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A Chemical Overview of *Azanza garckeana*

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Abstract

Azanza garckeana is a popular fruit tree in Nigeria, specifically in Gombe State, where it is locally called 'goron tula' which means 'Kola of Tula'. It is also found in part of some African countries. Different plant part of this small tree/shrub has recorded different uses by the locals; uses ranging from its fruits being edible and others parts helping to remedy different diseases, especially sexually related diseases. It also records use as booster for sexual performance. The uses of the plant are majorly attributed to the presence of chemicals. Its local use initiates the necessity of this review to enhance the research for drug discovery since Chemicals are the chief constituencies responsible for its medicinal importance.

Keywords: *Azanza garckeana*; Chemical; Compounds; Mansonone.

INTRODUCTION

The indigenous fruits collected from the wild play a significant role in food and nutrient security of the poor and rural dwellers. Some wild fruits have been identified to have better nutritional value than cultivated fruits (Musinguzi et al., 2007) As a result, in recent years, a growing interest has emerged to evaluate various wild edible plants for their nutritional features (Nkafamiya, 2007; Aberoumand and Deokule, 2009; Nazarudeen, 2010). Nutritional value of indigenous fruit bearing tree species indicates that many are rich in sugars, essential vitamins and minerals, while others are high in vegetable oil and protein contents. In addition to fruit production and cash, the extensive list of benefits includes firewood, fodder, building material, shade and medicine especially to rural communities. Edible wild leaves and fruits are consumed frequently in Northern Nigeria especially in rural communities where a variety of edible leaves and fruits abound. Some of these are cultivated while others grow in the wild (Nkafamiya et al. 2016).

Azanza garckeana is a member of the Malvaceae family. The generic name "Azanza" is derived from the word "Azania", a word meaning black and surviving in Zanzibar. The specific name "garckeana" is in honour of Professor August Garcke (1819-1904), a German botanist and plant collector who specialized in pharmacognosy (Maroy, 2017).

Botanical Classification of *Azanza garckeana*

Kingdom : Plantae – Plants
Subkingdom : Tracheobionta – Vascular plants
Superdivision : Spermatophyta – Seed plants
Division : Magnoliophyta – Flowering plants
Class : Magnoliopsida – Dicotyledons
Subclass : Dilleniidae
Order : Malvales
Family : Malvaceae – Mallow family
Genus : Azanza
Specie : *Azanza garckeana*

English (common name) - tree hibiscus, azanza, snot apple Nigeria (Hausa): goron tula, Bostwana – morojwa South Africa - *Thespesia garckeana* (Mojeremane and tshwenyane, 2004; and Ochokwu et al., 2014).

DESCRIPTION

Azanza garckeana is a deciduous shrub; the tree can grow to a Height of 3-15m high depending on the climate condition stem diameter at breast height of up to 25cm. The tree is multi-stemmed with straight or crooked stem, which is sometimes forking from the base. The bark is rough and greyish-black or brown, fibrous with longitudinal fissures. The twigs are hairy when young but become smooth with age and branches have woody hairs. The leaves are distinctively rounded, 8 by 12cm on long stalks. They are always simple, alternate and roundish. The leaves have 3 to 5 lobes, which are covered in brown star-shaped hairs, and have longitudinal fissures in the midrib. The tip of the leave is usually bluntly pointed or rounded. The base of the

leave is heart-shaped and is 5 to 7 nerved. The young leaves are brown in colour and velvety. The flowers are large up to 6cm long, solitary on long pedicels in the axils of uppermost leaves, yellow with a purple-brown centre; the petals are globose and capsules are up to 4cm long, the thickness is 3cm. the fruit is globose and have woody capsules of up to 3 to 4cm in diameter, it is divided into 5 segments with each segment containing a seed, the remains of the calyx and epicalyx at the base; the seeds are hemispherical, up to 10 mm long, 7 mm thick, with brownish and woolly floss (Orwa et al., 2009).

A. Shoot B. Leaves and fruits C. Mature fruit

Figure 1. Different parts of *Azanza garckeana*.

Table 1. Uses of *Azanza garckeana*.

