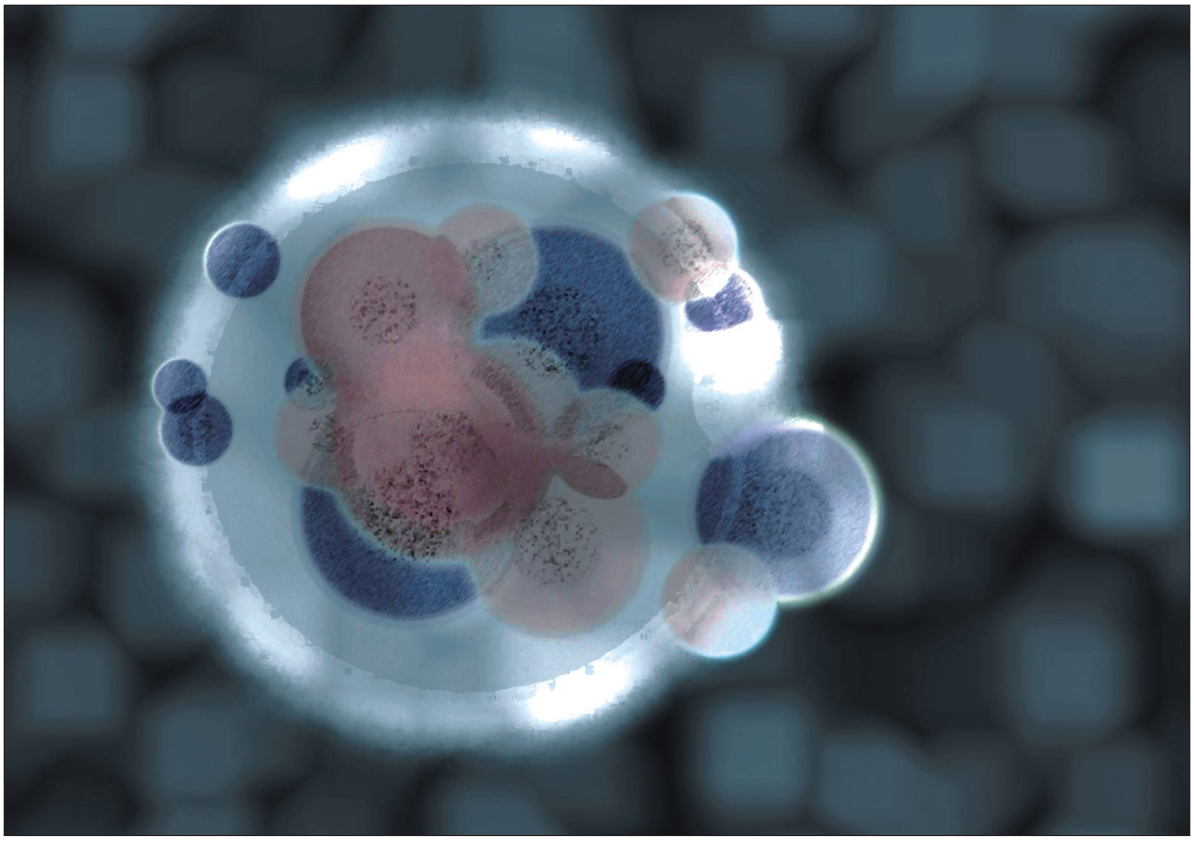

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Research Article
Ethno-medical Botany and Some Biological Activities of *Ipomoea oblongata* collected in the Free State Province, South Africa

