

The Pharmacological Actions of the Aqueous Extract of the Leaves of *Solenostemma argel* (Hayne) on Isolated Rabbit Aortic Strip and Guinea Pig Atria

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Abstract: The effects of the aqueous extract of the leaves of *solenostemma argel* were examined on the isolated rabbit aortic strip and guinea pig atria. The aqueous extract produced stimulatory effect on isolated rabbit aortic strip and this effect was not blocked by tolazoline. When added to isolated guinea pig atria the extract decreased both the rate and force of contraction and this effect was blocked by calcium chloride, it was concluded that the inhibitory effect may be due to the local anaesthetic activity. Therefore the antiarrhythmic activity of *solenostemma argel* should be investigated.

Key words: *Solenostemma argel*, rabbit aortic strip, guinea pig atria, local anaesthetic

INTRODUCTION

Solenostemma argel (Del.) Hayne, family: Asclepiadaceae is a shrub occurring in wild state in Egypt, and Sudan. The herb of the plant locally called El Hargel^[1]. The natives prepare decoctions from the leaves and branches for treatment of various colics and pains^[1].

Khaled and his colleagues have noted the presence of several flavonol glycosides. Two of them were isolated, a monoglycoside and a diglycoside of kampferol. Of the alkaloids they reported that only choline was found in considerable amounts^[2] has detected the presence of flavonoides, sterols, cardenolides (unsaturated steroid nucleus), tannins, saponins and alkaloids in the three morphological plant parts. It was found that the Chloroform Methanol (CM) extract of *solenostemma argel* produced a biphasic effect on the rabbit jejunum, an initial reversible inhibition followed by delayed and sustained inhibition. CM also suppressed the activity of the uterus and the effect was not antagonised by cimetidine, haloperidol or propranolol. Furthermore, CM exhibited local anaesthetic activity when tested on the foot withdrawal reflex of the frog. The chloroform extract stimulated rat uterus contraction. This effect was antagonised by atropine or cyproheptadine^[1].

MATERIALS AND METHODS

Extraction of the leaves: (Decoction): The leaves of *solenostemma argel* were freed from the other parts of plants and crushed by hand, then 10 g of the leaves extracted with 100 mL of distilled water in a water bath for 90 min, filtered then the volume was adjusted to 100 mL by passing hot water through the residue.

Isolated tissues preparation:

Guinea-pig atria: Guinea-pig was killed by dislocating its neck and exanguinated. The thorax was opened immediately and the heart was exposed and removed as rapidly as possible and transferred to petri dish containing ice-cold aerated Ringer solution. The fat was removed and the ventricles were dissected off. Threads were tied to the tip of each atrium and the preparation was mounted on a tissue holder, then transferred to an organ bath and the upper thread was attached to the transducer. (Harvard universal oscillograph).

Rabbit aortic strip preparation: The rabbit aortic strip was prepared according to the method of Furchgott and Bhadrakom. The rabbit was exanguinated, the chest was opened and the internal viscera was pulled to one side to expose the aorta. The aorta was cut close to the heart and the aorta then dissected out. The tissue was transferred to a petri dish containing oxygenated Krebs solution at room temperature. After removal of the surrounding fat and connective tissues, then a plastic canula was inserted into the lumen of the aorta which was then cut spirally to produce a continuous strip. The lower end of the strip was tied to the tissue holder, then the preparation was transferred to an organ bath and the upper end of the strip was attached by thread to isometric transducer^[3,4].

RESULTS

Effect of aqueous extract of leaves of *solenostemma argel* on isolated guinea pig atria: The extract decreased both the rate and force of contraction in a dose dependent manner 0.192, 0.384 and 0.768 mgmL⁻¹, Fig. 1 a.