Medicinal use	Plant part(s) used	Country practised
Dietary uses		
Edible fruits	Fruits	Botswana, Kenya, Malawi, Nigeria, Sudan, Tanzania, Zambia, Zimbabwe
Food additive	Fruits	Sudan, Tanzania
Medicinal uses		
Abscesses	Fruit poultice applied	Nigeria
Anemia	Ripe fruits	Sudan
Antiemetic	Root infusion taken orally	Zimbabwe
Aphrodisiac	Ripe fruits taken orally	Nigeria
Asthma	Root decoction mixed with Sterospermum kunthianum Cham.	Malawi
Chest pains	Root infusion taken orally	Nigeria, Zimbabwe
Cough	Root infusion taken orally	Kenya, Nigeria, Zimbabwe
Diabetes	Leaf decoction taken orally	DRC
Earache	Root infusion dropped into ear	Zimbabwe
Edema	Leaf decoction taken orally	DRC
Epilepsy	Leaf decoction taken orally	DRC
Fever	Root decoction taken orally	Malawi
Gonorrhoea	Roots and stem bark taken orally	Malawi, Nigeria
Induce	labour Root decoction taken orally	Tanzania
Infertility	Ripe fruits or root decoction taken orally	Botswana, Malawi, Nigeria
Liver problems	Stem and leaf decoction taken orally	Kenya, Nigeria
Madness (mental illness)	Root decoction taken orally	Zimbabwe
Malaria	Eat raw fruit or cook and eat as relish	Zambia
Membrane rupture	Root decoction taken orally	DRC
Menstruation	Root infusion taken orally	Nigeria, Zimbabwe
Retained placenta	Root infusion taken orally	Zimbabwe
Sexually transmitted diseases	Root and bark infusion taken orally	Zambia
Syphilis	Root decoction taken orally	Nigeria

Maroyi, 2017

Table 2. Compounds extracted from *Azanza garckeana.*

Compounds	Extract	Plant parts
Sesquiterpenoids		
Gossypol, 6, 6-Dimethoxygossypol, 6-Methoxygossypol	Ethyl acetate in n-hexane; methanol in dichloromethane	Root
Phytosterol Stigmasterol	Ethyl acetate in n-hexane; methanol in dichloromethane	Root and Stem bark
E-docosyl 3-(3, 4-Dihydroxyphenyl) Acrylate	Ethyl acetate in n-hexane; methanol in dichloromethane	Root and Stem bark
O-naphthoquinones	n-hexane	heartwood
Mansonones E, F, G, H Azanzone A, B	n-hexane	heartwood
Triterpene		
Betulinic acid	Ethyl acetate in n-hexane; n-hexane; methanol in dichloromethane	Fruit pulp, root, stem bark

Dikko et al., 2016 & Maroyi, 2017

Azanza garckeana is widely distributed in the east, west and southern Africa. It generally grows naturally in all types of woodlands from sea level to about 1700m above sea level. It also grows in semi-arid areas. *Azanza garckeana* grows in a variety of soils and is found near termite mounds and deserted areas while in Nigeria it grows in open woodland in the north eastern part of the country (Ochokwu et al., 2015). *Azanza garckeana* (Goron Tula) as an Edible Indigenous Fruit in North Eastern Part of Nigeria (particularly Gombe State).

FAO (1983) reported that *A. garckeana* grows naturally in semi-arid areas receiving annual rain fall that range from 250mm to 1270mm. Flowering takes place during the raining season, while fruit ripening occurs during the dry season, hence it takes about six months from flower fertilization to ripening of the fruit. In Southern Africa, flowering occurs from December to May and fruiting from February to September while in North Eastern Nigeria flowering occurs from May to October and fruiting/ripening from November to April (Ochokwu et al., 2015).

