002 and December 2006 from bites recorded in Beni Mellal. The results showed that poisoning strongly coincides with the summer period, especially in July and August. All age groups are affected by this disease with an average age of 17.28 ±17.91 years (Charrab et.al., 2009).

Historically, scorpion envenomations were treated with a "lytic cocktail" of barbiturates and narcotics to decrease the hyperdynamic state and involuntary muscle activity. However, this combination is no longer recommended. Because the clinical manifestations and severity of the symptoms vary among patients, the management of scorpion stings is individual specific. Treatment generally consists of moving the patient away from the scorpion and stabilizing the patient's airway and vital signs, followed by administration of antivenin and institution of symptomatic and local treatments. In a country like India, where there is limited supply of antivenin or antisera, against scorpion venom, the death due to scorpion stings are very common specially in rural parts of India where the symptomatic treatments are also not available. As mentioned earlier, that scorpion envenomation treatment
is very species specific, and very few specific antisera to particular species of scorpions are available.

The other mode of treatment includes herbal therapy, which are cheap, readily available treatments in the rural places where antivenin or symptomatic and local treatments are far from reach. Herbal medicine which is the oldest form of healthcare known to mankind has been used by all cultures throughout history. It formed an integral part of the development of modern civilization. Primitive man observed and appreciated the great diversity of plants available to him. The plants provided food, clothing, shelter, and medicine. Much of the medicinal use of plants seems to have been developed through observations of wild animals, and by trial and error. Opinions on the efficacy of herbal therapy range from complete skepticism to full confidence in the healing properties of herbs. While some herbs serves as the basis for a number of Western medications, other herbs do not as yet have the backing of scientific proof that they are as effective as folklore claims them to be. Still, there are many people who claim to have found relief from various ailments using herbs after receiving little or no relief from modern medicine.

The juice of fresh leaves, flower tops and slender roots of tulsi is a very good antidote for scorpion bite. The local people in India apply fresh housefly (Musca domestica) as first aid measure. Most frequently used herbs are Achyranthes aspera (locally known as Onga), Cleome viscosa, Euphorbia hirta, etc. Aqueous extracts of 64 plant species,
listed as animal or insect-bite antidotes in old Thai drug recipes were screened for their activity against scorpion envenomation (Uawonggul, 2006). In scorpion bite, the most frequently used herb, in India is *Achyranthes aspera* (locally known as Onga, Chirchita or Latkana) in which the whole plant is used against scorpion bite. The juice of the plant repels away the scorpion. Conventional treatment in Trinidad for scorpion stings makes use of steroids, antibiotics and the ananase enzyme (from the pineapple *Ananas comosus*). Juice of the fresh rhizome (*Arisaema flavum*) is applied to scorpion sting. In an *in vitro* test, addition of *Andrographis paniculata* and *Barringtonia acutangula* extracts strongly inhibited, in a concentration-dependent manner, the ileum contractions induced by scorpion venom (Jimenez-Ferrer et.al., 2005). In ayurvedic branch of medicine, an herbal oily mixture called Arka Taila (Arka Tailam) comprising of Sesamum oil, *Calotropis gigantea* (Arka) juice and turmeric are useful in relieving the pain and burning in scorpion and insect bites. As medicine 'Anantmool' or *Hemidesmus indicus* holds a reputed place in India. The roots are used in the treatment of scorpion sting. *Hemidesmus indicus* is reported to have anti-inflammatory activity against snake envenomation (Alam et.al., 1998b). *Pluchea indica* or certain standard drugs significantly inhibited inflammation and also lowers gastric damage, which are common symptoms of scorpion envenomation (Sen et.al., 1993). *Aristolochia indicus* has also been used in treating scorpion sting, locally (Hutt and Houghton, 1998). It was reported that *Andrographis paniculata* neutralized red scorpion venom activities (Brahmane et.al., 1998).
2010). These plants might have an important role in alleviating the symptoms associated with scorpion envenomation, which in turn might grant us with the time to provide proper antivenom against the scorpion sting. But no scientific evaluation has been done, on these three plants or their pure compounds to antagonize the actions of scorpion venom.

Scorpion envenomation is a universal problem especially in countries where only symptomatic treatments are available. It is expected that if any herbal clues could be developed it will help to minimize the problems related to scorpion envenomation as well as it will also be a major contribution to the drug development industries. And it is our duty to explore the natural ways, which are more compatible with human body and its environment, in any of the treatment protocol. Thus, if these natural plant products, which are easily available and cheap, could be used against scorpion sting, then it might help in better management of this problem especially in rural parts of our country.