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Pharmacological Evaluation of *Thevetia neriifolia*

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Mini Review

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ABSTRACT

In my previous paper determination and estimations of different glycosides, proteins analysis, spectroscopic characteristics, and chromatographic techniques, etc. were performed and found the plant toxic in nature. This paper is based on the pharmacological activities which were performed in the lab and found that the plant possess anti-microbial and anti-termite activity as well. A small dose of plant part certainly helps in possessing both of the activities and gave desired results.

INTRODUCTION

Thevetia neriifolia is commonly known as Yellow Oleander. Scientifically it is also known as *Thevetia peruviana.* This plant contains different glycosides in every part of it esp. cardiac glycosides [1-5].
Heart failure in today's era has become common cause of death. Inspite of having such famous medicines and techniques one cannot control over it and the mortality rate is same from the past several decades [6-10].

CHEMISTRY OF T. NERIFOLIA

T. neriifolia is found to be most toxic plant among all and it has been noticed that a small dose if given to a human being may cause fatal death. This plant contains cardiac glycosides in it named Thevetin A and B and other glycosides too [11-16]. Cardiac glycosides have been used for centuries as therapeutic agent. Compounds containing steroid nucleus having unsaturated lactone at C-17 position and one or may be more residues at C-3 position too which are found in most of the plants and toad species which acts as venoms and toxins that serves as protection against any predator. Glycoside in this plant also contains digoxin and its related compounds which is a cardiac glycoside and used in the treatment of several cardiac diseases [17-25].

In 1900s digoxin was prescribed for most of the cardiac diseases because of its expedient pharmacokinetic nature and has different routes of administration. A number of cardiac glycosides have been isolated from *Thevetia neriifolia*, one of them is peruvoside is found to be most potent compound as compare to digoxin [26-30].

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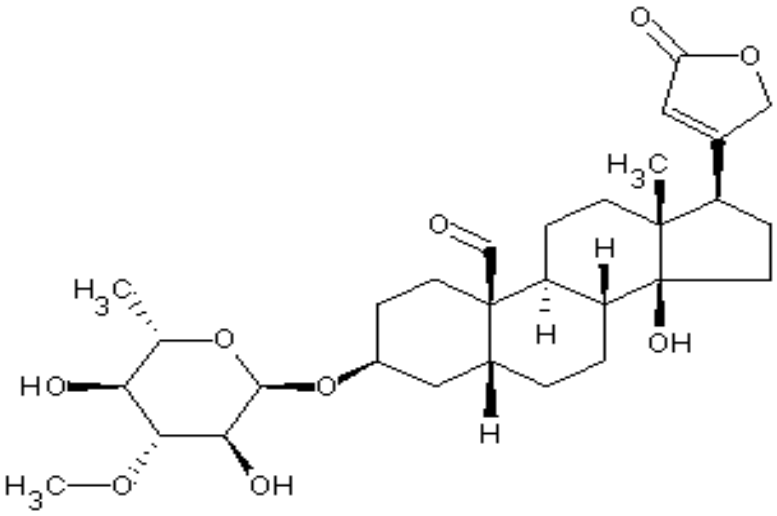