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Abstract

Background and Objective: Literature reporting on the therapeutic uses and biological activities of *Ipomoea oblongata* (E.Mey.ex Choisy) is very scanty in South Africa. This study was carried out to comprehensively document medicinal use of this species and also determine some of its biological activities namely the antioxidant, total phenolic content and phytochemical properties. **Materials and Methods:** Ethnobotanical data on the healing applications of *I. oblongata* was gathered using a semi-structure questionnaire with 12 traditional healers (THs) practicing in the Free State province. The antioxidant properties and the total polyphenol content of *I. oblongata* extracts (Dichloromethane, DCM, Methanol, MeOH and Water, H_2O) were determined by means of the 2, 2-Diphenylpicrylhydrazyl assay and the Folin Ciocalteu method, respectively. Gallic acid and ascorbic acid were used as standards. Phytochemical constituents were determined using standard screening procedures. **Results:** Roots of *I. oblongata* were mainly used by THs as remedy for ailments such as cancer, cardiovascular diseases, diarrhoea and nausea, inflammatory diseases, pregnancy and postnatal, respiratory infections, sexually transmitted infections and wounds. The MeOH roots extract of *I. oblongata* showed remarkable (98% at 0.25mg mL^{-1} and 99% at 0.5mg mL^{-1}) antioxidant potential. Total phenolic contents of this species showed the Gallic acid equivalence (GAE) of 0.04 for both the MeOH and DCM and 0.03 for the H_2O extract. The phytochemical screening exhibited the presence of carbohydrates, glycosides, steroids, terpenoids, alkaloids, flavonoids and tannis. **Conclusion:** *Ipomoea oblongata* roots are highly harvested and multi-used by THs against various human ailments, which could be attributed to the present of biologically active pharmaceutical components demonstrated.

Key words: Antioxidants, ethno-medicine, *Ipomoea oblongata*, phytochemicals, total phenolic content, traditional healers

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Ipomoea oblongata (E.Mey.ex Choisy) is perennial herb with large fusiform tuberous root, growing up to 1 m long in the Convolvulaceae botanical family[1]. Its leaves are usually over 50 mm long, hairy above and below, pubescence usually stiff and pressed on leaves[2]. With regards to the habitat, *I. oblongata* grows in bushveld, savanna, grassland, often on wet and sandy soils and it is sometimes regarded as a weed[3]. Geographically, this species is widely distributed in Southern African countries such as Botswana, Malawi, South Africa, Tanzania, Swaziland and Zimbabwe[3]. In South Africa, *I. oblongata* occurs naturally in the Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North West Provinces[4].

The parts of *I. oblongata* have been used by diverse cultural groups in Africa to treat a suite of complaints and this is highlighted in general ethnobotanical surveys. In Lesotho, roots are multi-used for cancer, stomach ailments and swollen feet[5]. Mugomeri *et al.*[6], who recently conducted an ethnobotanical study in Lesotho found that pulverized roots are mixed with water and used as asthma and wounds therapy. Same plant part was reported by Watt and Breyer-Brandwijk[7] to be edible and extensively used as a charm and in snuff and traditional medicine in Southern Africa. In South Africa, Swati THs residing in the Mpumalanga province prescribe the decoction made from roots to people diagnosed with both asthma and hypertension[8]. Despite the evidence highlighting the traditional use of *I. oblongata* in African and South African traditional medicines, to date there is no ethnobotanical study focusing on the documentation of medicinal use of this species in Africa at large.

With regards to the pharmacological or biological activities of *I. oblongata*, there is no study reporting on them. However, bioactive compounds that are generally found in *Ipomoea* species are flavonoids, glycosides, proanthocyanidins (condensed tannins) and anthocyanins[9]. It worth mentioning that other *Ipomoea* species, excluding *I. oblongata* have been validated for phytochemical compounds, antimicrobial, antibacterial and anti-inflammatory properties in literature[10-12]. The aim of the present study is therefore, two fold, (1) To document the medicinal use of *I. oblongata* in the treatment of human afflictions and (2) Determine total phenols, scavenging activity (antioxidants) and phytochemicals constitutes of extracts of this species.

