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Phytochemical Investigations of *Tapinanthus Globiferus* (Loranthaceae) from Two Hosts and the Taxonomic Implications

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ABSTRACT
Tapinanthus globiferus is one of the mistletoes commonly consumed by the people of Akwa Ibom State as a herbal cure for ailments such as hypertension, diabetes, ulcer and heart disease. It is believed that their efficacy depends on the host plant. In this work, *T. globiferus* collected from different hosts; *Pentaclethra macrophylla* (African oil bean tree) and Cola *acuminata* have been screened for secondary metabolites, nutrients, anti-nutrients and minerals. The phytochemical investigation showed that alkaloids, saponins, tannins, flavonoids, phlobatannins and cardiac glycosides were present in *T. globiferus* from *P. macrophylla* while anthraquinones were absent. In *T. globiferus* from *C. acuminata*, alkaloids, saponins, tannins, flavonoids and cardiac glycosides were also present but phlobatannins and anthraquinones were absent. The nutrient analysis for the latter showed moisture content-11.70%, carbohydrate- 69.96%, crude protein- 9.88%, ash- 8.90% and crude fat-2.90%. In *T. globiferus* on *P. macrophilla* the nutrient analysis showed moisture content was 12.63%, carbohydrate was 68.80%, crude protein was 9.71%, ash was 9.20% and crude fat was 2.30%. Anti-nutrient analysis in the latter showed that hydrogen Cyanide was 13.99mg/100g, Phytic acid was 2.42mg/100g, oxalates were 38.88mg/100g, tannin content was 147.55mg/g. In *T. globiferus* on *C. acuminata*, anti-nutrient analysis showed that Hydrogen cyanide was 8.52mg/100g, phytic acid was 2.38mg/100g, oxalic acid was 39.46mg/100g and tannin content was 147.54mg/100g. The mineral content in the latter was 1.10mg/100g for Potassium, 0.43 mg/100g for Calcium, 0.12mg/100g for Phosphorus and 0.09mg/100g for Magnesium In *T. globiferus* from *P. macrophylla,* the mineral content was 0.12mg/100g for Potassium,0.37mg/100g for Calcium, 0.14mg/100g for phosphorus and 0.02mg/100g for Magnesium. Findings confirm its medicinal value in ethnobotany and chemical evidence confirms relationship at species level.
Keywords: Mistletoe, hosts, chemical evidence, ethnobotany, relationship.

INTRODUCTION

Mistletoes are often described as hemiparasite because they are partial parasites on various hosts most of which are of economic value. They are partially parasitic in the sense that though they are attached to the host plant from which they obtain nutrients and water, they have green leaves which carry out photosynthesis and thus manufacture food for the plant.

Tapinanthus globiferus is a mistletoe of the family Loranthaceae. It is a woody, spreading shrub with blackish, smooth stems made rough by the presence of lenticels. The leaves are opposite but sometimes alternate. The leaf length varies from 7-15(20) cm while the leaf width could be 3-10(15) cm. The leaves are thick, ovate, obtuse, rounded to cuneate at base, petiolate. Petiole length up to 2cm long and grooved adaxially. Nerves pinnate with barely prominent and irregular lateral nerves. The inflorescence is a sub-sessile fascicle with up to 6 flowers. The flower is bisexual with a red corolla tube up to 2cm long and a swollen base that is greenish in colour. Calyx forming a short tube enclosing the corolla tube. The stamens are five alternating with the petals and partly fused to the petals. The unattached portion of the filament curls up as soon as the petal lobes open. The fruits are one-seeded, globose and green when immature.

According to [1], mistletoe leaves and twigs have been popularly used by herbalists in Europe especially Germany for treating circulatory and respiratory system problems and cancer. [2], reported that mistletoe extracts have exhibited both cytotoxic and immuno-modulatory properties which have been efficacious in the treatment of cancer. European mistletoe (usually *Viscum album*) according to [3], is chiefly used to lower blood pressure and heart rate, ease anxiety and promote sleep. In low doses, mistletoe also relieves panic attacks, headaches and improves concentration. It is also prescribed for epilepsy.

