A REPORT ON UNCONDITIONED FOOD ADDICTION FOR THE *IPOMEA CARNEA* PLANT IN GOATS


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ABSTRACT

Unconditioned food addiction is a rare phenomenon in goats. The marssilin like content existing in the *Ipomea carnea* plant is responsible for addiction of goats towards the respective plant. In addition, the plant contains two toxic principles, swainsonine and calystegines which induce lysosomal storage disease; a condition characterized by neurological impairments and generalized cytoplasmic vacuolation of various tissues of the body. In case 1, a doe with a history of dilated pupils, continuous head shaking, rolling of eyeballs, hyperexcitability, strabismus, severe incoordination, and ataxia was presented to the hospital. Based on the history, the condition was identified as unconditioned food addiction of the goat towards *Ipomea carnea*. In case 2, the goats with Ipomea addiction, were aborted at mid and later stages of gestation. In case 3, the serum SGPT, SGOT, Glucose, BUN, and Creatinine levels have decreased after complete food aversion through stall feeding. The phytochemical analysis conducted to find the anti nutritional factors of *Ipomea carnea* leaves revealed the presence of steroids, saponins, alkaloids, tannins, flavonoids, and Glycosides.

KEY WORDS: *Ipomea carnea*, Unconditioned food addiction, goats, Antinutritional factors.

INTRODUCTION

India contributes largest livestock population in the world. But, the inadequate feed resource has been one of the major constraints in India; the country is short of dry fodder by 11%, green fodder by 28%, and concentrate feeds by 35% (NIANP, 2005). Due to the low availability of forages, livestock in India were more likely to eat unconventional plants, especially during drought and scarcity periods. Among them, certain poisonous plants often cause serious livestock losses. *Ipomoea carnea*, an aquatic leguminous plant found in the wetlands of India as well as the tropical countries is an evergreen plant blooming throughout the year (fig 1.0). The genus Ipomoea occurs throughout the tropical and subtropical regions of the world with more than 500 species (Mabberley, 2008).

![Ipomea carnea plant](image)

FIGURE 1. *Ipomea carnea* plant
Unconditioned food addiction for the *Ipomea carnea* plant in goats

Ganesh (2008) and Deshmukh (2012) reported that the amphibious weed, *Ipomoea carnea* is one of the most productive perennial shrubs vine of India growing profusely on water bodies and adjoining marshy lands, often jostling out most other plant species. *Ipomea* species are generally known as “poison peas”, and sheep/goats eating them develop a syndrome called “pea struck” (James et al., 1970; Hartley et al., 1989). In Andhra Pradesh, major part of the state belongs to coastal area (also called as coastal Andhra) in which the distribution of this plant is abundant. Among the *Ipomea* species, *Ipomoea carnea* ssp. fistulosa (Common name: Thutukada in telugu and Morning glory in English) is the commonest species found in the Coastal Andhra region (Sharma, 2010). Further, the state is blessed with huge goat population of about 22.3 million (GOI, 2012), which are more prone for the poisoning, especially in rural areas. Even though, goats don’t prefer the *Ipomea* plant, the feed scarcity and drought period compels them to feed on these evergreen blooming shrubs. Fascinatingly, the goats will unconditionally get addicted to this plant, due to the presence of a component similar to marsilin, a sedative. Further, Swainsonine, a phytotoxin is known to present in *Ipomea carnea* plant which is reported to produce inimical disorders in livestock on continuous feeding. Natural intoxication occurs in livestock that chronically ingest the plant, and the early poisoning reports were also reported from Sudan and India (Idris et al., 1973; Tirkey et al., 1987). In addition to that, the toxicity has been confirmed in feeding experiments with goats and sheep (Damir et al., 1987; de Balogh et al., 1999). Often, few cases of Ipomea poisoning, those lead to abortion and other reproductive and physiological dysfunctions have been reported in Brazil (Armien et al., 2007; and Oliveira et al., 2013), Peru (Molyneux et al., 1991), and Mozambique (De Balogh et al., 1999). Furthermore, behavioural results indicate that goats fed higher doses of *I. carnea* leaves spent less time paying attention to the newborn in the two hours after birth, as they sniffed and licked the kid with less frequency than did by unfed group (Gotardo et al., 2016). In this context, a report on unconditioned food addiction to *Ipomea carnea* plant and its effect on the reproductive, and physiological functions was stated; and the respective plant leave was examined for the presence of various anti-nutritional factors, which are deleterious to the animals.

