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Research Article

THERAPEUTIC USAGES OF *RHINACANTHUS NASUTUS (L) KURZ* (ANITHTHA) IN SRI LANKAN TRADITIONAL MEDICINE

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ABSTRACT

Rhinacanthus nasutus (Family: Acanthaceae; Sinhala name: Aniththa; Tamil name: Nagamalli Sanskrit name: Yuthikaparni) is a plant used in Sri Lankan traditional system of medicine. Specially for Kitibha (Psoriasis) in excellent results. It is widely distributed in Southern and North central province.

Therapeutic usages of this plant are not known widely. Hence the present study was undertaken to collect scattered knowledge. Data was gathered from traditional physicians, medical books, and internet. Roots, leaves, stems and entire plant are used in preparation of various medicine. It is administered internally in treatment of hepatitis, hemorrhoid, diabetes mellitus, hypertension, skin diseases, cancers, obesity, helminthiasis in the form of decoction. The wound healing potential is a highly useful attribute of this plant. It is used externally in the form of Alepa (paste) in treatment of ringworm, psoriasis abscesses, septic ulcers, leprosy, eczema, dhobi's itch, prickly heat, herpes, scurvy, and in the inflammatory conditions. Antifungal, anti proliferative, anti oxidant, antibacterial, antiviral, anti-inflammatory, anti-allergic, and anticancer properties of *R.nasutus* are scientifically proven. This plant pacifies vitiated Kapha and Vata Dosha due to its Ayurveda pharmacodynamic properties. This plant is used in psoriasis to reduced itching, indurations, inflammation as a single drug or in combination with other ingredients. *R. nasutus* is a plant with multi-faceted medicinal values especially in treatment of Kitibha.

Keywords: *Rhinacanthus Nasutus*, Aniththa, Anti Cancer, Anti Proliferative, Psoriasis.

INTRODUCTION

Rhinacanthus nasutus is a herb used in traditional system of medicine. It is native to Sri Lanka, India, Malaysia, Philippine Islands and Tropical Africa. In Sri Lanka, it is a very common road-side plant at the edges of the jungle in dry region of Tissamaharama, Polonnaruwa. Appearance and shape of the flower is very similar to a white water crane¹.

The aim of the present study is to collect and record therapeutic usages of *R. nasutus* phytochemicals and scientifically proven bio activities of this plant. *R. nasutus* is used in treatment of common disorders including cancer, fungal infections, eczema, pulmonary tuberculosis and herpes virus infections. *R. nasutus* can be used for health promotion due to its immunomodulating activity. Through various researches, it has been reported that the plant has no toxicity. *R. nasutus* contains several chemical compounds such as rhinacanthin A, B, C, and D which are active against human

cytomegalovirus, microbials, diabetes mellitus, cancers and hypertension. Preparations of *R. nasutus* are very effectively used by traditional practitioners in Sri Lanka in treatment of skin diseases².

MATERIALS AND METHODS

Medicinal uses were gathered from traditional practitioners in various provinces of Sri Lanka, authentic Ayurvedic and traditional medical books and internet search.

Whole fresh plants of *R. nasutus* were collected from herbal gardens of Huldummulla, Nawinna, Pallekelle, and Maththegoda. Identification and authentication of *R.nasutus* was done by Mrs Sudeepa Sugathadasa, Scientist, Division of Botany, Bandaranayake Memorial Ayurveda Research Institute, Navinna, Sri Lanka. Further tested Phytochemicals and scientifically proven bioactivities also gathered from books, internet and local refereed journals and web search.

