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# **Lasiosiphon Anthylloides as a Poisonous Plant.**

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## HISTORY.

IN August, 1926, Mr. Dunning, Government Veterinary Officer, Dundee, reported heavy mortality in a flock of sheep belonging to Mr. C. F. Meintjes, Dundee, and submitted for examination a specimen of a plant, the ingestion of which he believed to be the cause of death. Portion of this plant was pressed and forwarded to the Division of Botany for identification, being determined as *Lasiosiphon anthylloides*, Meisn.

As far as could be ascertained, the sheep amongst which the deaths occurred had recently trekked from the Orange Free State to Dundee, and the first death had occurred shortly after their arrival at their present pasture.

According to Phillips, *Lasiosiphon anthylloides*, Meisn, was first brought to the notice of the Division of Botany in October, 1922, as a suspected poisonous plant, but at that time, owing to the incomplete material to hand, the identity of the plant could not be determined accurately. The Division of Veterinary Education and Research received a quantity of material from Mr. Gys Uys, Stillewoning, P.O. Memel, Orange Free State, and carried out feeding tests, some of which were of a positive character. On the other hand, some sheep drenched with the material showed no reaction. This plant was subsequently identified as *L. anthylloides*.

Further feeding tests were carried out with the same results as before, i.e. it proved fatal to some sheep and not to others.

Phillips appears to be of the opinion that the Division of Veterinary Education and Research has proved that the plant does possess toxic properties, but believes that its wide distribution in South Africa, and the fact that it has only recently been brought to notice as a poisonous plant, leads one to the conclusion that it is responsible, probably, for only isolated cases of vegetable poisoning.

## THE PLANT.

*Lasiosiphon anthylloides* is a member of the family Thymeleaceae, a family represented in this country by nearly 170 species, widely distributed. Amongst the natives of South Africa several members of the family Thymeleaceae are highly valued as medicinal plants, this being more particularly true of the species *Lasiosiphon*, which is used as a tonic and blood purifier and in the treatment of sore throat.

Among the better known species in South Africa are:—

*Arthrosolen gymnostachys*, C. A. Mey.—In Basutoland, the leaves are smoked to relieve headache.

*Lasiosiphon linifolius*, Done.—The roots are washed, scraped, and shredded, and, after drying, smoked and the fumes inhaled. This is said to be a cure for inflammation of the lungs. The ground

root is also used as a snuff for headache. A chemical examination of the root showed that it contained an amorphous resin, but yielded nothing else of chemical interest.

*Lasiosiphon meisnerianus*, Endl.—The roots are used by natives as a cure for snake bite, the dose being  $\frac{1}{2}$  to  $\frac{3}{4}$  oz. of dried root, but sometimes both the leaves and the root are used. The chief constituent of the root is an amorphous resin.

*Lasiosiphon kraussii*, Meisn.—A decoction of the plant is used in Basutoland to bathe wounds and bruises. It is stated to be poisonous.

*Lasiosiphon anthylloides*, Meisn.—This is an undershrub with lemon-yellow flowers. Stems erect, much branched from the base, branches virgate, terete, bark light brown, scarred in the lower portion by base of leaves, glabrous; upper leafy portion pilose with long white hairs, densely so near apex. Leaves alternate, exstipulate, very shortly petiolate, linear-oblong to elliptical, the upper ones near the flower heads much the largest; quite entire, acute at apex, rounded at base, pilose beneath, and ciliate with long white hairs, the young ones densely so;  $\frac{1}{2}$  to  $1\frac{1}{4}$  inch long, 2 to 5 lines wide; petioles  $\frac{1}{2}$  to 1 line long, thickened. The inflorescence is in terminal, many flowered, bracteate heads. Bracts 10 to 15 or more, gradually passing into the true leaves; lanceolate; 8 to 12 lines long, 2 to 4 lines wide. Receptacle is flat and honeycombed. The disk is anular. Perianth tubular, pilose externally, circumscissile above the base, the lower portion enclosing the ovary and eventually hardening round it; upper and deciduous portion cylindrical, widening a little below the throat. Limb 5-lobed, lobes oblong, spreading or a little recurved. Scales 5, alternate with lobes, very minute or occasionally absent. Stamens 10, in two rows, inserted a little below throat; upper row a little exerted, lower included; filaments very short; anthers lanceolate, 2-celled. Ovary enclosed in the persistent base of perianth tube, sessile, 1-celled, 1-seeded, pilose in upper portion; style lateral, filiform; style capitate bristly, included or exerted. Seeds  $2\frac{1}{2}$  lines long, testa crustaceous.