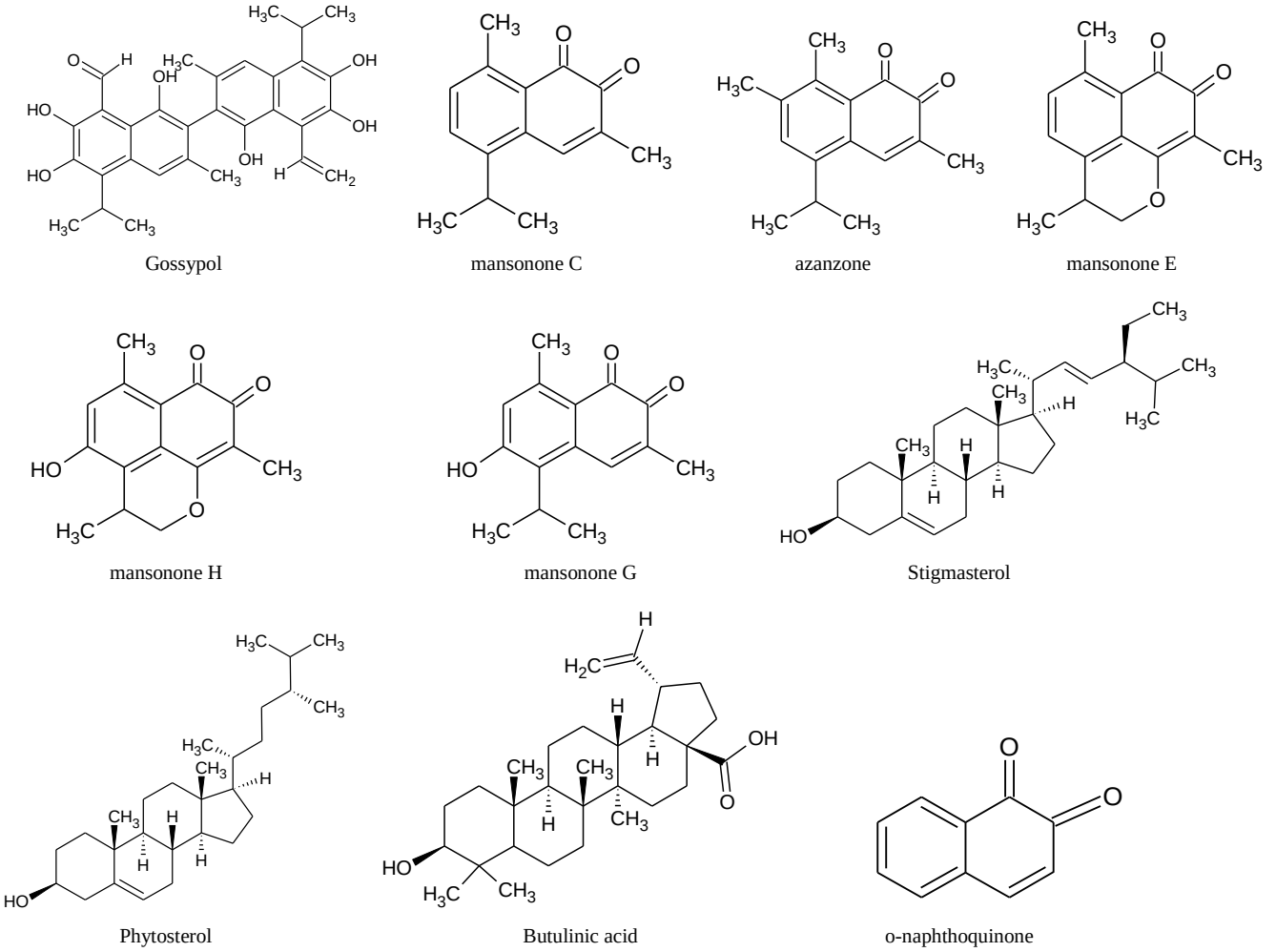

Figure 2. Some compounds Isolated from *Azanza garckeana.*

EFFECTS OF CHEMICALS EXTRACTED FROM *Azanza garckeana*

Mansonone E, C, G and H displayed antifungal activity against *P. parasitica*, with Mansonone E showing the highest activity. Also suggests potential Mansonone E as a new natural pesticide for agricultural plant pathogen management. (Mongkol1 and Chavasiri, 2016).

A Computational and Experimental Study carried out on the anticancer ability of mansonone G by β-Cyclodextrin-Based Host-Guest Complexation revealed that The inclusion complex formation between Mansone G and β-Cyclodextrin was confirmed by DSC and SEM techniques. Notably, the Mansone G/β-Cyclodextrin inclusion complexes exerted significantly higher cytotoxic efect on A549 lung cancer cells than the uncomplexed Mansonone G (Mahalapbutr, 2019)

Anticancer Activity, Anti-HIV Activity, Antimalarial Activity was recorded for betulinic acid, it also shows pronounced antinociceptive properties, anti-inflammatory activity (Moghaddam, 2012)

The effect of the terpenoids gossypol, 6-methoxygossypol, 6,60-dimethoxygossypol, gossypolone and apogossypolone on growth of fungal soil pathogens were investigated. Gossypol, gossypolone and apogossypolone demonstrated strong growth inhibitory activity (≥90%) against Pythium irregulare, Pythium ultimum and Fusarium oxysporum. These same terpenoids provided good growth inhibition against most *Rhizoctonia solani* isolates. Methylated gossypol derivatives generally yielded reduced growth inhibition against the tested fungi compared with gossypol. Dose–response effects of gossypol, gossypolone and apogossypolone were determined over a concentration range (Mellon, 2014).

Extracts from plants with high Phytosterol (stigmasterol and β-sitosterol) content is used in the treatment of inflammatory conditions and prevention of cancers and cardiovascular diseases (Ivanescu et al., 2013).

Sitosterols have been found to induce apoptosis when added to cultured human prostate, breast and colon cancer cells. Therefore, they may play significant roles in the management and prevention of human cancers. beta-sitosterol preparation improved symptoms, increased peak urinary flow, and decreased post-void residual urine volume. However, relatively few controlled studies have examined the efficacy of phytosterol supplements in men with symptomatic BPH. (Ogbe, 2015).

The plant has antifertility/contraceptive, antitumor properties (anticancer properties of gossypol against many types of cancer cell lines), Antioxidant properties, Antiparasitic properties, Antivirus properties, Antimicrobial properties, Plasma cholesterol reduction properties. (Keshmiri-Neghab & Goliaei, 2014).

CONCLUSION

The various pharmacological activities of the chemicals extracted from the plant justifies the use of *Azanza garckeana* as plant effective for various diseases and health conditions, especially sexually trelated issues, as exposed by various researches. The use of the plant for further research will help to make even drug discovery.

Conflict of interest: The author declares that there are no conflicts of interest concerning the publication of this article.

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