Figure 1: Structure of Peruvoside

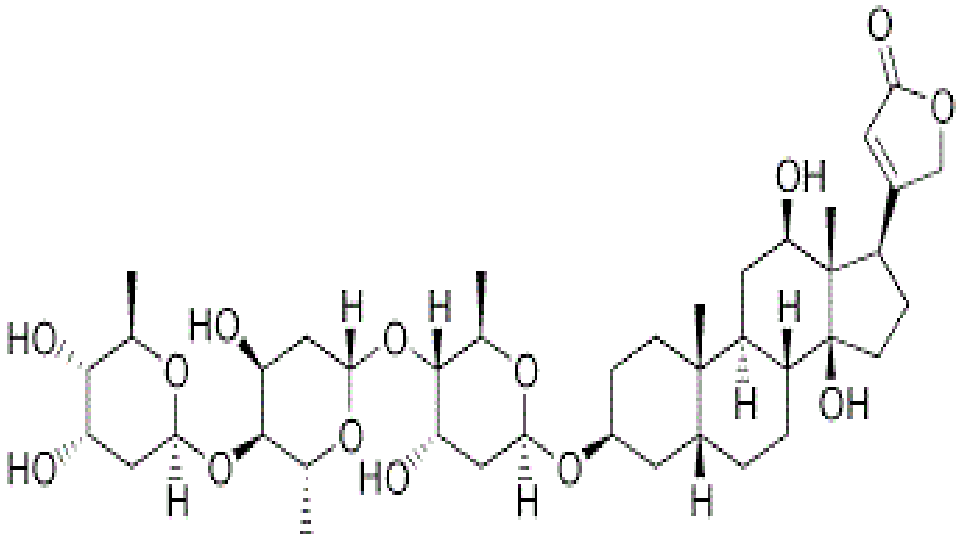

Figure 2: Structure of Digoxin

Thevetian glycosides are chemically closely related to each other (Chart 1). The aglycones as well as glycosides undergoe isomeric changes in the presence of bases. A number of glycosides are also present in each and every part of this plant like thevetin B & digitoxigenin-β-gentionbiosyl (1→ 4)- α-L- acoprioside: 19- carboxy digitoxigenin-β-gentiobiosyl-(1→4)-α-L thevetoside, thevetin A , cannogenin – β-gentiobiosyl-(1→4)-α-L- acofrioside,& cannogenin – α- L- rhamnoside,uzarigenin-β-gentiobiosyl-(1→4)-α-L-thevetoside & thevetogenin-β-gentiobiosyl-(1→4)-α-L-thevetoside , & thevetogenin-β-gentiobiosyl-(1→4)-2-O-acetryl-α-L-thevetoside, thevetogenin-β-gentiobiosyl-(1→4) – α-L acofrioside,thevetogenin-β- glucoside (1→4)-α-thevetoside which were identified in the polar fraction of the frozen leaves. Among all these theviridoside was the first chmical which was isolated and characterized in T.neriifolia. it is completely destructed in yellow senescent leaves due to blocked chromogenic group [31-40].

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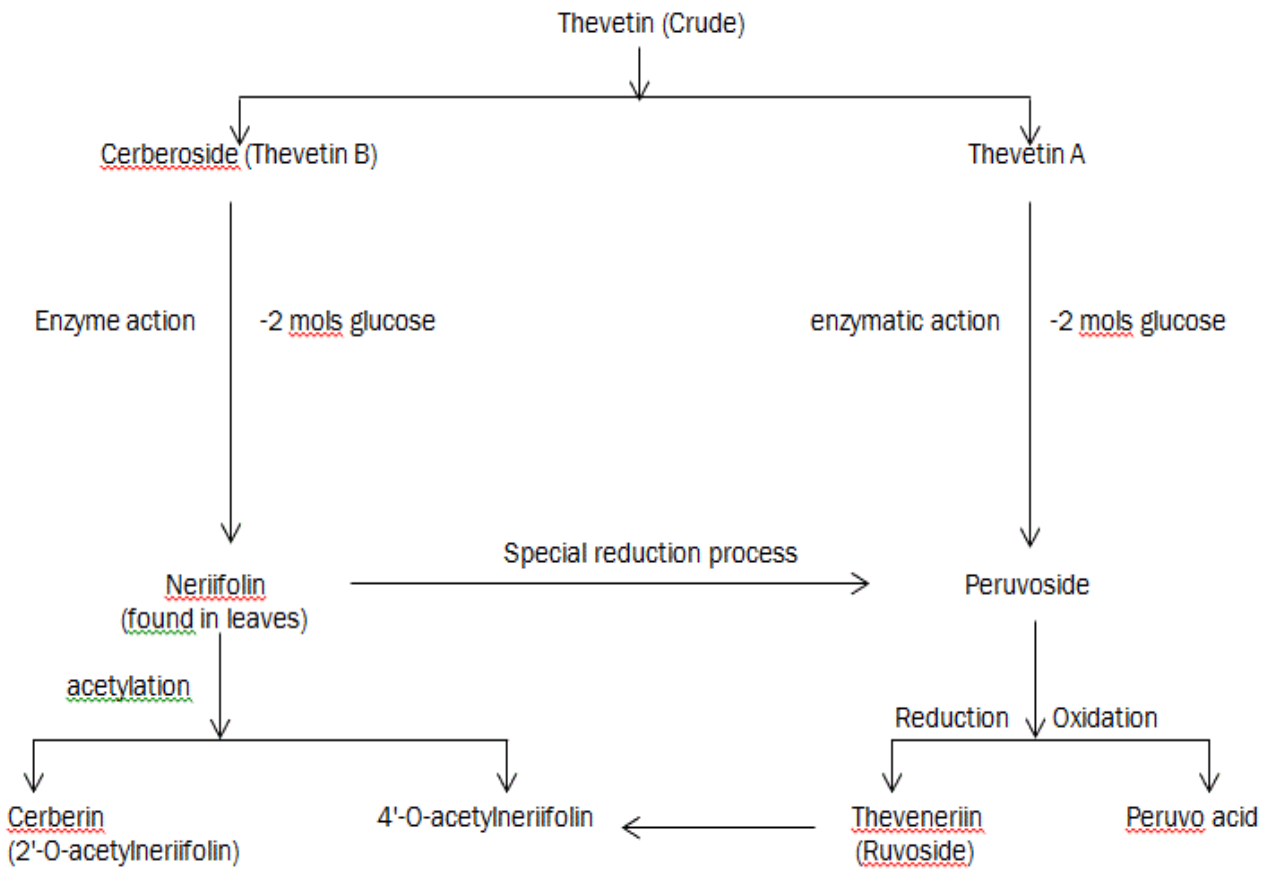