It is rather a showy plant when in flower, and is known to the native as "Indolo." The flowers are fragrant, especially in the evening. According to Dr. Andrew Smith, M.A., the dried root of this species is used medicinally by natives in the Cape Province, and also as a remedy for snake bite. He also says: "If a fragment is chewed, it is nearly tasteless at first, but its burning quality is presently developed. Great caution must be used as to the quantity administered. It becomes a question whether the roots of the *Lasiosiphons* might not be employed with advantage in minute doses as a substitute for arsenic (Fowler's solution), or to make a lotion for the throat in place of a solution of lunar caustic. They would be much safer than either."

It is worthy of note that the native employed to pound up the material (*vide seq.*) for feeding, and the assistants who carried out the feeding, suffered great inconvenience and discomfort, since working with the plant causes a marked irritation of the buccal, nasal, and pharyngeal mucosa, followed by persistent coughing and sneezing, and subsequently a violent headache accompanied by a feeling of nausea. It was found essential either to wear a mask or to plug the nostrils with cotton wool and breath through the mouth covered with a handkerchief.

*Distribution of the Plant.*—The following is the distribution of the species and its two varieties:—

Districts of Riversdale, George, Knysna, Uitenhage, Port Elizabeth, Albany, Bathurst, Kingwilliamstown, Komgha, Stockenstrom, Graaff-Reinet, Somerset, Pretoria; also in Pondoland and Basutoland. In Natal chiefly along the coast districts, but extending to 2,000 feet or more above sea-level.

*Feeding Tests: Animals.*—The plant was fed to adult sheep, cattle, and horses. It was subsequently found that the sheep used were suffering from a concurrent panverminosis (*stilesia hepatica*, *cysticercus echinococcus*, *cysticercus tenuicollis*, *oesophagostomum columbianum*), but this could have had no material bearing upon the results obtained.

The cattle used had previously been infected artificially with *T. congolense* (December, 1925), but had apparently recovered, no parasites having been found in the blood for several months and the animals being in fair condition. On post-mortem examination a marked hepatitis bacillaris necroticans was evidenced, apparently unconnected with the feeding tests. No trypanosomes were seen in smears from the spleen, liver, bone-marrow, heart-blood, or peripheral circulation.

The horse used was of the type of ordinary horse-sickness serum animal.

#### CONDITION OF PLANT WHEN FED AND METHOD OF FEEDING.

The plant when fed was in the early flowering stage. As the material submitted contained a large portion of hard woody stems, unsuitable for feeding, and which normally would not be eaten by stock, the leaves, flowers, and younger, more succulent, stems only were used. These were air-dried for about four days until the moisture-content was such that they could be pounded into a coarse powdery mass in a large mortar and pestle. The quantities fed were weighed out in this condition, then moistened with water to the consistency of a thick paste, and forcibly fed to the sheep and cattle by placing it on the back of the tongue with a spoon.

For the horse, water was added to bring the consistency to that of thin cream and then forcibly drenched with a drenching-bottle.

*Feeding Tests.*—When the report was first made only a single sheep (DOB. 827) was available.

On the 15th August, 1926, this animal was placed in a loose-box bedded with sawdust and allowed water, but no feed for twenty-four hours. In order to determine whether the plant would be eaten voluntarily, a few young leaves and stems were placed in a trough, and these were eaten immediately. A weighed quantity,  $3\frac{1}{2}$  oz., was then put in the trough; a few mouthfuls were taken but the remainder was refused. It was then mixed with finely chopped lucerne, and of this only a small quantity was eaten. Consequently there is no record available of the actual amount of the plant ingested by this sheep.

On the 17th August the sheep was apparently normal, but not feeding well.

18th August: Sheep visibly ill. Dull, listless, drooping ears, and standing in a corner of the loose-box with head down and feet drawn together under the body. Temperature 105·4; pulse 120 hard and wiry; respirations 48; costo-abdominal and laboured. Foetid green diarrhoea. Not feeding.