RESULTS

Taxonomy³:

| | |
|------------|----------------------|
| Kingdom – | Plantae |
| Division – | Magnoliophyta |
| Class – | Magnoliopsida |
| Order – | Lamiales |
| Family – | Acanthaceae |
| Genus – | Rhinacanthus |
| Species – | Rhinacanthus nasutus |

Morphology of the Plant:

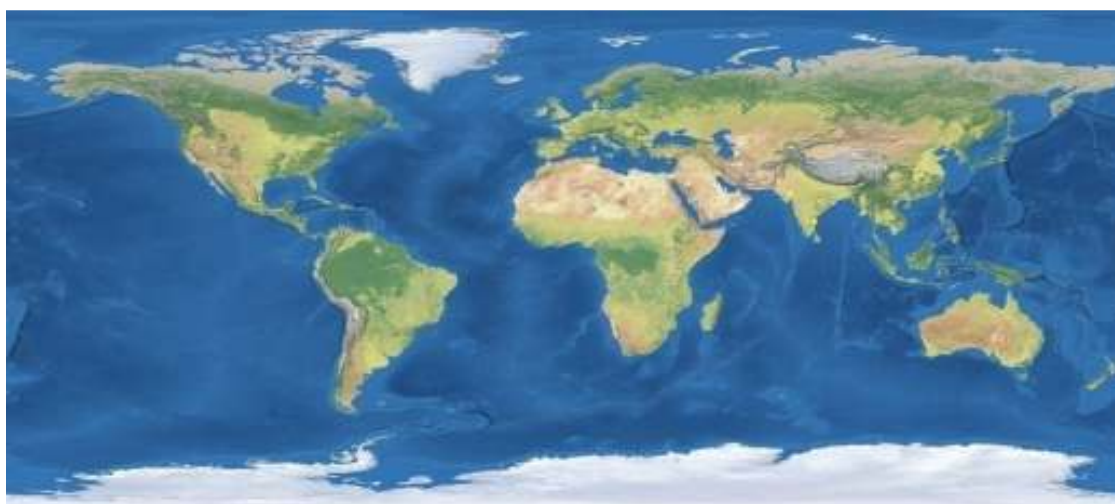
A small slender undershrub; **stem** 0.6- 1.2 m tall, slightly branched, nearly cylindrical, internodes 3.5 – 5.5 cm long, slightly rough with hairs, **leaves** simple, opposite, decussate, 3.5-9.5cm long, 1-3.5cm broad, lanceolate, tapering at both ends, acute, entire, scantily hairy on both sides; **petioles** 0.3-1.3 cm long and hairy; **flowers** zygomorphic, bisexual, white in simple axillary cymes at the ends of branches together forming a large, lax, pubescent, terminal panicle; bracts linear-lanceolate, 1.7mm long, 0.7mm broad, acute, hairy; bractlets 2 to each flower, as long as bracts but narrower; sepals 5, equal, 2.5-3 mm long 0.5mm broad, linear, glandular pubescent,

slightly connate at base; petals 5, fused into a long, cylindrical corolla tube expanded into a 2- lipped limb, 1.7 cm across corolla tube 1.3-1.7 cm long very narrow, greenish white, pubescent outside with some hairs glandular, glabrous inside, upper lip narrow linear, 8.5 mm long, 2mm broad, bifid at apex and pubescent outside, lower lip 3-lobed, 1.4cm long 1.3 cm broad, lobes oblong and obtuse; stamens 2 inserted in the throat of the corolla-tube, diverging; filaments 2.5mm long; anthers 2- celled, cells superposed, blunt at base; ovary superior, 1.7 mm long, hairy 2-locular with 2 ovules in each loculus; style 1.8cm long, hairy; stigma bilobed, lobes linear; **fruit** capsule 1.2cm long, glabrous, loculicidally dehiscent with 4 glabrous seeds⁴ (Figure: 1, Figure: 2).

Distribution of the Plant:

Sri Lanka, India, Indo China, Southern China, Tropical East Africa, Thailand and the Malaysian region (Peninsula Malaysia, Java, the Moluccas, the Philippines) where it is now widely naturalized and often common in Sri Lanka⁵.

Worldwide geographical distribution of *Rhinacanthus nasutus* is given below⁶.

