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A POTENT MEDICINAL PLANT: *SECURINEGA VIROSA* (WILLD.) MULL. ARG.

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Evaluation of medicine value is an important part of the health-care system, *Securinega virosa* (Willd.) Mull. Arg. has been recorded as a poisonous plant, while the present investigation intrigues this plant from pharmacological point of view to show medicinal value other than the piscicidal activity. Study includes major phytochemical screening (alkaloids, anthracene derivatives, flavonoids, polyphenols, phenolic acids and terpenoids etc.), antimicrobial activities against human pathogenic strains (*Staphylococcus aureus, Bacillus subtilis, Escherichia coli* and *Proteus vulgaris*) and anti-inflammatory activity.

Keywords: Medicinal plant; *Securinega virosa.*

Introduction

Securinega virosa (Willd.) Mull. Arg. a large unarmed shrub with smooth, thin, reddish brown bark belongs to family Euphorbiaceae occurring throughout tropical and subtropical regions of both hemispheres. *Securinega virosa* predominantly included under the list of poisonous plants of India[1] due to its piscicidal properties[2]. Alkaloids of this species have been categorized separately. Parry[3] and Sankawa *et al.*[4] have studied the biosynthesis of alkaloids from *S.virosa*. Nakano *et al*[5] have structurally elucidated virosecurinine from this plant.

This species has not been investigated further for its medicinal uses due to its well known piscicidal and poisonous activity. Medicinal or poisonous property of a plant is dose dependent and every plant has some medicinal properties. Hence, it is essential to standardize it for utilization. The present study deals with the phytochemical and pharmacological activities of *Securinega virosa.*

Material and Methods

For phytochemical and pharmaceutical study, healthy and freshly collected aerial parts of *Securinega virosa* (Willd.) Mull. Arg. have been used. Aerial parts were dried in shade so as to prevent decomposition of active principles, and further made into fine powder in blender. Preliminary phytochemical screening of plant was done according to the standard procedures adopted by the various workers[6-9]. Qualitative phytochemical screening of plant was done through Thin Layer Chromatographic technique according to the standard procedures[9-11].

The alcoholic extracts were used for assaying antibacterial activity by using filter paper disc diffusion method[12]. Different bacterial species used for the purpose were, *Staphylococcus aureus, Bacillus subtilis* (Gram +ve); *Escherichia coli* and *Proteus vulgaris* (Gram –ve) courtesy, Microbiology Lab, Department of Pharmacy, Nagpur University, Nagpur. The "Carageenan Induced Rat Paw Odema Assay"[13] was adopted to study the anti-inflammatory action. The test compound was administered orally in the dose of 100mg/kg body weight and 1% Acacia gum was used as control. After an hour carrageenan 0.05ml was injected into the planter tissue of right hind paw. The paw columns were measured plethysmographically at 1 and 3 hrs after the carrageenan injection. The percentage inhibition of the paw oedema was calculated using the equation: Percentage inhibition = *(1 – Vt/Vc) X100*

Where, *Vt* and *Vc* are the volumes of the paw oedema in the treated and control animals respectively.

Results and Discussion

Phytochemical screening : A general screening conducted to characterize chemical composition of *Securinega virosa* leaf and stem samples. The screening covered mainly nitrogenous compounds, isoprenoids, acetogenins and carbohydrates, are summarized in Table 1. Screening for nitrogenous compounds was mainly concerned with alkaloids. Both leaf and stem samples showed positive test with three different alkaloids on the basis of their Rf values in TLC. Out of which, one alkaloid is common in both leaf and stem samples. Amino acids and proteins were observed in water extracts of leaf and stem samples. Acetogenin screening included tannins, flavaonoids, coumarins, emodins, anthocyanidins, anthocyanins,

Table 1. Preliminary phytochemical screening of *S. virosa.*

Chemical name	Part	Tests with all five extracts P.ether	Chloroform	Acetone	Alcohol	Water
Alkaloids	Leaf	+	+	+	+	+
	Stem	-	+	+	+	-
Steroids	Leaf	+	+	+	+	+
	Stem	+	+	-	-	-
Triterpenoids	Leaf	+	+	-	-	-
	Stem	+	+	-	-	-
Coumarins	Leaf	-	-	-	-	-
	Stem	-	-	-	-	-
Flavonoids	Leaf	-	-	-	-	-
	Stem	-	-	-	+	-