Many African mistletoes parasitise economic trees as observed by [4]. [5], observed that the activities and presence of phytochemical substances in African mistletoes was partly dependent on the host plant species.

T. globiferus is one of the mistletoes commonly consumed by the people of Akwa Ibom State for the treatment of hypertension, ulcers, epilepsy, diabetics, weakness of vision, and for promoting muscular relaxation before delivery. The purpose of this work was to-

1. Investigate the phytochemical contents of *T. globiferus* from two different hosts and
2. Elucidate the taxonomic implications of such findings.

MATERIALS AND METHODS

Fresh samples of *Tapinanthus globiferus* on *P. macrophylla* were collected from Ukpom in Ikono Local Government Area, Akwa Ibom State. Fresh samples of *T. globiferus* on *Cola acuminata* were collected from Itak Ikot Akap also in Ikono L.G.A of Akwa Ibom State. Both samples were dully authenticated by a taxonomist in the Department of Botany and Ecological Studies, University of Uyo.

These samples were extracted for phytochemical screening using the methods of [6] for alkaloids, saponins, cardiac glycosides, phlobatannins and anthraquinones. The methods used for tannins, flavonoids and anthraquinones (Borntrager's Test) were according to [7] .

The determination of mineral contents was by wet digestion method according to [8]. So also was the proximate analyses. Crude fat was determined using the method of [9].

RESULTS AND DISCUSSION

The results obtained in this investigation have been summarised in Tables 1 to 4. Table-1 shows that the content of Potassium and magnesium were higher in *T. globiferus* from *C. acuminata* (1.10 and 0.09 mg/100g.respectively) than in the samples obtained from *P. macrophylla* (0.12 and 0.02 mg/100g respectively).

In Table-2, it was observed that the values for ash content, crude fibre, lipid, carbohydrate and protein were higher in *T.globiferus* on *C. acuminata* than values obtained in *T. globiferus* on *P. macrophylla.* In Table 3, only the value for hydrogen cyanide was clearly higher in the latter than in *T. globiferus on C. acuminata.* In Table 4, the values of alkaloid, saponins, cardiac glycoside and phlobatannin in *T.globiferus* on *P. macrophylla* was observed to be different from values in *T. globiferus* on *C. acuminata* while the values of tannin, flavonoid and anthraquinones were the same in both samples.

The value of calcium in both *T. globiferus* samples (on *C.acuminata* – 0.43mg/100g; on *P. macrophylla* - 0.37mg/100g) was low when compared to that of *Asystasia gangetica* (7.00mg/100g) reported by [10]. Higher values of potassium and magnesium in the sample from *C. acuminata* (1.10mg/100g and 0.09mg/100g respectively) than samples on *P. macrophylla* (0.12mg/100g and 0.02mg/100g respectively) implied that though the samples were the same taxonomically, the host must have an influence in the chemical configuration of the plants being its immediate growth environment. This could also explain the differences observed in Table 2, in the crude fibre content in both samples – 8.30% in the samples obtained from *C. acuminata* and 6.00% in the sample from *P. macrophylla.* The higher content of Hydrogen Cyanide (Table 3) in the sample from *P. macrophylla*(13.99mg/100g) than the sample from *C. acuminata* (8.52mg/100g) as well as absence of phlobatanins in the sample from *C. acuminata* and lower contents of alkaloids and saponins in the sample from *P. macrophylla* (Table 4) may all be attributed to the same reason.

Alkaloids have been reported to function as amoebicides, expectorant, anaesthetic, analgesic and anti- helminthic [11]. Mistletoe alkaloids are sequestered by the parasite from the host tree according to [12]. Saponins on the other hand have been said to be beneficial in lowering blood cholesterol [13]; [14]. The higher content of both alkaloids and saponins in the sample from *C. macrophylla* implies that collections from this host may be more effective when administered as herbal drugs for hypertension. This may explain why emphasis is often placed on the hosts by the TMPs. In administration of the herbs for heart problems, it is obvious that samples from *P. macrophylla* may be more effective hence; more recommended by the TMPs, being that a higher and diverse content of cardiac glycosides (Table 4) were obtained from those samples than from the sample from *C. acuminata.*

Tannins and Flavonoids were strongly present in samples from both hosts. High content of tannins have been reported to decrease protein quality by decreasing digestibility and may cause damage to the intestinal tract [15]. The values obtained for both samples (Table 3) compared favourably with the value obtained for *Vernonia amygdalina* (153mg/100g) by [16]. The tannin content should determine the care with which the herbs are administered considering the side effects if consumed in large quantities. Flavonoids on the other hand are referred to as Nature's Biological Response Modifiers [17].They found strong experimental evidence of their ability to modify the body's reaction to allergens, viruses and carcinogens.