MATERIALS AND METHODS

Ethnobotanical study: This study was conducted in Serwalo (Koppie) village (29° 12' 0" South, 26° 47' 0" East) which is situated in Thaba-Nchu, Free State province of South Africa. Traditional healers who are affiliated to Kopanang Dingaka Association (a local Traditional Medical Practitioners' Organisation) were selected as participants in this study. Prior data collection the aim and objectives of our study was communicated to each healer using the local dialect of Sesotho and those who agreed to participate were requested to sign a consent form.

Ethno-medical data on the utilization of *I. oblongata* was collected during first half of 2014 and 2016 with 12 THs who consent to participate in this study. Information on the medicinal use of this species was collected using a semi-structured questionnaire which were designed to gather the following information pertinent to *I. oblongata*, ailments treated with *I. oblongata* extracts, used part/s, preparation method, source of plant, harvesting methods and storage of medicinal materials. Traditional healers were questioned independently in their consultation room to avoid data biasness. After interview section, each healer accompanied researchers to the field for plant specimen collection and identification. In this regard, *I. oblongata* was initially identified by healer via its vernacular name, *Mothokgo* and subsequently researchers collected plant specimen which were later deposited at Central University of Technology Free State's herbarium for taxonomic identification (by scientists at the National Botanical Gardens in Bloemfontein). Voucher specimen, KT001/2013 was kept in the same herbarium for future reference. The data generated was analyzed using statistical Package for the Social Sciences (SPSS) by calculating descriptive statistics.

Biological activities study

Plant material collection and extraction methods: *Ipomoea oblongata* roots was collected in the communal land of Thaba-Nchu and then dried at room in the oven at 40°C for 3 days, thereafter, crushed into fine powder and stored in a plastic jar container. The plant was kept in a cool dry area in the laboratory until it was used[13]. Pounded root materials (10 g) of *I. oblongata* were extracted (using a rotary shaker) overnight in 150 mL of aqueous (H_2O), methanol and dichloromethane solvents. These extracts were filtered to remove the solvent completely using rotary evaporator and completely dried out to make the final volumes of the original material.

Phytochemical analysis of *Ipomoea oblongata* extracts: The presence of saponins, carbohydrates, proteins, flavonoids, tannins, steroids, terpenoids, glycosides and alkaloid within *I. oblongata* extracts were determined by qualitative testing methods[14]. All the chemical tests were carried out on the methanolic and water extracts using standard procedure to identify the chemical constituents by colour changes as described in previous studies[14-17]:

- **Test for saponins:** To determine the presence of this compound, 0.7 mg of the extract was dissolved into 3 mL of distilled water and shaken vigorously. The formation of form indicated the presence of saponins
- **Test for carbohydrates:** Benedict's test was performed using 0.2 mg of the extract which was dissolved in 2 mL of methanol. About 1 mL (1000 µL) of the sample and 1 mL proportion of Benedict's solution were added into a test tube. The green to bluish-green indicated the presence of carbohydrates
- **Test for protein:** Biuret reagents were used to test the present of proteins in *I. oblongata* extracts. This were carried out by measuring out 0.2 mg of the extract and re-dissolved in 2 mL of methanol. Few drops of 1% copper sulphate ($CuSO_4$) and 4% sodium hydroxide (NaOH) were added to the extract. The violet colour indicates the presence of protein.
- **Test for flavonoids:** Five milliliter of dilute ammonia solution were added to the both portion of the methanol and distilled water extracts and then followed by adding few drops of concentrated sulphuric acid (H_2SO_4). A yellow colouration observed indicated the presence of flavonoids
- **Test for tannins:** The methanol and water extracts were eachre-dissolved in 2 mL methanol and 2 mL distilled water (solvents of extraction), then 3 drops of 0.1% ferric chloride solution was added. The formation of blue-black or brownish green precipitation in the solution indicates the presence of tannins
- **Test for steroids and terpenoids:** The Salkowski test was employed to detect the presence of these compounds within *I. oblongata* extracts. 0.2 mg of extracts were dissolved in 2 mL of methanol and distilled water, then the extracts where premixed with 1 mL of chloroform. Afterwards, concentrated sulphuric acid (H_2SO_4) was added into the sample then a layer was formed. These experiments gave a reddish brown colour precipitate at the border or interface of chloroform and H_2SO_4, to show the presence of steroids and terpenoids
- **Test for cardiac glycosides:** The Keller-Killani test was used to determine the presence of cardiac glycosides within the investigated species. About 2 mL methanol extracts and 2 mL distilled water extracts were dissolved in the solvents of extraction. The extracts where both treated with 2 mL of glacial acetic acid and one drop of ferric chloride solution. There was also an addition of 1 mL concentrated sulphuric acid. A brown ring of the interface indicates a deoxysugar characteristic of cardenolides. A violet ring appears below the brown ring interface, while in the acetic acid layer, a greenish ring forms gradually throughout the thin layer
- **Test for alkaloids:** The Meyer's test was used to determine the presence of alkaloids. About 1 g of the methanolic and water extracts was re-dissolved in 3 mL methanol and 3 mL distilled water, 1 mL Meyer's solution (potassium mercuric iodide solution) was added into 200 µL of the samples, respectively. The presence of cream and orange-brownish colours indicated the presence of alkaloids