19th to 20th August: Condition unchanged. Animal tethered during day in open green pasture, but refused to feed.

21st August: Dead. Immediately before death animal was lying down evidently in great pain. Temperature 107. Respirations hurried and painful. Pulse almost imperceptible, the artery appearing cord-like under the finger.

*Post-mortem.*—Slight hydropericardium; subepi-, subendo-, and myocardial haemorrhages; catarrhal gastro-enteritis plus haemorrhagic colitis.

As a result of the positive finding of the above tentative test it was decided to carry out a series of tests with sheep, cattle, and horses.

#### SHEEP.

7th August, 1926 (in the afternoon):—

D0B. 614 fed 4 oz. *Lasiosiphon anthylloides*.

D0B. 616 fed 2 oz. *Lasiosiphon anthylloides*.

D0B. 615 fed 1 oz. *Lasiosiphon anthylloides*.

D0B. 617 control. All sheep having access to green fodder and lucerne-hay.

D0B. 614 (4 oz.), 8th August: Found dead in box at 6 o'clock in the morning, the cadaver showing rigor and being cold, indicating that death had taken place early in the night.

*Post-mortem.*—Slight ascitis, hydrothorax and hydropericardium; subendocardial haemorrhages; bile stasis and slight hepatic cirrhosis. *Cysticercus echinococcus* in liver plus stilesia hepatica in larger bile ducts. Tumor splenis plus hyperplasia of the Malpighian bodies. Gastric hyperaemia plus hyperaemia of *intestinum tenue*.

D0B. 616 (2 oz.), 8th August: Not feeding. Standing in box with legs drawn under the body, ears drooping, head down, and a haggard expression on the face. Pulse 116, hard and wiry. Respirations 38, costo-abdominal and panting. Slight diarrhoea. Temperature 105.2° F.

9th August: Dead.

*Post-mortem.*—Ascitis, hydrothorax and hydropericardium; subendocardial haemorrhages; red hepatitis of right apical lobe of lung; catarrhal rhinitis and laryngitis; tumor splenis; omasal hyperaemia; haemorrhagic gastritis and duodenitis plus marked hyperaemia of *intestinum tenue*. Stilesia hepatica in larger bile ducts; oesophagostomum columbianum nodules numerous.

D0B. 615 (1 oz.), 8th August: Apparently normal, but not feeding well.

9th August: Not feeding; dull, listless, drooping ears; disinclined to move and huddled up; respirations 40, costo-abdominal and panting; pulse 128, pressure high; conjunctiva pink; slight diarrhoea.

10th August: Temperature 103.6° F.; not feeding; general symptomatology unchanged except diarrhoea profuse and evil smelling.

11th August: Temperature 104.6° F.; not feeding and flanks much depressed; respirations 30 and mainly costal in nature, inspirations short and sharp, expirations prolonged and sometimes showing a double movement; diarrhoea profuse and animal evidently suffering great abdominal pain.

12th August: Diarrhoea abating slightly, otherwise condition unchanged.

13th August: Temperature 104·6° F.; pulse 108, fair excursion and pressure; general habitus much brighter; respirations 18, costal; inspiration short and sharp, expiration prolonged; diarrhoea abating; nibbles occasionally at food.

14th August: Temperature 103° F.; animal emaciated; feeding slightly; respirations as before; pulse 120; small excursion poorly maintained; faeces normal.

15th August: Dead.

*Post-mortem.*—Hydropericardium; subendocardial haemorrhages; bile stasis; cysticercus echinococcus and stilesia hepatica in liver; calcified cysticerci in omentum; slight catarrhal gastro-enteritis.

D0B. 617: Control. On 30th August, 1926, this sheep was discharged, and at no time did it show any departure from normality.

### *Bovines.*

D0B. 414: The animal used for this test was a small heifer of about 400 lb. live weight. This heifer had been spayed about six weeks previously, and since the operation had shown vague symptoms of pulmonary and intestinal disorder, no definite diagnosis being possible from the clinical picture.

22nd September: 12 noon, fed 12 oz. *L. anthylloides*.

3.30 p.m., definite signs of uneasiness shown; salivating.

