INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

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

[1]Ravi Kanth Reddy, P., [2]Nagarjuna Reddy, A., [3]Senthilnathan, M., [4]RajaKishore, K., [5]Pandu Ranga Reddy, P. [6]Srihari, P., M.Nagendra Reddy[7]

[1]PhD Scholar, Dept. of Animal Nutrition, NTRCVSc, Gannavaram – 521 102.
[2]PG Scholar, Dept. of Livestock Production Management, NTRCVSc, Gannavaram– 521 102.
[3]PG Scholar, Dept.o Veterinary Pharmacology and Toxicology, NTRCVSc, Gannavaram– 521 102.
[4]Asst. Professor and HOD, Dept. of Animal Nutrition, NTRCVSc, Gannavaram – 521 102.
[5]Scientist and Head, Livestock Research Station, Mahanandi – 518 502.
[6]Veterinary Assistant Surgeon, Mandapaka, West Godavarai (Dist) – 534 218.
[7]Veterinary Assistant Surgeion, Porumaamilla, Kadapa (Dist) – 516 193.
[*]Corresponding author email: ravi.nutrition001@gmail.com

ABSTRACT
Unconditioned food addiction is a rare phenomenon in goats. The marsilin 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).

FIGURE 1. *Ipomea carnea* plant

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 leaves were 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 dispensaries of Cumbum, and B.Peta Mandals 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 10^{th} week (mid gestation) (fig 4.0), and the latter around 18^{th} 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

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 shaked 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.

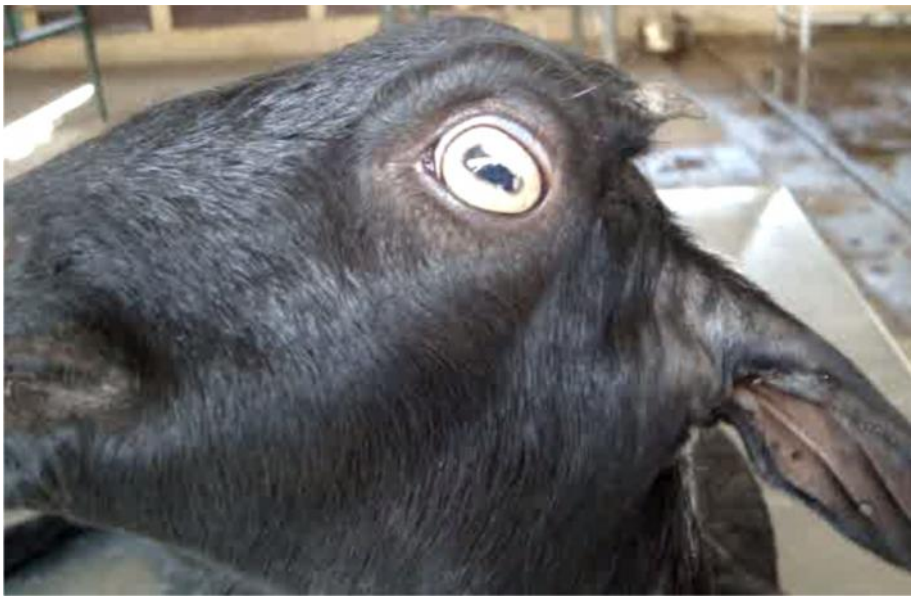

FIGURE 3. Dilated pupil in goat poisoned by *Ipomea carnea* plant consumption

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

Component	Chloroform Extract	Ether Extract
Steroids	+	-
Alkaloids	+	-
Saponins	-	+
Tannins	+	+
Flavonoids	+	-
Cyanogenic glycosides	+	+

+ Present - Absent

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 (Radostits *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 Ipomea 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 Ipomea 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 Ipomea 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 Ipomea 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

Ipomea 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 Ipomea plants. Massive removal of Ipomea 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.

ACKNOWLEDGEMENT

The authors are thankful to Animal Husbandry Department - Andhra Pradesh, and Deparment of Animal Nutrition, NTRCVSc, SVVU, Gannavaram for providing facilities to carry out this research.

REFERENCES

Armien, A.G., Tokarnia, C.H., Peixoto, P.V. and Frese, K. (2007) Spontaneous and experimental glycoprotein storage disease of goats induced by Ipomoea carnea subsp. istulosa (Convolvulaceae). Vet. Pathol. 44, 170-184.

Barbosa, R.C., Riet-Correa, F., Lima, E.F., Medeiros, R. M., Guedes, K.M., Gardner, D.R., Molyneux, R.J. and de Melo, L.E. (2007) Experimental swainsonine poisoning in goats ingesting Ipomoea sericophylia and Ipomoea riedelii (Convolvulaceae). PesquisaVeterinária Brasileira, 27(10), 409-414.

Carlos, A., Oliveira, J.G., Riet-Correa, C., Tavares, E., Souza Valíria, D., Cerqueira, J., Pfister, D., Cook, F. and Riet, C. (2014) Conditioned food aversion to control poisoning by *Ipomoea carnea* subsp. fi stulosa in goatsCiência Rural, 44, 7-8.