Total phenolic of *Ipomoea oblongata*: The principle behind this study was to evaluate the amount of total polyphenols found in the methanol extract, water extract and dichloromethane extract of *Ipomoea oblongata.* The extracts in their solvents of extraction and Gallic acid were serially diluted to different concentrations (2.5 and 5 mg mL^{-1}) by half method of serial dilution. Stock solutions were made from 0.010 mg of crude extracts (methanol, water and dichloromethane) and re-dissolved in 2 mL of each solvents of extraction. The gallic acid standard curve was obtained by weighing 0.250 mg. Then 5 mL of ethanol and 46 mL of distilled water were added. About 1 mL of Folin-Ciocalteu (FC) reagent from (Sigma) was also added. After 3 min the mixture was top-up to 50 mL by adding 2.9 mL of sodium bicarbonate and 0.01 mg of the extracts[18]. The samples were incubated in the dark for 2 h and absorbance was read at 760 nm spectrophotometrically. Total phenolic content was expressed as milligram (mg) gallic acid equivalents per gram of the dry material[18,19]. This method was repeated for each extract.

Antioxidants activities of *Ipomoea oblongata*: The free radical scavenging activity was carried out using 0.004% of 2,2-Diphenyl-1-picrylhydrazyl (DPPH, Sigma) as standard. DPPH solution without sample solution was used as negative control and ascorbic acid was used as a positive control. The blank used for both ascorbic acid and the sample was 1 mL of

methanol. About 0.004 g of DPPH was weighed to make 1 mM and then added 100 mL of methanol into the flask. For ascorbic acid 0.001 mg of ascorbic acid powder was weighed. It was then diluted with 1 mL of distilled water into the 50 mL tubes. The 2 mL of DPPH was added to the tubes for serial dilutions obtained using half method dilutions. The concentrations obtained for the ascorbic acid were as follows[20,21]; 1, 0.5, 0.25, 0.125, 0.06, 0.03 and 0.015 mg mL^{-1}. The ascorbic acid was incubated in the dark for an hour. The absorbance was read at 517 nm using a spectrophotometer[19]. The test was done in triplicates.