4.30 p.m., temperature 101·6° F.; animal much distressed and repeatedly lying down and getting up. When lying down, head thrown back against the flank. Intermittent groaning and grinding of the teeth. Profuse salivation. Animal died during the night.

*Post-mortem.*—General diffuse blue discoloration from previous trypan blue injection; subendo- and epicardial haemorrhages. Broncho-pneumonia; tumor splenis and hyperplasia of Malpighian bodies Reticular and omasal hyperaemia; gastro-intestinal hyperaemia.

D0B. 384: This animal was apparently recovering from artificial *T. congolense* infection. About 600 lb. live-weight.

27th September: Fed 6 oz. *L. anthylloides*.

28th September: Temperature 100° F.; not feeding; respirations 20; costo-abdominal. Salivation and serous nasal discharge; grinding of teeth; slightly huddled up.

29th September: Temperature 101·2° F.; nasal discharge and salivation profuse; intermittent grunting and grinding of teeth; slight diarrhoea and increased micturition.

30th September: Not feeding; nasal discharge and salivation decreased; faeces normal; micturition increased; animal disinclined to lie down and showing marked signs of uneasiness. Turned out into paddock during day, but makes no attempt to graze. Thirst marked.

1st October: Temperature 102·2° F.; not feeding; profuse dark coloured diarrhoea; pulse 40, good excursion fairly well maintained. Respirations 25, mainly costal in nature; inspiration sharp, expiration prolonged and accompanied by a groan. Increased micturition.

2nd to 5th October: Condition practically unchanged. Animal refuses all dry food, but occasionally takes a few mouthfuls of green grass. Marked thirst and increased micturition; profuse diarrhoea; emaciation fairly rapid.

6th October: Animal now very weak, lying down and disinclined to move; pulse 56, weak; respirations as before; subcutaneous emphysematous swelling on abdominal floor and left flank.

7th October: Condition unchanged.

8th October: Dead.

*Post-mortem.*—Hydrothorax and ascitis; subendocardial haemorrhages; tumor splenis and hyperplasia of Malpighian bodies; fatty degeneration of liver plus focal bacillary necrosis; bile stasis; renal hyperaemia; haemorrhagic gastro-enteritis, colitis and proctitis; focal ruminal necrosis.

D0B. 185: This animal was an adult Friesland ox, apparently recovering from artificial *T. congolense* infection. Approximately 1,000 to 1,200 lb. live-weight.

14th October: Fed 6 oz. *L. anthylloides*.

The observations on this animal differed in no respect from those made on D0B: 384, and this test turned out to be merely a duplication.

26th October: Dead.

*Post-mortem.*—Hydrothorax ascitis; cachexia; pleuritis; peritonitis; pulmonary congestion and oedema; slight tracheitis; acute bronchitis and pulmonary emphysema; pericarditis; fatty degeneration and focal bacillary necrosis of liver; tumor splenis; nephritis chronica; haemorrhagic gastro-enteritis, colitis, proctitis, necrotic areas of mucous membrane of rumen (ruminal ulcers).

#### *Equines.*

D0B. 315/16596, 14th October: Drenched with 12 oz. *L. anthylloides* at noon.

15th October: 8.30 a.m. Animal apparently normal, except not feeding, and showing traumatic lesions on lips and buccal mucosa as a result of forcible drenching.

10.30 a.m. Showing signs of uneasiness; pawing the ground and moving from side to side in stall; respirations 28, mainly costal, and expiration occasionally accompanied by a grunt; pulse 64, hard and wiry.

12 noon. Animal died during a violent attack of colic.

*Post-mortem.*—Slight ascitis and hydropericardium; atrophy of the spleen pulp; slight hepatic pigmentation; slight pulmonary hyperaemia; glossitis and pharyngitis; acuta catarrhalis; dilatation of intestinum tenue; gastro-intestinal hyperaemia; *dictyocaulus arnfeldi* in bronchi; numerous *gastrophilus equi* larvae.

#### SUMMARY AND CONCLUSIONS.

The feeding tests carried out indicate clearly that *L. anthylloides*, at least at the flowering stage, contains a poisonous principle in the combined flowering heads, leaves, and less woody stalks, which is extremely toxic to sheep, cattle, and horses.