Synonyms for *Rhinacanthus nasutus*⁷:

R. nasutus has several vernacular names.

Botanical names: *Justicia nasuta* L., *Rhinacanthus nasutus* Nees, *Rhinacanthus rottlerianus*, Nees, *Justicia rottleriana* wall, *Rhinacanthus communis*, *Dianthera paniculata*

Sinhala name: Aniththa; **English name:** Snake Jusmine;

Tamil names: Nagamalli, Nagamulli, (Antidote in cobra bites), Uragamalli: (Antidote in snake bites.); **Sanskrit name:** Yuthikaparni; **Hindi name:** Jupani⁸.

Chemical Constituents⁹:

leaves and stems: A quinol 4-acetyl -3,5-dimethoxy- p-quinol, accompanied by 17 known compounds including triterpenoids, steroids, benzenoids, coumarin, anthraquinone, quinine, glycosides, carbohydrate, and chlorophyll, were isolated from the leaves and stems.

Root: Afforded 1,4 – naphtho-quinone ester, rhinacanthin-Q(1) Rhinacanthin-A to –D dimethyl dihydro pyranonaphthoquinone esters and eight new 2 hydroxy -1,4-naphthoquinone esters were isolated from the root.

Experimental Pharmacology of *R. nasutus*:

1 Sendl, *et al.*, (1996) reported two new naphthoquinones, rhinacanthin-C (1) and rhinacanthin-D (2), exhibit inhibitory activity against cytomegalovirus (CMV), with EC50 values of 0.02 and 0.22 μ g/mL, respectively, against human CMV. They were isolated from the medicinal plant *Rhinacanthus nasutus* (Acanthaceae). The structures of the compounds were determined by analysis of their spectroscopic data, in particular, 2D NMR¹⁰.

2. Rao *et al.*, (2013) evaluated the therapeutic efficacy of *R. nasutus* on mitochondrial and cytosolic enzymes in streptozotocin-induced diabetic rats. The rats were divided into five groups with 6 rats in each group. (Group I. Normal rats: controls: animals receiving only buffer, Group ii. *R. nasutus* treated normal rats; 200 mg /kg/day, Group iii. Diabetic rats; untreated. Group iv. *R. nasutus* treated diabetic rats: 200 mg/kg/day, Group v. Glibenclamide treated diabetic rats: 50 mg/kg/day), The methanolic extract of *R. nasutus* was orally administered at a dose of 200 mg/kg/day, and

glibenclamide was administered at a dose of 50 mg/kg/day. All animals were treated for 30 days and were sacrificed. The activities of both intra- and extramitochondrial enzymes including glucose-6-phosphate dehydrogenase (G6PDH), succinate dehydrogenase (SDH), glutamate dehydrogenase (GDH), and lactate dehydrogenase (LDH) were measured in the livers of the animals. The levels of G6PDH, SDH, and GDH were significantly reduced in the diabetic rats but were significantly increased after 30 days of *R. nasutus* treatment. The increased LDH level in diabetic rats exhibited a significant reduction after treatment with *R. nasutus*. These results indicate that the administration of *R. nasutus* altered the activities of oxidative enzymes in a positive manner, indicating that *R. nasutus* improves mitochondrial energy production. Researchers suggest that *R. nasutus* should be further explored for its role in treatment of diabetes mellitus.

Rao *et al.*, (2013) were observed that no overt signs of toxicity and behavioral changes, renal toxicity, hepato toxicity, in rats after following oral administration of 200mg/kg freeze dried extract of *Rhinacanthus nasutus*. Some previous studies had reported that the plant extract has no toxic effect when used in animals at higher doses (500 mg/kg body weight)¹¹.