The stock solution was 0.002 mg of the methanol root extract mixed into 1 mL of methanol solvent. The stock solution was made into serial dilutions for different concentrations. The dilutions were obtained same as the ascorbic acid. Afterwards 2 mL of the DPPH was added to the extract dilutions. The samples were incubated in the dark for an hour. The absorbance was read at 517 nm using (ThermoSpectronic, Helious Epsilon model, USA) spectrophotometer[19]. The scavenging equation described below was used to calculate scavenging percentage (antioxidants activity):

$$\text{Scavenging (\%)} = 100-\frac{\text{Abs}_{\text{sample}}-\text{Abs}_{\text{blank}}}{\text{Abs}_{\text{control}}}\times 100$$

RESULTS AND DISCUSSION

Ethno-medical botany of *Ipomoea oblongata*

Medicinal applications: The current study revealed that *I. oblongata* is multi-used by THs in Serwalo (Koppie) village (Thaba-Nchu, Free State Province) to treat and manage an assortment of human ailments such arthritis, bleeding, septic wounds, bleeding wounds, cancer (blood, skin and stomach), cardiovascular disease, cross infection from animals to humans, diarrhea, general respiratory infections, hypertension, impotence, inflammation, kidney failure, panic attacks, pregnancy and postnatal pregnancy, rash, sores, sexually transmitted infections (Chlamydia and gonorrhea) and stroke (Table 1). The medicinal applications of *I. oblongata* specifically for cancer, sore, wounds and respiratory infections were also reported in Lesotho[5,6]. Similarly, the use of *I. oblongata* for the latter infections and hypertension were echoed by Tshikalange *et al.*[8] amongst Swati Ths. According to Maroyi[22], plants that are used medicinally for similar ailments by different people across diverse geographical areas are more likely to be effective against the diseases they are utilized for. Therefore, the same can be said with the medical applications

Table 1: Medicinal application's of *Ipomoea oblongata* by traditional healersin Thaba-Nchu (Free State Province of South Africa)

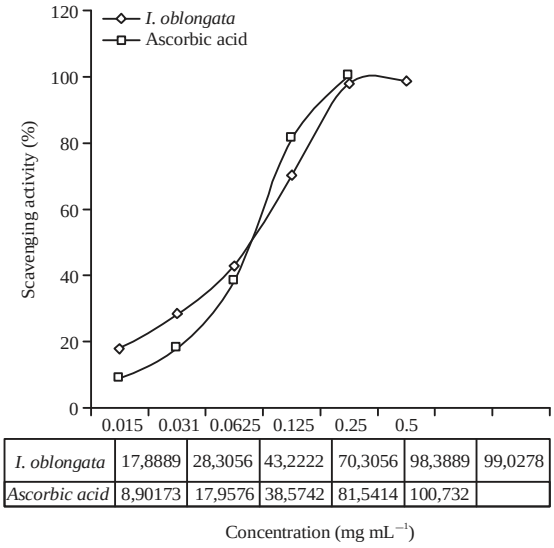
Diseases	Used plant part	Plant/s mixed with during herbal preparation	Methods of herbal preparation and administration	Number of THs
Inflammation	Roots	*Pentanisia prunelloides* (Klotzsch ex Eckl. and Zeyh.) Walp. (*Prunellades*)	Boiled and cool extracts is taken orally	8
		Dicoma anomala Sond. (Asteraceae)		
		Androcymbium longipes Baker (Colchicaceae)		
Cardiovascular disease	Roots	*Indigofera zeyheri* Spreng. ex Eckl. & Zeyh. (Fabaceae)	Boiled and cool extracts is taken orally	12
		Schizoglossum montanum R.A.Dyer. (Apocynaceae)		
Panic attacks	Roots	Not identified (*Selepe-Se-Sesweu Tabola*)	Boiled and cool extracts is taken orally	1
Cross infection from animals to humans and kidney failure	Roots	*Berkheya cirsiifolia* (DC.) Roessler (Asteraceae)	Boiled and cool extracts is taken orally	10
Pregnancy and postnatal pregnancy	Roots	*B. cirsiifolia*	Boiled and cool extracts is taken orally	1
STIs (Chlamydia and gonorrhea)	Roots and leaves	*Oxalis corniculata* L. (Oxalidaceae)	Boiled and cool extracts is taken orally	12
Cancer (blood, skin and stomach)	Roots and leaves	*D. anomala* (Asteraceae)	Boiled and cool extracts is taken orally	9
		Heteropyxis natalensis Harvey (Heteropyxidaceae)		
Hypertension	Roots	-	Boiled and cool extracts is taken orally	12
Arthritis	Roots	-	Boiled and cool extracts is taken orally	8
Stroke	Roots	-	Boiled and cool extracts is taken orally	4
Bleeding Wounds	Roots	*Eucomis bicolor* Baker (Hyacinthaceae)	Boiled and cool extracts is taken orally	6
		Bulbinena rcissifolia Salm-Dyck (Asphodelaceae)		
General respiratory infections	Roots	*Leonotis dubia* E.Mey. (Lamiaceae)	Boiled and cool extracts is taken orally	12
Rash	Roots	*Malva verticilata* L. (Malvaceae)	Boiled and cool extracts is taken orally or used as bath	12
Diarrhoea	Roots	*Salvia triangularis* Thunb. (Lamiaceae)	Boiled and cool extracts is taken orally. Roots are also dried, pounded and sucked	7
Sores and peeling off (Animals)	Roots	*Eucomis regia* (L.) L'Hér. (Hyacinthaceae)	Burned and ashes used topically as rub	1
Bleeding and septic wounds	Roots	-	Boiling and cool extracts were used topically to dress wounds	11
Impotence	Roots	-	Boiled and cool extracts is taken orally	10