It is doubtful whether animals maintained under good hygienic conditions would ever voluntarily graze the plant, but experience has shown, e.g. the case amongst sheep at Dundee, that under certain conditions the plant may cause heavy mortality in a manner closely resembling that of a highly infectious disease with a fatal termination. The factors which come into consideration are:—

- (1) Trekking from an area where the plant is unknown to an area where the plant abounds.
- (2) Drought and overstocking the natural grazing, with the result that the noxious plants begin to preponderate.

*Symptomatology* (under experimental conditions).

When comparatively large quantities of the plant are fed, e.g. 4 oz. to sheep and 12 oz. to cattle and horses, death follows so quickly that no symptoms, other than those of acute abdominal pain, are evidenced, i.e. the toxic principle appears to act in the manner similar to that of a corrosive poison.

Ingestion of the plant in smaller quantities is immediately followed by complete anorrhœxia, which persists until death ensues. In those cases where death is delayed for several days a clinical picture is exhibited resembling that produced by a severe gastro-intestinal irritant. The respirations are increased in frequency, chiefly costal in nature, inspiration being sharp and expiration prolonged, often with a double movement, and usually accompanied by a grunt or groan. The pulse becomes hard, wiry, and frequent, indicative of acute pain. This pain is one of the cardinal symptoms of an inflammatory process, which clinically may be identified with the initial portion of the alimentary tract owing to the incidence of diarrhœa some time after the first manifestations of pain and the alternating diarrhœa and constipation. Increased salivation, thirst, and profuse urination are clearly in evidence. Graphical recording of the daily temperature shows a curve closely resembling that obtained in the course of an acute infectious disease. This must be considered to be due not to the toxin as such, but to the inflammatory changes initiated by the toxin in the alimentary tract.

When death is delayed for as long a period as twelve days after the ingestion of small quantities of the plant, e.g. 6 oz. by a large adult bovine, the animal probably succumbs to a generalized intoxication as a result of the intestinal inflammatory changes.

*Minimum Toxic Dose.*—From the experiments, it would appear that the minimum toxic dose closely approximates 1 oz. in sheep, 6 oz. in horses and cattle, since, when these quantities were fed, the animals lived for periods up to twelve days, and in each case showed signs of recovery before ultimate collapse supervened.

*Pathological Anatomical Changes.*—These resemble in every respect the changes that would theoretically be expected from the ingestion of a toxic substance which is easily assimilated.

In the peracute cases the only constant finding is a markedly pronounced gastro-intestinal hyperaemia. This hyperaemia extends up as far as, and including, the mucosa of the rumen, though the most marked alterations are to be found in the abomasum and initial portion of the *intestinum tenue*.

In the subacute and chronic cases this hyperaemia is followed by a marked haemorrhagic gastro-enteritis, and in the majority of cases a severe haemorrhagic proctitis makes its appearance. In addition, there is encountered ascitis, hydropericardium and hydrothorax, together with pulmonary oedema and subendo- and epicardial haemorrhages. In most cases a distinct renal hyperaemia is seen.

In two cases a distinct condition of ruminal ulceration was found, but whether this is directly associated with the phytotoxin or not is not known.