**MATERIALS & METHODS**

**Clinical manifestations of the Cases:**

**Case 1:**
A doe of one year age weighing around 15kg was presented to veterinary dispensary, mandapaaka, West Godavari (district), with a history of anorexia, continuous head shaking, rolling of eyeballs and high coloured urine. The goat was unable to stand and attained sternal recumbence (fig 2.0) with nervous signs like dilated pupils (fig. 3.0), continuous head shaking, rolling of eyeballs, hyper excitability, strabismus, severe incoordination, and ataxia. The rectal temperature was 40°C with heart rate @ 92 BPM. The farmer reported that the goat has been consuming the *Ipomea carnea* plant since 4 months period.

**Case 2:**
Two foetal death cases in goats, reported at the veterinary dispensary of Cumbum, and B.Peta Mandal of Prakasam (district), Andhra Pradesh had a history of continuous consumption of Ipomea plant leaves, since 2 months period. The former goat was aborted around 10th week (mid gestation) (fig 4.0), and the latter around 18th week (late gestation) (fig 5.0) of gestation.

**Case 3:**
A Buck of 8 months age weighing around 13 kg was presented to veterinary dispensary, Porumaamilla, Kadapa (district), with a history of anorexia. The farmer was questioned and confirmed that the goat was addicted to the *Ipomea* plant. Although, no nervous signs were noticed, the goat was weak and anemic. The goat was stall fed and not sent for grazing for 3 weeks, as a part of aversion therapy. The blood samples were collected from the jugular vein of the goat, before and after Ipomea aversion to carry out different laboratory and biochemical tests by standard kits (Erba Mannheim Kits).

![FIGURE 2. Sternal recumbency in goat poisoned by Ipomea carnea plant consumption](image-url)
Forage Analysis
Fresh leaves of *Ipomea carnea* plant were collected, washed under tap water and shade dried for 48 hours. The samples were finely ground and the chloroform and ether extracts were prepared by using Soxhlet apparatus. Later, the extract was tested for the presence of bioactive compounds by adopting standard procedures given by Harborne (1984). The extract was subjected to Hagers test (Alkaloids), Salwoski test (steroids and sterols), Baljet test (Glycosides), Zinc hydrochloride test (Flavonoids), Saponin test (Saponins), Ferric chloride test (Tannins) to detect the respective phytochemicals.

**Hagers test:** To the extract add few drops of saturated solution of picric acid. Yellow colour precipitation signifies the presence of Alkaloids.

**Salwoski test:** To the extract add few drops of chloroform followed by concentrated sulphuric acid. Appearance of bluish red to cherry red colour indicates the presence of steroids and sterols.

**Baljet test:** To the extract add picric acid. Appearance of orange color signifies the presence of Glycosides.

**Foaming test:** Foams produces when the extract is shaken with water due to the presence of Saponins.

**Zinc hydrochloride test:** To the extract added zinc dust, 1-2 drops of concentrated hydrochloric acid. Appearance of red color indicates the presence of Flavonoids.

**Ferric chloride test:** To the extract add ferric chloride. Formation of greenish black colour shows the presence of Tannins.

RESULTS
The goat (Case 1) was treated with 5% DNS @ 10 ml/kg B.wt (iV), Ringers lactate @ 10 ml/kg B.wt (iV), Atropine sulphate @ 0.1 mg/Kg B.wt and tribivet @ 2 ml/15 kg B.wt (i/m). Fluid therapy was continued for five days. Although slight improvement in appetite and mild reduction of nervous signs were noticed, no complete recovery was seen. The goat (Case 1) preferred consuming the Ipomea plant even in recumbent position, and this phenomenon shows strong addiction developed by the goat towards *Ipomea carnea* plant. The mean SGPT (IU/L), SGOT(IU/L), Glucose (mgs/dl), BUN (mgs/dl), and Creatinine (mgs/dl) contents before and after aversion were 72.5, 185.4, 52.8, 19.4, and 1.24; and 48.6, 128.6, 62.5, 18.0, and 0.94 respectively (Table 2.0).