of *I. oblongata* recorded in this study, which are exploited similarly to that reported by previous study[22]. The rest of the medicinal uses of *I. oblongata* documented in the present study is presently restricted to the interviewees. This finding might be due to the fact that apart from current study, there is no survey that focused exclusively on ethno-medical botany of *I. oblongata*. Furthermore, it showed the importance of the documentation of traditional medical indigenous knowledge pertinent to this species.

Used plant parts and methods of herbal preparation: Only two morphological parts of *I. oblongata*, namely leaves and roots, were used by THs to prepare remedy. Amongst these organs, roots were mainly preferred to heal and manage the ailments depicted in Table 1. The distinct preferences of plant roots in traditional medicines by South African THs is mainly based on the perception that they store more healing power as opposed to other parts or it's an old century traditional practices handed down from one generation to another[23].

The method of preparing *I. oblongata* medicinal material by THs in this study was mainly via boiling, using water as a solvent. The utilization of water for extracting active healing ingredients is a common practice amongst THs of other cultures elsewhere[24,25], probably because water is cheaply available or it's a traditional practice they learned from their mentors. Other method of herbal preparation documented in this study was via burning. Traditional healers preferred mixing the harvested parts of *I. oblongata* with roots from different plant species depicted in Table 1, probably to increase the effectiveness of preparations[26-28]. Medicine were most dispensed orally and in a very few instances it was taken topically as ashes (i.e., as rub), wounds dressers and bath.

Source of plant, harvesting methods and storage: Other findings from the questionnaire showed that *I. oblongata* was found on the grass lands within the mountainous areas and river banks in Serwalo (Koppie) village. This finding was expected because *I. oblongata* grows naturally within the bushvelds and on wet-sandy soils[3], similarly, to those that characterizes mountainous areas and river banks, respectively. The methods of harvesting roots and leaves from this species amongst the questioned THs of Kopanang Dingaka association were comparable. For instance, the entire plants were uprooted by all THs to harvest the roots. Similarly, the whole plant was dug-out to hand-pick leaves. This harvesting method of leaves might be ascribed to the fact that some THs utilizes both leaves and roots. Generally, the techniques employed by THs in this study for collecting the morphological



I. oblongata	17,8889	28,3056	43,2222	70,3056	98,3889	99,0278
Ascorbic acid	8,90173	17,9576	38,5742	81,5414	100,732	

Fig. 1: DPPH, ascorbic acid (Series 2) and *Ipomoea oblongata* (Series 1) methanol extract scavenging activity comparisons

parts from *I. oblongata* is repeatedly reported in the literature as highly destructive and causing immediate plant mortality[29,30]. Therefore, THs affiliated to the Kopanang Dingaka Association should be targeted and educated about the sustainable harvesting methods of healing plant resources.

