AN OVERVIEW OF THE RESEARCH ON THE HEPATOTOXIC PLANT LANTANA CAMARA

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ABSTRACT

Lantana (Lantana camara Linn), a noxious weed, grows in many tropical and subtropical parts of the world. Ingestion of lantana foliage by grazing animals causes intrahepatic cholestatis and associated liver damage. The hepatotoxins are pentacyclic triterpenoids called lantadenes. Both ruminants (cattle, buffaloes, sheep and goats) and nonruminant animals like horses, rabbits, guinea pigs and female rats are susceptible to the hepatotoxic action of lantana toxins. Treatment of lantana toxicosis in animals is done by drenching with activated charcoal and supportive therapy. A number of biological activities have been associated with various parts of lantana, in folk medicine. Roots of lantana plant are rich in oleanolic acid, a hepatoprotective triterpenoid. Translactone-containing triterpenes from lantana leaves showed thrombin inhibitory activity and are lead compounds for drug discovery. Pentacyclic triterpenoids (the class of compounds to which lantadenes belong) are the focus of attention for drug research for anti-cancer, anti-AIDS, antiinflammatory and antimicrobial activities. Future research should be directed towards molecular taxonomy of Lantana spp., the new drug discovery based on natural products in different parts of the plant and investigations on toxicity and natural products chemistry of different taxa of Lantana in our country which have not been investigated so far.

Lantana camara (family: Verbenaceae) has spread as an intractable weed in many parts of the world. The ingestion of plant foliage by grazing animals causes hepatotoxicity. L. camara has been found in nearly fifty countries and is the principal weed in twelve countries. Lantana poisoning in livestock has been reported from India, the USA, Australia, Brazil, Indonesia, and Africa. Lantana was introduced into India in the nineteenth century and has spread all over the country. The plant is a serious weed in the hilly terrains as well as in the plains of the country. Weeds are known to inhibit the growth of neighbouring vegetation due to release of phytotoxins.

Lantana affects the animal husbandry activity in two ways: morbidity and mortality in grazing animals due to ingestion of lantana foliage and loss of fodder due to allelopathic action. The incidence of lantana poisoning varies from sporadic cases throughout the year to heavy outbreaks during drought or flood conditions when fodder is scarce. Incidence of lantana poisoning has also been reported during transportation of animals from lantana free regions to lantana infested areas or on leaving the animals for grazing in lantana infested localities after some period of stall feeding. Sporadic incidents of lantana poisoning in cattle, buffalo, sheep and goat have been reported in the Kangra valley while a heavy outbreak of poisoning in sheep and goats was reported from Rampur Bushier, H.P. Immediately after eating lantana foliage, the animals suffer from constipation and become anorexic. In the next 24-48 h the animals get jaundice and become photosensitive. Subsequently, eyelids, muzzle and other hairless parts
become swollen. Lantana poisoning has been demonstrated in cattle, buffaloes, sheep and goats. In a survey of Kangra valley of Himachal Pradesh in India, lantana poisoning was found to be the main cause of livestock mortality.

**Toxicity**

Two major components of lantana (*L. camara*) leaves are lantadene A (LA) and B (LB) (Figure 1). LA is toxic to sheep and guinea pigs. The nontoxic taxa either do not contain LA and LB or contain very small amounts. Because of its comparative toxicity and abundance, LA is the most significant toxic principle in the plant. Lantadene C (LC) induced hepatotoxicity in guinea pigs. A novel triterpenoid LD, was isolated from the leaves of *L. camara* var. *aculeata*. After absorption, the toxins are transported to the liver in portal blood. Lantana toxins resemble cholesterol and absorption of cholesterol is known to be facilitated by esterification with cholesterol esterase. However, it is not known whether the lantana toxins are absorbed in native form or after modification. It has been hypothesized that the bile canalicul membrane is site of primary injury by lantana toxins. Biotransformation and disposition of lantadenes in guinea pig as laboratory animal model has been investigated. Lantadenes could not be detected in liver, bile, gall bladder, blood and urine samples. LA, LB and their reduced derivates reduced lantadene A (RLA) and reduced lantadene B (RLB) and two unidentified metabolites could be detected in the contents of lower GIT and faeces. The intrahepatic cholestasis in lantana poisoning causes photosensitisation due to retention of phylloerythrin which is normally excreted in bile and jaundice due to accumulation of bilirubin, as a result of inhibition of bile secretion.

![Figure 1. Chemical structures of lantadenes](image-url)
Lantana poisoning was treated surgically by rumenotomy followed by removal of rumen contents and replacement with fresh/ artificial rumen contents. However, this treatment would be uneconomical when large numbers of animals are affected. Administration of activated charcoal at the rate of 500 g in 4 litres of electrolyte to sheep and 2.5 kg in 20 litres of electroyte to cattle, in the early phase of intoxication process, successfully treated the affected animals and did not cause elevation in plasma bilirubin in the sheep. This treatment should be started before the onset of absorption of the toxins. Administration of Bentonite (5g/ kg b.wt.) has potential as a cheaper alternative to activated charcoal for curing lantana poisoned calves, though the animals take a little longer to recover as compared to treatment with activated charcoal. Injection of LA and LB conjugated to BSA and haemocyanin elicited antibody production. However, only partial protection against lantana poisoning could be achieved by this method.

**Medicinal Properties**

Lantana is considered antiseptic, antispasmodic, carminative, and diaphoretic. Antiinflammatory, antipyretic and analgesic properties of extracts of *L. camara* leaves have been reported. Major natural products investigated in the lantana plant belong to the group of triterpenoids, flavonoids and other compounds. Most of the triterpenoids (lantadenes) isolated from the leaves of *L. camara* are pentacyclic and belong to the oleane series. LA, LB and LC are the major constituents of *L. camara* (Red flower variety) leaves, which grows abundantly in the temperate lower hills of Himachal Pradesh, Jammu and Kashmir and Uttar Pradesh. The profile of triterpenoids in the roots of *L. camara* is different from that in the leaves. Oleanolic acid is the major constituent of the roots of *L. camara*. A flavonoid isolated from lantana (*L. trifolia*) leaves, umuhengerin, exhibited antimicrobial activity. Triterpenoid ursolic acid showed antiinflammatory activity. Oleanolic and ursolic acids occurring in the stems, leaves and roots of *L. camara* and *L. tiliaefolia* have application as oral drug for human liver disorders, as antihyperlipidemic and as anti-tumour promotion agents. Verbasconsid isolated from the leaves of *L. camara* exhibited inhibition of protein kinase C and antitumour activity. Methanolic extracts prepared from leaves of *L. camara* were found to inhibit human thrombin. Twenty pentacyclic triterpenoids of the oleanane, ursane and lupane group and their transformation products from *L. camara* and *L. indica* exhibited antimicrobial activity against several pathogenic and non-pathogenic bacteria and fungi. Application of lantana flower extract mixed with coconut oil provided protection from Aedes mosquitoes (*Aedes albopictus* and *A. egypti*) bites.

**Further Reading**


Sharma, O. P. and Makkar, H. P. S. (1 98 1) Lantana- the foremost livestock killer in Kangra district of Himachal Pradesh. *Livestock Adviser*, 6: 29,

