



Phytochemical screening, proximate analysis and anticonvulsant effect of the methanol extract of *Spigelia anthelmia* (Loganiaceae)

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Abstract

Spigelia anthelmia is used traditionally in Southern Nigeria for the treatment of infant convulsion and epilepsy. This study investigated the phytochemical constituents, proximate analysis and anticonvulsant effect of the methanolic extract of *Spigelia anthelmia*. Phytochemical evaluation and proximate analysis was carried out using standard procedure and the anticonvulsant screening was carried out using the maximum electroshock-induced seizure model on albino rat. Results show that the plant contains carbohydrates, reducing sugars, saponins, tannins, flavonoids, alkaloids, fats, proteins and fibre. Also, the plant exhibited a dose-dependent anti-seizure activity on the MES-induced seizure. At a dose of 150mg/kg, it exhibited 73.3% protection against electrically induced seizure in rat; suggesting that anti-seizure effect of *S. anthelmia* may be associated with the secretion and released of GABA since electroshock causes the inhibition of GABA release. This work will help in understanding and possibly explaining the ethnomedicinal use of the plant in the treatment of convulsion and epilepsy.

Keywords: Convulsion; Proximate analysis; *Spigelia anthelmia*; Anticonvulsant

INTRODUCTION

The ethnomedicinal use of plant is becoming more mainstream in clinical practice as improvements in analysis, quality control and clinical research shows the value of herbal medicine in the treatment and prevention of diseases (Gbile and Adesina, 1986). In traditional medicine practice in Nigeria, *Spigelia anthelmia* is currently used in the management of convulsions and epileptic seizures.

The plant is commonly called worm bush. It is a tropical annual weed growing not higher than a foot tall. The stem is scarcely branched; short stalked and has feather lobed leaves set like a whorl. The spikes with small

purple flowers come out of the middle of the whorl. The flowers are on one side of the spike and opens up in the afternoon. The fruit is a two-lobed capsule with warty seed.

In Nigerian traditional medicine the plant is used as a worm expeller (Jegade *et al.*, 2006) and in the management of convulsion and epilepsy. The powdered plant is boiled in water and is recommended as worm expeller by the herbalist as a drink. A glassful of the drink is taken three times daily. To relieve convulsions, the whole plant is partially flamed and is passed through the nostril of the convulsing patient to relieve convulsion.

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Previous scientific work reported the presence of tannins, flavonoids, saponins, steroids and phlobatannins in the plant. It contains the alkaloids spigeline and spiganthine, which act upon the heart especially the endocardium (Achenbach *et al* 1995, Hubner *et al.*, 2001). In large doses, it debilitates the heart (Wagner *et al* 1986). However, to the best of the authors' knowledge, there has been no investigation on the nutritional value and anticonvulsant activity of the plant.

EXPERIMENTAL

Plant collection and identification. Whole plants of *Spigelia anthelmia* was collected from Egor Local Government Area of Edo State, Nigeria in September 2011. The plant was identified and authenticated by the curator of the Department of Pharmacognosy, University of Benin and a voucher specimen was deposited in the herbarium.

Sample preparation. The plant was washed, air-dried and pulverized to a powder using a Thomas-Willey milling machine and the powder was sieved using a sieve of aperture size 1.0mm. The powdered plant was weighed and kept in an air-tight container, extracted with methanol using the soxhlet apparatus for 24hours at a controlled temperature of 60⁰C. The extract was stripped of its organic solvent under reduced pressure at 40⁰C. The crude extract was stored at 4⁰C in a refrigerator until use.

Phytochemical screening. Phytochemical tests were done using standard procedures as described by Sofowora and Harborne (Harborne, 1992, Sofowora, 1993).

Proximate analysis of *Spigelia anthelmia*. The proximate analysis was carried out using standard methods as described by the Association of Official Analytical Chemists (AOAC, 1984).

Pharmacological screening. The anticonvulsant activity of the methanolic

extract of *Spigelia anthelmia* against MES-induced seizure was carried out on albino rats. Groups of albino rat (n = 5 per group) were administered with 75mg/kg, and 150mg/kg of the methanolic extract of *Spigelia anthelmia* respectively. Phenobarbitone 30mg/kg was used as a positive control, while normal saline 1ml/1kg was used as negative control. All administration was done intra-peritoneally.

One hour after administration, each albino rat was stimulated with an alternating current of 150mA for 0.25 seconds through steel electrodes clipped on the left and right ear lobes of the rats. The animals were considered protected against MES-induced seizure if the hind-limb tonic extensor phase of the maximal seizure pattern was absent after stimulation.