3. Gotoh *et al.*, (2004) The anti proliferative activity of the ethanol extract of root and aqueous extract of leaves of *R. nasutus*, and the supposed active moiety rhinacanthin C was assessed *in vitro* using the human cervical carcinoma cell line HeLa, its MDR1-overexpressing subline Hvr100-6, human prostate carcinoma PC-3 cells and human bladder carcinoma T24 cells. rhinacanthin C was chemically synthesized and its content in the *R. nasutus* extracts was determined by HPLC with a photodiode array detector. The antiproliferative activity of the *R. nasutus* extracts was also assessed *in vivo* using sarcoma 180-bearing mice. It was suggested that 1) the *in vitro* antiproliferative activity of rhinacanthin C was comparable with or slightly weaker than that of 5-FU, 2) rhinacanthin C showed anti proliferative activity for MDR1-overexpressing Hvr100-6 cells, similarly to parent HeLa cells, 3) the *in vitro* anti proliferative activity of the ethanol extract of root *R. nasutus* was due to rhinacanthin C, whereas that of the aqueous extract of leaves of *R. nasutus* was due to constituents other than rhinacanthin C, and 4) both of the *R. nasutus* extracts showed *in vivo* anti proliferative activity after oral administration once daily for 14 day¹².

4 Rao *et al.*, (2010) reported, *in vitro* antimicrobial activity of *Rhinacanthus nasutus* leaves was investigated against various strains of bacteria and fungi viz. Staphylococcus aureus, Pseudomonas aeruginosa, Klebsiella pneumonia, Escherichia coli and Aspergillus niger by disc diffusion method. The Methanolic and ethyl acetate extract in a dose of 20mg/ml showed significant activity against Staphylococcus aureus and Klebsiella pneumonia when compared with the standard antibiotic ciprofloxacin (10 µg /disc) and ampicillin (10 µg/disc) respectively. Chloroform extraction showed great significant result against *A.niger*¹³.

5. Desu and Saileela (2013) were tested the anti-hyperlipidemic effect of methanolic extract of whole plant of *Rhinacanthus nasutus* (RNM) in Triton and fat diet induced hyperlipidemic rat models. Here, Acute hyperlipidemia was

induced by administration of single dose of Triton X 100 (400 mg/kg,i.p) and Chronic hyperlipidemia was induced by feeding fat diet for 21 days to rats. Treatment with RNM (200 and 400 mg/kg, p.o) significantly reduced the hyperlipidemia i.e., decreased levels of serum Total Cholesterol, Triglycerides, Low Density Lipoprotein Cholesterol (LDL-C), Very Low Density Lipoprotein Cholesterol (VLDL-C) , and increase of serum High Density Lipoprotein Cholesterol (HDL-C) when compared to vehicle control and standard drug Atorvastatin (10 mg/kg). The results demonstrated that methanolic extract of whole plant of *Rhinacanthus nasutus* possessed significant antihyperlipidemic activity¹⁴.

6 Suift (2003) reported that vasoconstriction of the blood vessels can result in a number of clinical diseases, some more potentially dangerous than others. The objective of the present study was to compare the effects of nifedipine, a proven vasodilator, and *Rhinacanthus nasutus* on blood pressure in hypertensive rats. Nifedipine is a calcium channel blocker used most often for the treatment of hypertension. In comparison, *Rhinacanthus nasutus* is a Thai plant also used to lower blood pressure. The hypothesis tested was that the administration of *R. nasutus* would lower blood pressure and prove to be an effective vasodilator. To observe their effects, both drugs were per fused into the cannulated aorta, just above the femoral artery, of a hypertensive rat at a constant but pulsatile rate of 3mL/min, for an extended period of time. Blood pressure was measured using a pressure transducer and results were recorded using Power Lab. Stastical results were calculated using the ANOVA system and they support the hypothesis that *R. nasutus* effectively lowers blood pressure to the same extent as the pharmaceutical drug (P > 0.05). Therefore this demonstrates that this herbal treatment is just as effective as the pharmaceutical drug in lowering blood pressure, possibly without the adverse side effects associated with nifedipine use¹⁵.

7 Ediriweera, E.R.H.S.S and Devanarayana A. observed that no adverse reactions present in patients, in a clinical study conducted at Ayurveda teaching hospital, Borella, Sri Lanka with external application of paste of *Rhinacanthus nasutus* for 30 days in 40 patients suffering from psoriasis

Parts used in medicine:

Leaves, roots and entire plant are used in medicine.