The harvested *I. oblongata* materials (roots and leaves) were air-dried by THs and subsequently stored in bags, plastic jars with lids, newspapers and dry brown bags for future usage. These are the common methods of preserving harvested healing plant material in South Africa[31,32] and elsewhere[25,33,34], for ensuring the sustainability in the supply of medicines.

Biological activities of *Ipomoea oblongata*

Antioxidants activities: The methanolic extracts of *I. oblongata* was found to have antioxidants activities on the DPPH assay of 98.39 and 99.03% at 0.25 and 0.5mg mL^{-1}, respectively (Fig. 1). This result suggested that *I. oblongata* can be used as a source of antioxidants for pharmacological preparations useful in the management of various diseases including those reported in Table 1. *Ipomoea oblongata* was active as the ascorbic acid which was used as a standard for the experiment, echoing the fact that this plant species has antioxidant activities that can be therapeutically useful. The high antioxidant activity of the referred species was attributed to the presence of major bioactive phenolic compounds such as tannins and flavonoids that act as primary antioxidants or

free radical scavengers[35]. Therefore, *I. oblongata* extracts has potential to be utilized as future therapeutic agent against free radical induced oxidative stress[36]. In other words, *I. oblongata* extract can mitigate the various diseases associated with this stress such as cancer and cardiovascular disease including coronary heart diseases, amongst other conditions reported in Table 1.

Phenolic content of *Ipomoea oblongata*: The phenolic contents of *I. oblongata* dichloromethane, methanol and water extracts was determined and gallic acid was used as a reference standard. Accordingly, the methanolic and dichloromethane extracts had similarities at 2.5 mg mL^{-1} concentrations, both with a gallic acid equivalence (GAE) of 0.04 and 1.64% phenolic content. The water extract was a little lower at the same concentration of 2.5 mg mL^{-1}, with GAE of 0.03 and contained about 1.28% phenolic content (Table 2). The standard curve obtained for the gallic acid is displayed in Fig. 2.

The proportion of phenolic contents of *I. oblongata* might be influenced by the presence of flavonoids. Petti and Scully[37] demonstrated that the leaves, stem and flowers of related species, *I. carnea* contain a significant amount of phenols and flavonoids. According to Okem *et al.*[38], the

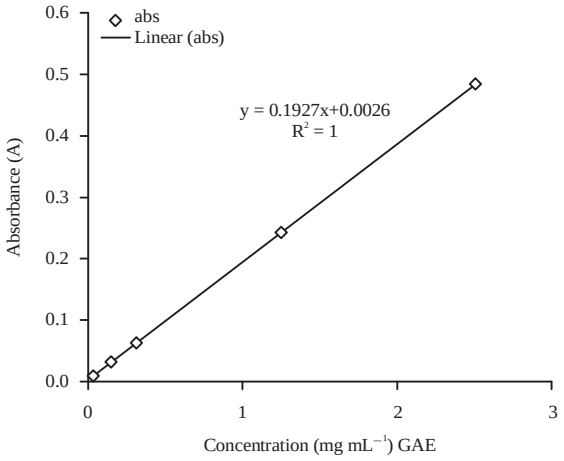


Fig. 2: Total Phenol compounds using the Gallic acid equivalence in mg g^{-1}

phenolic compounds possess multiple biological properties such as anti-tumor, anti-mutagenic, anti-bacterial and anti-inflammatory properties and these activities might be related to their antioxidant properties. The total phenolic contents in the present study are considered to be low as the experiment was conducted at very low concentrations. However, even at lower concentrations, the phenolic compounds have substantial positive effects of the above-mentioned properties[39]. Therefore, *I. oblongata* could be potential sources of natural anti-oxidants and anti-microbial agent.