Colegate, S.M., Dorling, P.R. and Huxtable, C.R. (1979) A spectroscopic investigation of swainsonine: An alfa-mannosidase inhibitor isolated from Swainsonacanescens. Aust. J. Chem. 32, 2257-2264.

Damir, H.A., Adam, S.E. and Tartour, G. (1987) The effects of *Ipomoea carnea* on goats and sheep. Vet. Hum. Toxicol. 29, 316 - 319.

de Balogh, K. K. I. M., Dimande, A. P., van der Lugt J.J., Molyneux, R.J., Naude T.W. and Welman, W.G. (1999) A lysosomal storage disease induced by Ipomoea carnea in goats in Mozambique. J. Vet. Diagn. InVest. 11, 266-273.

Deshmukh, H.V., Tartour, G. and TavaresII, E. (2012) Co-utilization of common weed Ipomoea carnea along with distillery waste for biogas production, International journal of current science. 229-240

Elvio, E., Ríos, L.A., Cholich, E.J., Gimeno, M.G. Guidi and Ofelia C. Acosta de Pérez (2012) Experimental poisoning of goats by Ipomoea carnea subsp. istulosa in Argentina: A clinic and pathological correlation with special consideration on the central nervous system. Pesq. Vet. Bras. 32(1):37-42.

Ganesh, P.S., Lima, E.F. and Gardner, D.R. (2008) Recovery of methane-rich gas from solid-feed anaerobic digestion of ipomoea (Ipomoea carnea), Bioresource Technology. 99, 812–818

GOI (2012) District wise livestock census data - 2012. Department of animal husbandry and dairying & fisheries, Government of India.

Harborne, J.B. (1984) Phytochemical methods, 2nd edition, Chapman and Hall, New York, 1984.

Hartley, W.J., Baker, D.C. and James, L.F. (1989) Comparative pathological aspects of locoweed and Swainsona poisoning in livestock. In Swainsonine and Related Glycosidase Inhibitors; Iowa State University Press: Ames, IA, 1989; pp 50-56.

Hueza, I.M., Dagli, M.L., Gorniak, S.L. and Paulino, C.A. (2003) Toxic effect of prenatal Ipomoea carnea administration to rats. Vet. Hum. Toxicol. 45:298302.

Idris, O.F., Tartour, G., Adam, S.E.I. and Obeid, H.M. (1973) Toxicity to goats of Ipomoea carnea. Trop. Anim. Health Prod. 1973, 5, 119-123.

James, L.F., Van Kampen, K.R., Hartley, W.J. (1970) Comparative pathology of Astragalus (locoweed) and Swainsona poisoning in sheep. Pathol. Vet. 7, 116-125.

Mabberley, D.J. (2008) Mabberley's Plant book, A portable dictionary of Plants, their classification and uses. Third Edition, Cambridge University Press, Cambridge.

Molyneux, R.J. and James L.F. (1982) Loco intoxication: Indolizidine alkaloids of spotted locoweed (*Astragalus lentiginosus*). Science 216, 190-191.

NIANP (2005) Feed data-base. National Institute of Animal Nutrition and Animal Physiology, Adugodi, Bangalore - 560 030.

Oliveira, C.A., Barbosa, J.D., Duarte M.D., Cerqueira, V. D., Riet-Correa, F. and Riet-Correa, G. (2009) Intoxicaçãopor Ipomoea carnea subsp. istulosa (Convolvulaceae) emcaprinosnaIlha do Marajó. Pesq. Vet. Bras. 29:583-588.

Radostits, O.M., Gay, C.C., Hinchcliff, K.W. and Constable, P.D. (2006) Veterinary Medicine: A Textbook of the diseases of cattle, horses sheep, pigs and goats, tenth edition. Saunders, Edinburgh. P. 1870-1871.

Sahayaraj, K. & Ravi, C. (2008) Preliminary phyto chemistry of *Ipomea carnea* and vitex negundo linn. Leaves. *Int. J. Chem. Sci.* 6(1), 1-6.

Schumaher-Henrique, B., Gorniak, S.L., Dagli, M.L.Z. And Spinosa, H.S. (2003) The clinical, biochemical, haematological and pathological effect of long-term administration of *Ipomoea carnea* to growing goats. Vet Res. Commun. 27, 311-319.

Sharma, S.K. (2010) Utilization of wetland resources by the rural people of nagaon district, Assam, Indian J. of traditional knowledge 9(1), 145-151.

Tirkey, K., Yadava, K. P. and Mandal, T.K. (1987) Effect of aqueous extract of Ipomoea carnea on the haematological and biochemical parameters in goats. Indian J. Anim. Sci. 1987, 57, 10191023.

Tokarnia, C.H., Döbereiner, J. and Peixoto, P.V. (2000) Plantas Tóxicas do Brasil. Editora Helianthus, Rio de Janeiro, p.120-122.