The phytochemical analysis of the plant leaves revealed presence of steroids, alkaloids, tannins, flavonoids and Glycosides in the Chloroform extract and Saponins, tannins and Glycosides in the Ether extract (Table 1.0).

**TABLE 1.** Phytochemical profile of the *Ipomea carnea* plant leaves

<table>
<thead>
<tr>
<th>Component</th>
<th>Chloroform Extract</th>
<th>Ether Extract</th>
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<tbody>
<tr>
<td>Steroids</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Saponins</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Tannins</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Cyanogenic glycosides</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**DISCUSSION**
Clinical recovery occurs following cessation of ingestion of the toxic plant by affected animal. However this may not be possible if the plant is consumed for up to 120 days. Recovery at intial stages is associated with complete reversal of all clinical signs (Radostitis et al., 2006; de Balogh et al., 1999; and Barbosa et al., 2007). However, animals that have developed addiction and continue to
ingest this plant in preference of other feed need to be culled (Barbosa et al., 2007).

In case - 1, the goat took lower quantities of Ipomoea sp shrubs earlier followed by addiction and continuous consumption of the plant. The similar reports of food addiction were shown by Schumaher-Henrique et al. (2003); Armien et al. (2007); Oliveira et al. (2009); and Elvio et al. (2012). The clinical signs showed in the present study such as cephalic tremors, nystagmus and difficulty in standing were in close conformity with the earlier workers (Tokarnia et al. 2000; Armien et al. 2007; and Elvio et al. 2012). Further, Oliveira et al. (2009) reported marked in coordination of limbs and recumbency of a goat fed with Ipomoea plant. In case 2, the goats were aborted at mid (10 weeks) and later (18 weeks) stages of gestation. Similar reports of reproductive dysfunctions in Ipomoea poisoning were given by Oliveira et al. (2013), Molyneux et al. (1991), and De Balogh et al. (1999). Later, Gotardo et al. (2012) revealed that consumption of 7.5 g/kg BW of I. Carnea leaves by pregnant goats result in fetal death, abortion, stillbirths, cytoplasmic vacuolation in the fetal CNS, and structural and functional changes in the offspring. In case 3, the SGPT and SGOT were increased due to fat mobilization because of Negative energy balance caused by anorexia, hepatic damage, and hepatic lipidosis. Increased BUN and Creatinine suggested involvement of kidney due to catabolism (Vasava et al., 2016). Hypoglycemia may be due to dietary deficiency of net energy caused by anorexia. The shrub contains several alkaloids, mainly swansonine which inhibits lysosomal α-mannosidase and Golgi mannosidase II (Colegate et al. 1979; Molyneux and James, 1982). The intoxication induces enzymatic dysfunction and the accumulation of complex oligosaccharides in lysosomes. As a sequela, vacuolation becomes evident in different cells, mainly in neurons. The alteration of glycoprotein synthesis may be clubbed with endocrine dysfunction, cardiovascular and gastrointestinal injury, neural and immune disorders (Hueza et al., 2003; Armien et al., 2007). In case of entire flock addiction, aversion of craving can be done by treating with Lithium Chloride @ 200 mg/kg bwt (Carlos et al., 2014). The extent of clinical signs and complications is dose-dependent. Elvio et al. (2012) reported that Ipomoea poisoning in goats occurred after the ingestion of 50 g of fresh leaves/per kg body weight, per day, over a period of 21 days, with a total consumption of 20 kg of plant per goat. The phytochemical analysis of the Ipomoea leaf extract revealed presence of steroids, saponins, alkaloids, tannins, flavonoids, and cyanogenic glycosides. The obtained results were in corroboration with Sahayaraj and ravi (2008).

CONCLUSION

Ipomoea carnea might be a potential source of poisoning to animals in the region thereby causing economic losses to the farmers. Based on the history, early diagnosis is essential to avoid monetary losses to the farmers. Effective supervision of the grazing animals should be done by the farmers, so that the animals don’t feed on the Ipomoea plants. Massive removal of Ipomoea shrubs in the grazing areas is another control measure to be followed. Moreover, it is concluded that the ipomea carnea leaves contains various anti-nutritional factors like saponins, alkaloids, tannins, flavonoids, and cyanogenic glycosides.

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