



## Common Plants of Punjab that Cause Photosensitization

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### Abstract

Photosensitization is an abnormal sensitivity of the skin upon exposure to sunlight. It can occur when the animals consume plants containing photodynamic agents which then get accumulated in animal's mucous membranes. Often this problem occurs in Punjab during the summers and draught seasons when there is sufficient sunlight and more importantly, shortage of fodder as some of the plants mentioned are weeds which are not normally consumed by animals in considerable amount. In this article, we highlight some of the plants of Punjab causing potential photosensitization with the aim of making the farmers aware when their livestock is feeding on the said plants.

**Keywords:** Photosensitization; Photosensitivity; Dermatitis; Berseem; Lucerne; Plant Toxicity; *Lantana Camara*

### Introduction

Photosensitivity is an anomalous reaction of the body due to the abnormal presence of photodynamic pigments/compounds in the skin cells, cornea or mucus membranes, when exposed to the direct sunlight [4]. Exposure to sunlight/UV light, lightly pigmented areas of the skin and a photodynamic agent which reaches the skin via the systemic circulation are the three essential combined factors for photosensitivity to occur. It differs from sunburn as in latter the body reacts to excessive sunlight even in the absence of photodynamic substance in it.

### Mechanism of toxicity

In photosensitization, there is formation of unstable, high-energy molecules when there is a reaction between photons (light) and a photodynamic agent. These high-energy molecules can cause reactions with the substrate molecules of the skin, leading to the release of free radicals. These free radicals further cause an increase in the permeability of outer cell and lysosomal membranes. This leads to damage of the outer cell membranes which permits the leakage of cellular potassium and cytoplasmic swelling. This damage to the lysosomal membrane produces lytic enzymes into the cell. This further lead to skin ulceration, necrosis, and edema. The

time period between exposure to the photodynamic agent and the onset of clinical signs depends on the type of agent, its dose, and the exposure to sunlight.

### Types of photosensitization

Photosensitization is classified into 4 types based on the cause, viz., Type 1, Type 2, Type 3 and Type 4.

Type 1 is known as primary photosensitization. In this case, the photodynamic agent is directly ingested and it undergoes biotransformation in the gastrointestinal tract. From here it is absorbed into the systemic circulation and ultimately reaches the skin/mucous membrane. Upon exposure to UV light, the non-pigmented areas of the skin undergo local inflammatory reaction resulting in tissue destruction, cell death and skin slough off.

Type 2 is due to aberrant pigment metabolism where the photosensitizing agents are endogenous pigments which may be acquired or inherited.

Type 3 is also known as secondary or hepatogenous photosensitization which is of our main concern because Type 3 is the one

which most commonly occurs in animals [4]. Here, the plant containing the photodynamic agent is ingested and in the gastrointestinal tract of the animal, chlorophyll in the plant undergoes bacterial breakdown into phyloerythrin. This phyloerythrin results in liver dysfunction and/or obstruction of the bile duct along with local inflammatory reaction of the skin upon UV exposure.

Type 4 photosensitization is idiopathic, in which neither the pathogenesis nor the photodynamic agent is identified.

### Clinical signs

Typical symptoms of photosensitization seen are photophobia, lacrimation, erythema, edema, intense pruritis and necrosis of the skin. The necrosed area of the skin may slough off after 2-3 weeks which results in secondary bacterial infections. There is ascites and jaundice if the liver is affected as in case of secondary photosensitivity.

### Treatment

Remove the animal from the plant source consumed and from sunlight immediately. Keep it indoor for 1 to 2 weeks. Apply topical creams and ointments on the skin wound and consult a veterinarian immediately. The reports from field show that animals due to hepatogenous photosensitization upon treatment with antibiotics, antihistaminics, non-steroidal anti-inflammatory drugs (NSAIDs), steroids and immunoboosters depending on the symptoms show uneventful recovery [3].

### Here are the common plants of Punjab that cause photosensitization

#### *Brassica sp.*

This family of plants include many species like Turnip, Rape, broccoli, mustard, Kale, etc. In cattle, Brassica photosensitization is associated with increased activities of hepatic enzymes and raised phytoporphyrin (phyloerythrin) concentrations in serum [1,2]. Therefore, it is classified as Secondary or hepatogenous photosensitization and is responsible for typical symptoms in animals which might range from mild to severe.

#### *Heliotropium eichwaldi*

Its common name is Hathajori. Tropical heliotrope is annual to perennial growing plant which is safe in small doses but if consumed in large doses, is a slow acting liver toxin and produces sec-

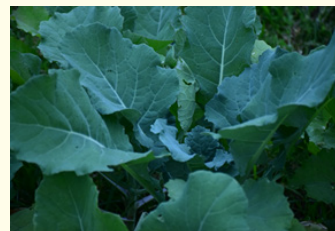


Figure 1

ondary photosensitivity in animal's body by causing atropic hepatitis. All parts of the plants are poisonous and the toxic principle is Pyrrolizidine alkaloid.



Figure 2

#### *Lantana camara*

It usually goes by the name Lantana in vernacular language as well and another common name is Raimuniya. All parts of the plants are toxic and the toxic principle is lantadene. It causes bile occlusion, potential liver damage and hence, is responsible for secondary photosensitization.



Figure 3

***Medicago sativa***

Common name of this plant is Alfalfa, Lucerne or Rijka. It's a very commonly available leguminous plant in Punjab which is used as forage for all bovines not only in the state but many parts of country. Its toxic principle is Pyrrolizidine alkaloid. The leaf of the plant is the main toxic part and thus, alfalfa hay in excess can potentially cause primary photosensitization.



**Figure 4**

***Tribulus terrestris***

Its common name is Puncture vine or Gokhuru. In Punjab it's commonly known as Bhakhra. Puncture vine is a problem annual weed that grows along with kharip crops like maize, pulses and some vegetable crops. Its toxic principle is steroidal sapogenin and also, a fungal toxin in the plant is associated with hepatogenic photosensitivity. It results in secondary photosensitization by causing bile occlusion.



**Figure 5**

**Conclusion**

Photosensitization is often encountered in livestock animals in North India and there have been many case reports regarding the occurrence of photosensitization related to some of the mentioned plants that can be avoided by proper management of the animal's feed. Photosensitization usually occurs sporadically and may not result in mortality, but rapid removal of affected animals from the source of the photosensitizing agent or provide protection from sunlight can result in rapid and complete recovery. We have highlighted a few important plants which cause photosensitization and there might be some that may have gone unmentioned but we highly advise farmers to be cautious with the plants that the livestock is consuming and the quantity being ingested while grazing or are being fed especially in seasons when fodder is scarce to avoid unnecessary suffering to animal and indirect losses to the farmer's economy.

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