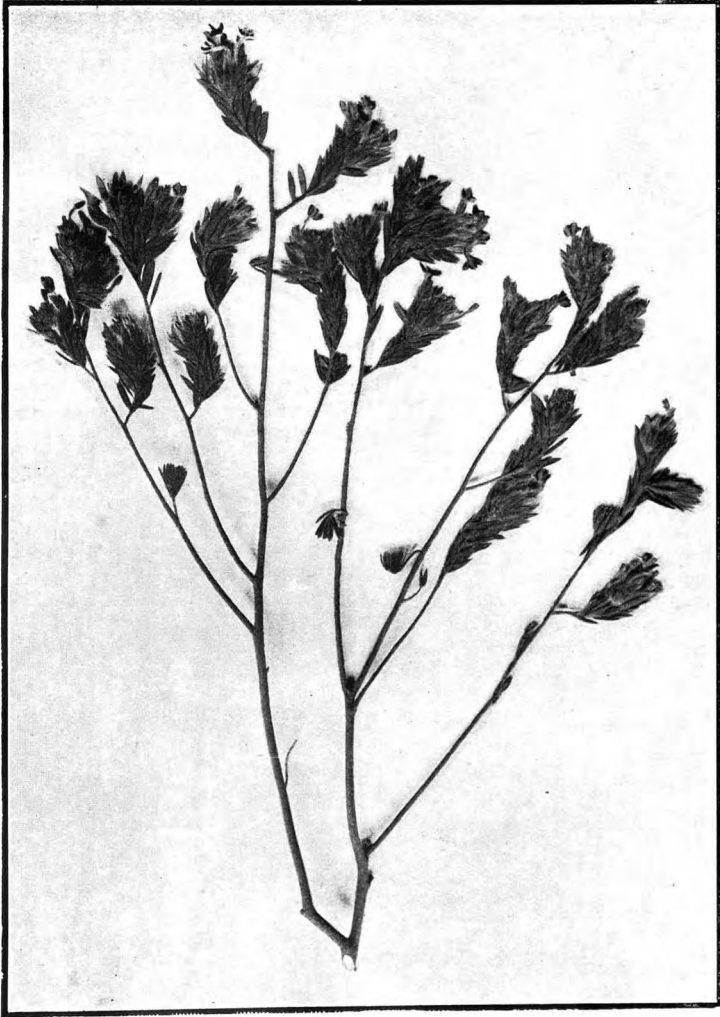
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Animal.	Amount Fed.	Period before Symptoms appear.	Chief Symptoms.	Duration.	Termination.	Post-mortem Appearance.
Sheep D0B 827	?	3 days	Dull, listless, abdominal pain; hard, wiry, and rapid pulse; increased respirations; diarrhoea; anorhoxia; temperature up to 107° F. immediately before death	6 days	Death	Hydropericardium, subepi-subendo- and myocardial haemorrhages. Catarrhal gastro-enteritis and haemorrhagic colitis.
Sheep D0B 614	4 oz.	Few hours	No symptoms observed.....	Few hours	Death	Ascites, hydrothorax, and hydropericardium; subendocardial haemorrhages. Gastric hyperaemia and hyperaemia of intestine tenue.
Sheep D0B 616	2 oz.	12 hours	Dullness; anorhoxia and abdominal pain; hard, wiry, and frequent pulse; increased respirations; slight diarrhoea; temperature rose to 105.2° immediately before death	2 days	Death	Ascites, hydrothorax and hydropericardium; subendocardial haemorrhages. Catarrhal rhinitis and laryngitis; omasal hyperaemia; haemorrhagic gastritis and duodenitis; marked hyperaemia of intestine tenue.
Sheep D0B 615	1 oz.	24 hours	Symptoms as before, except that animal showed signs of recovery before collapse and death. Maximum temperature 104.8° observed on the sixth day.	8 days	Death	Hydropericardium and subendocardial haemorrhages; slight catarrhal gastro-enteritis.
Bovine D0B 414 (400 lb.)	12 oz.	3 hours	Distress; abdominal pain; salivation; groaning and grinding of teeth	12 hours	Death	Subendo- and subepicardial haemorrhages. Reticular, omasal and gastro-intestinal hyperaemia.
Bovine D0B 384 (600 lb.)	6 oz.	12 hours	Anorhoxia; abdominal pain; salivation; grinding of teeth and grunting; diarrhoea; increased micturition; marked thirst; rapid pulse and increased respirations. Later emaciation. Temperature rose to 103.8° on 6th day and subsided by lysis	11 days	Death	Hydrothorax and ascitis; subendocardial haemorrhages. Renal hyperaemia; fatty degeneration of liver plus bile stasis; haemorrhagic gastro-enteritis; colitis and proctitis; focal ruminal necrosis.
Bovine D0B 185 (1,000 lb.)	6 oz.	12 hours	As above, except that the temperature curve was markedly irregular and subsided by crisis	12 days	Death	As above.
Equine D0B 315	12 oz.	20 hours	Extreme abdominal pain.....	24 hours	Death	Ascites and hydropericardium; pulmonary hyperaemia; glossitis and pharyngitis; acuta catarrhalis; dilatation of intestine tenue; gastro-intestinal hyperaemia.



*Plate 1.*

*Laiosiphon Anthylloides (Meisn).*

*Laiosiphon Anthylloides.*]

[*Alexander.*