Tests with water extracts		
Amino acids	Leaf	+
	Stem	+
Proteins	Leaf	+
	Stem	+
Carbohydrates	Leaf	+
	Stem	+
Monosachharides	Leaf	+
	Stem	+
Reducing sugars	Leaf	+
	Stem	+
Polyoses	Leaf	+
	Stem	+
Polyronoids	Leaf	+
	Stem	+
Gums and mucilages	Leaf	-
	Stem	+
Starch	Leaf	-
	Stem	+
Saponins	Leaf	+
	Stem	+

Tests with 70% ethanol extract		
Cardiac glycosides	Leaf	-
	Stem	-

Tests with alchol and water extracts			
Chemical name	Part	Alchol	Water
Anthocyanins	Leaf	-	-
	Stem	-	-
Anthocyanidins	Leaf	-	-
	Stem	-	-
Anthracene glycosides	Leaf	-	+
	Stem	-	+
Tannins	Leaf	+	+
	Stem	-	+
Tests with Petroleum ether extracts			
Emodins	Leaf	-	
	Stem	-	
Fatty acid	Leaf	+	
	Stem	-	
Volatile Oils	Leaf	-	
	Stem	-	
Tests with dry powder			
Acubins	Leaf	+	
	Stem	+	
Iridoids	Leaf	-	
	Stem	-	
Cynogenic glycosides	Leaf	-	
	Stem	-	
Anthraquinones	Leaf	-	
	Stem	-	

Note : '+' means positive test; '-' means negative test.

anthroquinones, anthracene derivatives, polyphenols; phenolic acids and fatty acids. Tannins and anthracene glycosides were found in both stem and leaf, flavonoids were present only in stem sample. Whereas, fatty acids were present only in leaf sample. On the basis of different Rf values, thin layer chromatogram showed abundant presence of few of these compounds, polyphenols (8) anthracene derivatives (5), phenolic acids (4), while, flavonoids (1) showed less occurrence (Table 2). Rest of the acetogenic compounds were not found in either of the samples (Table 1). (Figures in parenthesis show the number of bands in Thin Layer Chromatography)

Table 2. *S. virosa* : Qualitative Chemical screening by Thin layer chromatography.

Chemical name	Solvent system	Part	Rf values	Total bands	Spray reagent
Alkaloids	Methanol : Conc. NH_4OH(200:3)	L S	0.080, 0.18, 0.90 0.90	3 1	Dragendroff's reagent
Phenolic acid	Toluene : Chloroform : Acetone (8 : 5 : 7)	L S	0.09, 0.18, 0.21, 0.46 0.09, 0.21	4 2	Diazotized p-Nitro aniline reagent
Poly phenols	Toluene : Chloroform : Acetone (8 : 5 : 7)	L S	0.15, 0.21, 0.28, 0.33, 0.41, 0.74 0.09, 0.15, 0.29	6 3	Diazotized p-Nitro aniline reagent
Coumarins	Ethyl acetate : Formic acid : Glacial acetic acid : Water (100 : 11 : 11 : 26)	L S	Nil Nil	0 0	Borntrager's reagent
Anthracene derivatives	Ethyl acetate : Methanol : Water (100 : 13.5 : 10).	L S	0.14, 0.36, 0.76, 0.89 0.14, 0.27, 0.76	4 3	Borntrager's reagent
Flavonoids	Glacial acetic acid : Water (4:1:5), top layer	L S	Nil 0.60	0 1	No reagent, UV light
Diterpenoids	n- Hexane: Ethyl acetate (17:3)	L S	0.30, 0.56 0.30	2 1	Libermann-Burchard reagent and Anisaldehyde-Sulphuric acid reagent
Triterpenoids	Toluene : Chloroform : Ethanol (4 :4: 1)	L S	0.35 0.46, 0.66	1 2	
Steroids	Toluene: Ethyl acetate (9:1)	L S	0.08, 0.41, 0.63 0.08, 0.41	3 2	Phosphoric acid reagent

Note: L= Leaf; S= Stem

Table 3. Screening for antibacterial activity of *S. virosa.*

Part	*S.aureus*	*B.subtilis*	*E. coli*	*P.vulgaris*
Leaf	16.0	8.4	22.8	21.2
Stem	8.0	18.8	9.2	7.2

Note: Diameter in mm along with disc diameter (6mm)
S.aureus= Staphylococcus aureus; E.coli= Escherichia coli; B.subtilis= Bacillus subtilis; P.vulgais= Proteus vulgaris.