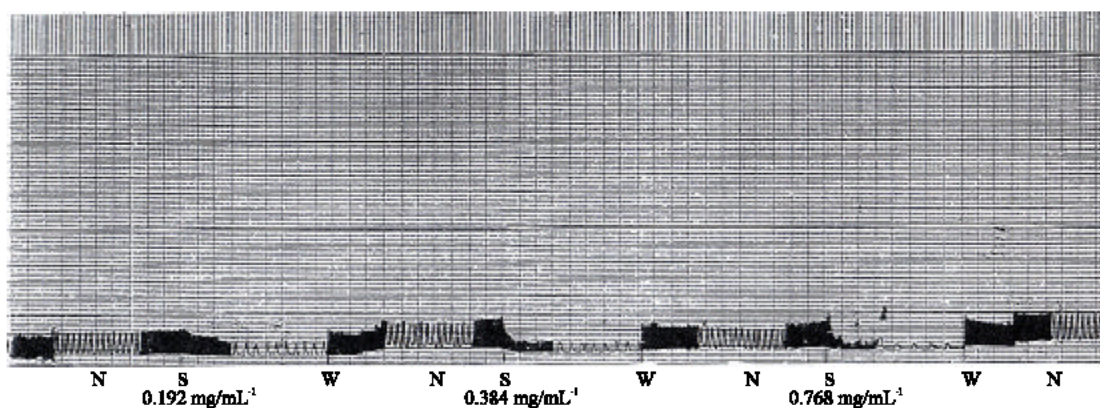


Fig. 1a: Effect of aqueous extract of leaves of *Solenostema agr* (S) in a dose of 0.192 mg mL⁻¹, 0.384 mg mL⁻¹, 0.768 mg mL⁻¹ on isolated guinea pig atria the extract decreased both the rate and force of contraction (N: Normal W: Wash)

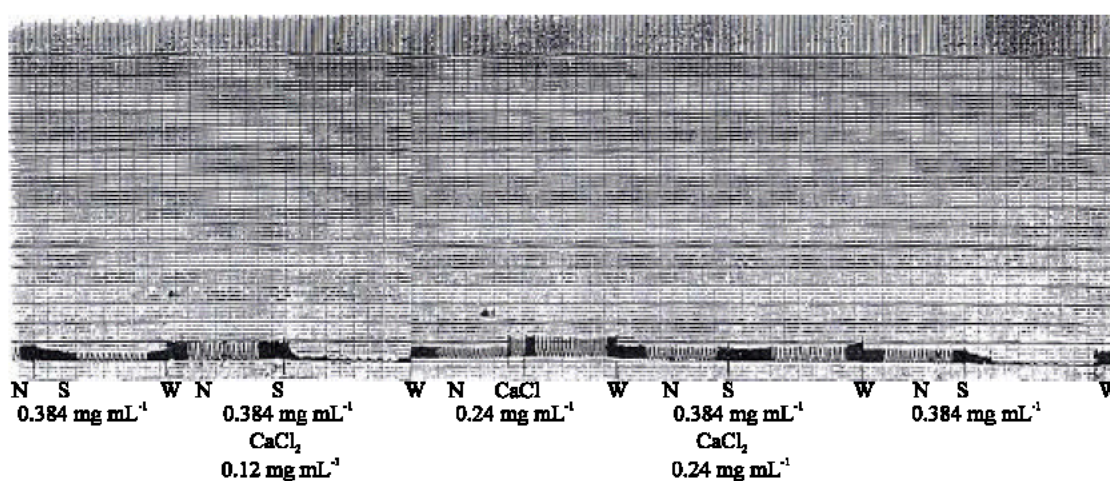


Fig. 1b: Effect of aqueous extract of leaves of *solenostema agr* (S) in a dose of 0.384 mg mL⁻¹ on isolated guinea pig atria, the extract produced inhibitory effect which was blocked by calcium chloride (CaCl₂ 0.24 mg mL⁻¹, (N: Normal: W: Wash)

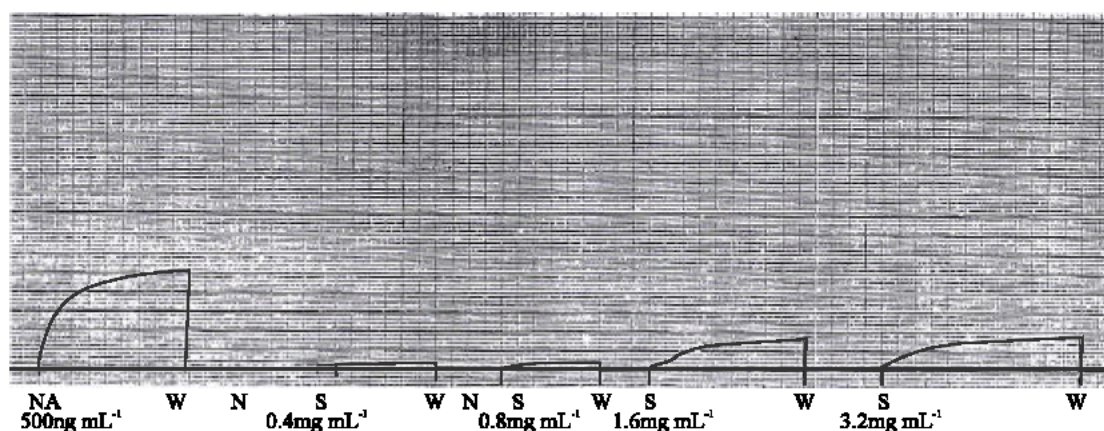


Fig. 2a: influence of aqueous extract of leaves of *S. agrifol* (S) on rabbit aortic strip, Noradrenaline (NA) in a dose of (500 ng mL⁻¹) was administered to produce standard contractile peak. The extract (S) was added in a dose of 0.4, 0.8, 1.6 and 3.2 mg mL⁻¹. Produced stimulatory effect, (N: Normal; W: Wash).