Statistical analysis. All values were expressed as mean \pm SEM (standard error of mean).

RESULTS AND DISCUSSION

Phytochemical analysis shows that *Spigelia anthelmia* contains carbohydrates, reducing sugars, saponins, alkaloids, anthraquinones, flavonoids, tannins, cardiac glycosides, and steroidal nucleus while diterpenes were absent.

The presence of saponin in *S. anthelmia* contradicts the observation of Taylor-Smith (1996), who reported that saponins were absent. It however agrees with another observation that saponin was present in the plant (Edeoga and Gomina 2000). Environmental factors and seasons of collection have been known to affect the type and quantity of the secondary metabolites that will be present in a plant. Saponins are known to cause a reduction of blood cholesterol by preventing its reabsorption (Osagie and Eka, 1998). They have also been shown to have antitumor activities and can lower the risk of human cancers. They are believed to react with the cholesterol rich membranes of cancer

cells thereby limiting their growth and viability (Roa *et al.*, 1995). Medicinal agents containing tannins have been shown to possess anti-diabetic properties (Iwu 1983) while those containing steroids and

phlobatannins are of interest in pharmacy because of their close relationship with sex hormones as they could be the starting materials for these hormones (Okwu 2001).

Table 1: Phytochemical analysis of the powdered whole plant of *Spigelia anthelmia*

Test	Class of compound	Result
Molisch	Soluble carbohydrate	+
Fehling's	Reducing sugar	+
Keller-Killani	Deoxy-sugar	-
Hager's	Alkaloid	+
Wagner's	Alkaloid	+
Mayer's	Alkaloid	+
Dragendorff's	Alkaloid	+
Bornntrager's	Anthranquinone	+
Frothing test	Saponin	+
Lieberman-Burchard's	Glycoside	+
Salkowski's	Glycoside	+
Legal's	Cardiac glycoside	+
Ferric chloride	Tannins	+
Sodium Hydroxide	Flavonoid	+
Lead acetate	Flavonoid	+
Ferric chloride	Phenols	+
Copper acetate	Diterpenes	-

Table 2: Proximate analysis of *Spigelia anthelmia*.

Constituent	Mean Concentration (%) \pm SEM
Moisture	0.27 \pm 0.03
Fat	4.03 \pm 0.12
Protein	6.33 \pm 0.03
Fibre	7.83 \pm 0.15
Ash	11.00 \pm 0.12
Carbohydrate	70.53 \pm 0.20

Table 3: Anticonvulsant activity of methanol extract of *Spigelia anthelmia* against MES-induced seizures

Dose of test compound (mg/kg)	Ratio of animals protected	% protected
Control	0/5, 0/5, 0/5,	0.
Methanol extract of <i>Spigelia anthelmia</i> (75mg/kg)	0/5, 0/5, 0/5,	0.
Methanol extract of <i>Spigelia anthelmia</i> (150mg/kg)	2/5, 5/5, 4/5,	73.3
Phenobarbitone (30mg/kg)	5/5, 5/5, 5/5,	100

Cardiac glycosides have been employed clinically in the treatment of cardiac failure. These agents increase the force of contraction in a failing heart by increasing the interaction of the action and myosin filament of the cardiac sarcomere by increasing calcium concentration in the vicinity of the contractile protein during systole (Prohp and Onoagbe, 2012).

The proximate analysis of *Spigelia anthelmia* showed that the powdered whole plant contained fat, protein, fibre, ash and carbohydrate in considerable amount. The moisture content of the powdered plant was low (0.27 \pm 0.03) compared to other constituents.

The anticonvulsant effect of the powdered plant of *Spigelia anthelmia* exhibited a significant dose-dependent

protection against maximum electroshock seizure in the albino rats. At a dose of 150mg/kg, seizure was completely abolished. Maximum electroshock causes the inhibition of GABA-release and this, in turn, might lead to the inhibition of GABA synthesis and inhibition of the secretion of the inhibitory neurotransmitter. GABA plays a central role in epileptogenesis.

Conclusion

The study reveals that the powdered whole plant of *Spigelia anthelmia* contains various phytochemicals and nutritional constituents in varying amount. The study also shows for the first time that the methanolic extract of the plant exhibits a dose-dependent anticonvulsant activity against electrically induced seizure. The work thus justifies the ethnomedicinal use of this plant in the treatment of convulsion.

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