Ayurveda Pharmacodynamic Properties:

Ayurveda Pharmacodynamic Properties are given below.

Rasa (Taste): Katu, (Astringent), Thiktha (Bitter),

Guna (Qualities): Laghu, (Lightness), Ruksha (Roughness),

Veerya (Potency): Ushna (Hot),

Vipaka (Post-digestive action): Katu (Astringent),

Effect on Dosha: It pacifies vitiated Kapha and Vata dosha due to its katu thiktha Rasa and Ushna Veerya.

Vyuhagatha karma (action on various channals):

Externally: Roots are Lekhana, (*Scraping wound*) Spotajanana, (*produces boils*), Kusthaghna, (*reduces dermatitis*), Dadrunashana, (*cures ringworms, wounds*)

Pachana Sansthana (*Alimentary canal*): Krumighna (*vermicide*), Abhyantara Rakthavaha Sansthana (*Cardio vascular system*) - Rakta-Shodana (*Blood Purification*)

Prajanana sansthana, (*Genitourinary System*), Vagikarana (*Aphrodisiac action*), Uththejaka, (*stimulating*)

Tvacha (*Skin*): Kusthaghna (*Cure Skin diseases*),
Sathmikanara: Vishagna, (*Antidote to snake poison*) Arbhudha
nashaka, (*cure tumors*)¹⁶.

Pharmaceutical preparation of *Rhinacanthus nasutus* (Aniththa):

Rhinacanthus nasutus (Aniththa) is used internally and externally in the form of paste and decoction. It is used singly or in combination with various medicaments. Various formulae prepared with *R. nasutus* are given below.

(a) Aniththadi Lepa¹⁷:

50g each of fresh leaves of *Rhinacanthus nasutus* and *Azadirachta indica* are mixed with 17g of fresh rhizome of *Curcuma longa* 25g of scraped *Cocos nucifera* are also added to the mixture and ground well. 200ml of Sesame oil is added to this paste and ground. The paste should be applied whole over the body. It should be rinsed with warm water after 2 hours. It can be indicated in treatment of Kitibha (psoriasis), pruritic rash, ring worm and eczema.

(b) Aniththadi kapuru Lepa¹⁸:

50 g of, fresh leaves of *R. nasutus*, 625 mg of, powder of *Cinnamomum camphora* and 1.250 g of powder of Potassium Sulphate of Aluminium (Seenakkaran), are mixed well. The mixture should be grounded with 100ml of lemon juice. This paste is applied externally in treatment of acne vulgaris (Yuvana Pidaka).

(C) Aniththa haridradi lepa¹⁹:

50 ml of fresh leaves of *R. nasutus* and 10ml of infusion of fresh rhizome of *Curcuma longa* are mixed well. This mixture is applied externally in treatment of skin diseases especially in dermatitis.

Single drug preparations of *R. nasutus* is used internally and externally:

External preparations are given below

i Aniththa preparation²⁰:

50 g of fresh leaves of *R. nasutus* are crushed well and applied on skin in the treatment of pruritic rash, (itching), scabies, ring worm, and other parasitic skin diseases.

ii Aniththa preparation²¹:

50 g of *R. nasutus* fresh leaves and root grounded well and apply on skin Indication in the treatment for itching, and Kustha (dermatitis).

iii Aniththa preparation²²:

50 g of *R. nasutus* (Aniththa) fresh roots are grounded with 50ml of lime juice and apply in the treatment of ring worm and eczema.

iv Aniththa preparation²³:

50 g of *R. nasutus* (Aniththa) fresh leaves and roots are either soaked in vinegar or Alcohol, pounded with infusion of Lemon or Tamarind and apply in the treatment of skin disease, ring worm eczema and herpes.

v Aniththa preparation²⁴:

50 g of *R. nasutus* (Aniththa) fresh leaves and roots are prepared with sulpha, and, Benzoin or Vaseline. in the treatment of skin diseases.

vi Aniththa preparation²⁵:

50 g of *R. nasutus* (Aniththa) fresh leaves pounded with Alcohol Lemon and Tamarind juice / extract is applied the treatment of skin disorder, Infected skin.