Steroids, diterpenoids, tripernoids, saponins were observed in both leaf and stem samples. And further TLC results confirmed diterpenoids (2); triterpenoids (3); steroids (3) *in toto*. Carbohydrates screening included reducing sugars, polyuronoids, polyoses and starch. All these compounds, except starch were shown positive tests in both stem and leaf samples, where as starch and gums were seen in stem extracts only.

Table 4. Screening for anti-inflammatory action. (All values represent average of 5 readings)

Drug	Dose(mg/Kg)	Mean edema			Percent inhibition		
		1hr	2hr	3hr	1hr	2hr	3hr
Acacia gum (negative control)	100	0.7±0.1	0.7±0.158	1.6±0.223	-	-	-
Securinega virosa	100	0.3±0.122	0.3±0.158	0.6±0.244	57.14	57.14	62.5

Pharmacological screening: It is found that the leaf and stem extracts of *Securinega virosa* inhibit growth of all the four bacteria (Two Gram +ve bacteria viz., *Staphylococcus aureus* and *Bacillus subtilis* and two Gram –ve bacteria *Escherichia coli* and *Proteus vulgaris*) conforming their antibacterial activity (Table 3). However, leaf samples were found to have more potential activity than stem extracts, except in case of *Bacillus subtilis*. Leaf samples inhibited the growth of *Escherichia coli* and *Proteus vulgaris* with a greater range of disc diameter i.e 22.8 mm and 22.1 mm respectively (Table 3). Alcoholic extract of aerial parts of *Securinega virosa* showed positive anti-inflammatory action. The percentage of anti-inflammatory activity was increasing from 57.4% to 62.5%, values correspond to percentage activity of 1st to 3rd hour after carrageenan injection respectively (Table 4).

Haslam[14] analyzed different polyphenols from several herbs and concluded that they can be used in wide range of treatments including inflammation, kidney problems, arteriosclerosis, stomach disorders, nervous and heart problems. While our present investigation reports eight unknown polyphenols, hence it can be used in medicine after the pharmacological scrutiny. Alkaloids are reputed to have dramatic physiological activities. They act mainly on central nervous system. Many drugs used as hallucinogens, mental stimulant, mental depressant contain alkaloid[7]. Nakano *et al.*[5] reported presence of verosecurinine in *Securinega virosa*. While in this investigation this plant showed three different alkaloids on the basis of Rf value.

Kapoor *et al.*[15] and Gill *et al.*[16] screened several plants from pharmacological point of view and reported that the alkaloids, anthracene glycosides, flavonoids, iridoids, reducing compounds and triterpenoids, presence may be attributed to the medicinal properties of plants. Steroids and triterpenoids are known to posses anti-inflammatory, activities as per Chawla *et al.*[17]. Saponins are well known expectorant[7,18]. Flavonoids have antiviral, anti-inflammatory and cytotoxic activities[7,19]. All these chemical compounds were sufficiently evaluated in our studies, hence, one or few of these may be important in inhibiting the inflammation. After proper experimental scrutiny, these reports provide a hope of isolating antiviral or antidiabetic or antirheumatic drugs from *Securinega virosa* due to the presence of above said phytochemicals. The present study includes the preliminary phytochemical, thin layer chromatographic, antibacterial and anti-inflammatory analysis of *Securinega virosa* (Willd.) Mull. Arg. Phytochemical analysis observed that this plant might be useful as a good source of medicine to stop these bacterial growth. Finally anti-inflammatory results proved that this plant is having medicinal properties other than piscicidal and poisonous activities. The results are encouraging, but scientific scrutiny is absolutely necessary before being put into practice.

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