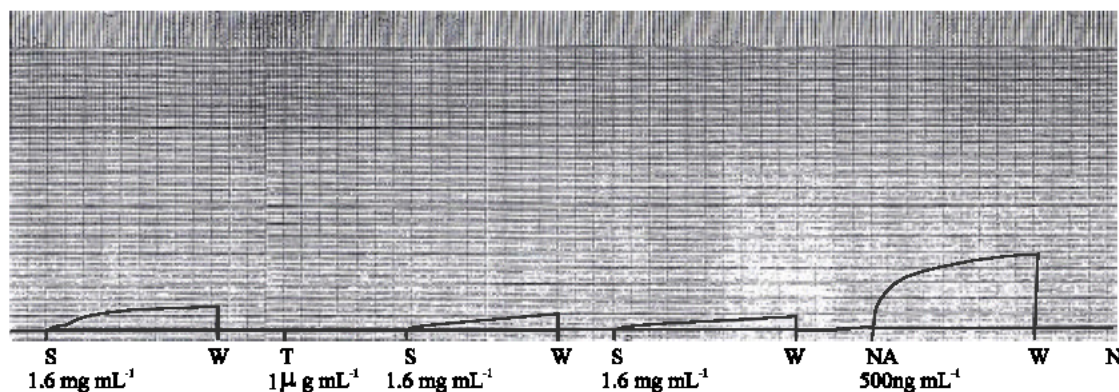


Fig. 2b: Effect of aqueous extract of leaves of *S. argel* (S) in a dose of 1.6 mg mL^{-1} on rabbit aortic strip produced stimulatory effect which was not blocked by Tolazoline(T)($1 \mu\text{g mL}^{-1}$), (N: normal; W: wash).

The inhibitory effect of the extract (0.384 mg mL^{-1}) was blocked by calcium chloride (Ca Cl_2 , 0.24 mg mL^{-1}) (Fig. 1b).

Effect of aqueous extract of leaves of *Solenostemma argel* on rabbit aortic strip: In Fig. 2a noradrenaline 500 ng mL^{-1} stimulated the aortic strip preparation. Addition of extract of *Solenostemma argel* 0.4 , 0.8 , 1.6 and 3.2 mg mL^{-1} to the aortic strip preparation produced stimulatory effect. The stimulatory effect of the extract (1.6 mg mL^{-1}) was not blocked by tolazoline ($1 \mu\text{g mL}^{-1}$) Fig. 2b.

DISCUSSION

Addition of aqueous extract of leaves of *Solenostemma argel* to isolated rabbit aortic strip produced stimulatory effect in a dose of 0.4 , 0.8 , 1.6 and 3.2 mg mL^{-1} , this effect was not blocked by tolazoline $1 \mu\text{g mL}^{-1}$ (alpha blocker). Drugs can affect vascular smooth muscle either directly, by acting on the smooth cells themselves, or indirectly, by acting on endothelial cells or on sympathetic nerve terminals^[5]. Since the aqueous extract of leaves of *Solenostemma argel* produced stimulatory effect on isolated rabbit aortic strip, which was not blocked by tolazoline it may exert its action by a direct effect on vascular smooth muscle.

The inhibitory effect of the aqueous extract of *S. argel* on guinea pig atria may be partly due to the local anaesthetic effect of *Solenostemma argel* extract.

Khalafall found that the original aqueous extract of leaves of *S. argel* exhibited a potent local anaesthetic action in the reflex of the tested frogs.

Local anaesthetics block cardiac sodium channels and thus depress abnormal cardiac pacemaker activity, excitability and conduction; they also depress the strength of cardiac contraction and cause arteriolar

dilation. However cocaine differs from the other local anaesthetic in that it produces vasoconstriction due to blockade of norepinephrine uptake^[6].

Although our findings agree with what reported by Ronald *et al.*,^[6] with respect the effect of local anaesthetics on the heart but they differ with regard to effect on arteriolar blood vessels where they reported arteriolar dilation, where as we found stimulatory effect on aortic strip. Nevertheless it is not cocaine like effect because it is not blocked by tolazoline.

The blockage of inhibitory effect of *S. argel* on guinea pig atria by addition of calcium chloride may be due to that elevated extra cellular calcium that partially antagonizes the action of local anaesthetics. This reversal is caused by the calcium induced increase of the surface potential on the membrane, which favours the low- affinity rested state^[6]

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