Internal preparations of *R. nasutus* are given below :

1 Aniththadi decoction²⁶:

The sap of *R. nasutus* roots and 120 g of fresh leaves are mixed with 1920 ml of water. The mixture should be boiled down to 240 ml. then 120 ml of decoction is given 2 times per day aural administrated in the treatment of dermatitis, particularly dhobis' itch.

2 Aniththa milk decoction²⁷:

120 g of fresh roots of *R. nasutus* are mixed with 1680 ml of water and 240ml of fresh cow's milk. This mixture should be boiled down to 240 ml. this is given in 120 ml two times per day to enhance aphrodisiacal powers.

3 Aniththa Decoction²⁸:

120 ml of *R. nasutus* Infusion of whole plant is used in the treatment of hypertension. this is given in 120 ml two times per day.

4 Aniththa decoction²⁹:

120 ml of *R. nasutus* leaves mixed with 1920 ml water and it should be boiled down to 240 ml. this decoction is given in 120 ml two times per day. It can be indicated for anti pyretic, antihypertensive, anti inflammatory, detoxication. and against snake venom.

5 Herbal Tea: (organic herbal Tea)³⁰:

In Thailand 100% *Rhinacanthus nasutus* dried entire plant is pounded and powder is prepared. Steralized & Non-Steroid 100 Tea bags product. (weight of each bag is 10 g) This treatment is indication for relieve allergies, rasher and lower blood pressure. This is given 1-2 tea bags dip into a glass of hot water and cover with a lid for 3-5 minutes use a spoon to press the tea bag in order to make dissolve better 1-3 times a day.

DISCUSSION

Rhinacanthus nasutus is a plant which has many therapeutic medicinal values, and Sri lankan traditional practitioners use this plant widely. Roots, leaves, entire plants are used in Asian countries as a folkloric and traditional medicine in treatment of various ailments especially for skin diseases. Various medicinal preparation of *R. nasutus* are administrated internally in treatment of diabetes mellitus, hypertension, cancers, hepatitis, hemorrhoids, skin diseases, obesity, helminthiasis, in the form of Decoctions, infusion and herbal tea, externally it is used in the treatment of psoriasis, ringworm, abscess, septic ulcers, leprosy, eczema, dhobi's itch, prickly heat, herpes, scurvy, and inflammation in the form of Alepa (paste) antifungal, anti proliferative, antioxidant, antibacterial, antiviral, anti-inflammatory, anti allergic properties are scientifically proven through *in vivo* and *in vitro* studies and its safety has been scientifically proven through toxicity studies. As the plant *R. nasutus* contain rhinacanthin E and D exhibit inhibitory activity against cytomegalovirus. Other compounds such as rhinacanthin E and F are activity against influenza virus and other microbials. Further *R. nasutus* has anti proliferative, anti diabetic, anti hypertensive, activities, due to rhinacanthin compounds due to its Ayurvedia Pharmacodynamic properties the Katu (Astringent) Thiktha (Bitter) Rasa Laghu, (Lightness), Ruksha (Roughness), guna., and Ushna veerya (Hot potency) and Katu

Vipaka (final Product of digestion) it pacifies vitiated Kapha and Vata dosha. when administrated internally, and it purifies blood reduces itching, indurations ,and Inflammation of skin diseases.

CONCLUSION

Aniththa (*Rhinacanthus nasutus*) is a plant with multi-faceted medicinal values. It can be used externally as well as internally and clinically recommend as a external application which can used for long term for patient suffering from psoriasis.

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Figure 1: *Rhinacanthus nasutus* (L) Kurz (Available from [http://www.Wikipedia, /Rhinacanthus nasutus the free encyclopedia.mht.](http://www.Wikipedia, /Rhinacanthus nasutus the free encyclopedia.mht))



Figure 2: *Rhinacanthus nasutus* (L) Kurz Dry herbarium specimen

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