Phytochemical constitutes of *Ipomoea oblongata*: Preliminary screening of phytochemicals constituents of *I. oblongata* roots extracts (water and methanol) indicated the presence of various secondary metabolites namely alkaloids, carbohydrates, cardiac glycosides, flavonoids, steroids, tannins and triterpenoids (Table 3). Different compounds found in *I. oblongata* as presented in Table 3 came as no shock as related species, *I. batatas* L. and *I. carnea* Jacq. are known to possess them[37]. Flavonoids prevent oxidative cell damage and also have strong anticancer activity[40]. Therefore, the medicinal utilization of *I. oblongata* for cancer in the present study to some extent might be effective. Steroids are responsible for cholesterol-reducing properties[41] and this corroborate the use of this plant species in the treatment of cardiovascular disease and hypertension as reported by questioned THs. Similarly, tannins aid in wound healing and inhibit the growth of micro-organisms to make microbial proteins[42], thus partly validating the use of *I. oblongata* by this THs as both septic and bleeding wounds therapies. Likewise, glycosides are responsible for upper respiratory tract inflammation properties, anti-diabetic, anti-tumor activity and anti-fungal properties[35]. In addition, alkaloids have analgesic, anti-inflammatory and adaptogenic properties which are very imperative in alleviating pains. This support and justify the usage of *I. oblongata* in treatment of inflammations as reported in Table 1. Generally, different bioactive compounds possessed by this species as shown in Table 3 contribute significantly towards its pharmacological activities[43-45] and as such explain its use by THs in this study for different diseases.

Table 2: Total phenolic compounds (TPL) in gallic acid equivalent (GAE)

Extracts	TPL (GAE)	Concentrations (mg mL^{-1})	Content (%)
Methanol	0.041109333	2.5	1.644373
Methanol	0.0801632	5.0	1.603264
Dichloromethane	0.041109269	2.5	1.644371
Dichloromethane	0.040595467	5.0	0.811909
Water	0.0319882	2.5	1.279528
Water	0.0608932	5.0	1.217864

Table 3: Phytochemical constitutes of *Ipomoea oblongata*

	Extracts	
Phytochemical test	Methanol	Water
Carbohydrates	+	+
Cardiac Glycosides	+	+
Saponins	-	-
Proteins	-	-
Steroids	+	+
Triterpenoids	+	+
Alkaloids	+	+
Flavonoids	+	+
Tannins	+	+

-: Negative, +: Positive

Also the potency of *I. oblongata* in the treatment of various afflictions as claimed by these THs could be typically the result from combinations of secondary metabolites depicted in Table 3.

CONCLUSION AND FUTURE RECOMMENDATIONS

The outcomes of this study showed that *I. oblongata* is highly harvested and valued by THs in the Free State Province as medicine for multiple human diseases. The antioxidants activity and various bioactive components exhibited by extracts from *I. oblongata* support its traditional uses in the management and control of these diseases. However, to ensure the sustain ability of this plant species, THs should be encouraged to utilize the sustainable harvesting methods and also propagate the species in the home-gardens. Overall, the present study paves a way for preliminary contribution towards the establishment of both the medical-ethnobotany of *I. oblongata* and its biological activities databases. Further studies focusing on the anti-microbial, anti-cancer, anti-diabetic and cytotoxicity properties of extracts of this therapeutic plant species are recommended.

SIGNIFICANCE STATEMENT

To our knowledge, there is no prior report focusing on the medicinal usage of *I. oblongata* and its biological activities in South Africa and elsewhere. Therefore, the present study is the first to address this gap in knowledge. We found that *I. oblongata* is extensively used by THs in the Free State Province as medicine to heal an assortment of human ailments. The biological activities (namely exceptional anti-oxidants activity and bioactive components) of this species as demonstrated here support its application as herbal medicine for afflictions, thus indicating that *I. oblongata* has the potential to be a novel therapeutic drug.

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