The complete absence of phlobatannins in the sample from *C. acuminata* implies that the same may be absent in the host plant. It is often observed that these hemi parasites often mimic the morphological features of the host plants particularly as it applies to the leaf morphology. It is therefore possible that the chemical makeup may also be adopted from the host especially since they are dependent on the host for their water and mineral salts This would imply that though taxonomically the same, these plants at best may be considered sibling species being impacted by the environment (hosts) in which they are found.

CONCLUSION

In conclusion, morphological evidence in terms of reproductive features may often determine the identity of mistletoes as being similar. However, from these chemical investigations it has been found that the hosts influence the chemical constituents of the mistletoes. This corroborates the practice by traditional medicine practitioners in recommending their usage in various cures based on the hosts.

Table-1: Mineral Composition in *T. globiferus* on *C. acuminata* and *T. globiferus* on *P. macrophylla*

MINERAL	*T. globiferus* on *C. acuminata* (mg./ 100g.)	*T. globiferus* on *P. macrophylla* (mg./100g.)
POTASSIUM	1.10 ± 0.25	0.12±0.04
CALCIUM	0.43 ± 0.00	0.37±0.00
PHOSPHORUS	0.12 ± 0.00	0.14±0.00
MAGNESSIUM	0.09 ± 0.00	0.02±0.00

Table-2: Nutrient Composition in *T. globiferus* on *C. acuminata* and *T. globiferus* on *P. macrophylla.*

NUTRIENTS	*T. globiferus* on *C. acuminata* (% composition)	*T. globiferus on P. macrophylla (% composition)*
MOISTURE CONTENT	11.70 ± 1.59	12.63 ± 1.07
ASH CONTENT	8.90 ± 0.54	9.20 ± 0.10
CRUDE FIBRE	8.30 ± 1.01	6.00 ± 0.00
LIPID	2.90 ± 0.85	2.30 ± 0.00
CARBOHYDRATE	69.96 ± 1.70	68.80 ± 3.49
PROTEIN	9.88 ± 0.38	9.71 ± 0.50

Table-3: Anti – nutrient Composition of *T. globiferus* on *C. acuminata* and *T. globiferus* on *P. macrophylla.*

ANTI-NUTRIENT	*T.globiferus* on *C. acuminata* (mg. /100g.)	*T. globiferus on P. macrophylla* (mg./100g)
PHYTATE	2.38 ± 0.04	2.42 ± 0.18
TANNIN	147.54 ± 1.70	147.55 ± 1.84
SOLUBLE OXALATE	39.46 ± 1.30	38.88 ± 1.30
HYDROGEN CYANIDE	8.52 ± 0.12	13.99 ± 9.71

Table-4: Results of phytochemical screening of ethanolic leaf extract of *T. globiferus* on *C. acuminata* and *T. globiferus* on *P. macrophylla*

CHEMICAL COMPOUND	TEST	Result in *T.globiferus* on *C. acuminata*	Result in *T. globiferus* on *P. macrophylla*
ALKALOID	Dragendorff Test	+++	++
SAPONIN	Frothing Test	+++	+
TANNIN	Ferric chloride Test	+++	+++
FLAVONOID	Schinoda's Test	+++	+++
CARDIAC GLYCOSIDE	Salkowski's Test	++	+++
	Keller-Killiani's Test	++	+
	Liebermann's Test	--	+++
ANTHRAQUINONE	Borntrager's Test	--	--
PHLOBATANNIN	Hydrochloride Test	--	+

Key: +++ = strongly present
++ = present
+ = trace
- = absent

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