Chart 1: Representation of Thevetian glycosides chemically

PHARMACOLOGICAL EVALUATION

Since ancient times (1000 BC) *T.neriifolia* has been used in curing different skin diseases by Charak. It was classified under toxicity by Sushruta in 1000 BC and was known as horse poison, hence named as Ashwamarak- the horse killer in Sanskrit language. In 1863 its cardio tonic activity was discovered and since then its plant parts was lighten as toxic plant. If ingested then this will produce numbness in tongue when chewed. The seeds cause fatal death to the animals if ingested [41-45].
During our research we have reviewed that this plant is pharmacologically very useful in nature besides its toxicity. Anti-termite and anti-microbial activity was performed on the leaves of this plant [46-53].

ANTI-MICROBIAL ACTIVITY

Preparation of microbes

The test microbes were collected and maintained in freshly prepared Nutrient agar Slants. Then it was incubated at 37˚C for overnight. A loopful of bacterial strain was added to a 50ml of L. B Broth in a conical flask and it was incubated at 37˚C for overnight [54-60].

Agar- well diffusion method

Agar well diffusion method was used to detect the antimicrobial activity of leaf extract against various organisms (E.coli, S.typhi, Staphylococcus, V.cholerae and Shigella). The culture of bacteria was spread on to the agar plates using L- rod. The wells were cut using gel puncture and to it, 100µl of extract was added. The plates were then incubated at 37˚C for 24 hours. After incubation the zone of bacterial inhibition was measured [61-65].

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The extract obtained from the leaves of Thevetia peruviana were analyzed for the presence of phytochemical components. The results show that the presence of phenols and proteins in the leaf extract. Purple or pink colour change indicates the presence of protein. The dark yellow colour was observed in the TLC plate and it shows the presence of phenols. Glycosides were confirmed by performing Borntrager's test. The purified compound was analyzed for the presence of phytochemical components using GC/MS. The results show that eleven different compounds were present [67-70]. They are:

(i) 2,3-Dihydro-3,5-Dihydroxy-6-Methyl-4HPyran-4-one.
(ii) 3-methyl 1- hepatanol
(iii) 3,6-Dimethylundecane
(iv) Tetradecane
(v) Lauric acid
(vi) Mome inositol
(vii) Palmitic acid
(viii) Ethyl palmitate
(ix) Phytol
(x) Ethyl(9z,12z)-9,12- octadecadienoate
(xi) Ethyl linolenate

RESULTS AND DISCUSSION

Among all compounds, the three other compounds resulted in high peaks (mome inositol, Ethyl palmitate, Ethyl linolenate). Apart from these 2,3-Dihydro-3,5- Dihydroxy-6-Methyl-4H-Pyran-4-one compound has an anti-cancerous, anti-microbial, anti-inflammatory property. It is a Millard reaction product of glucose and glycine.

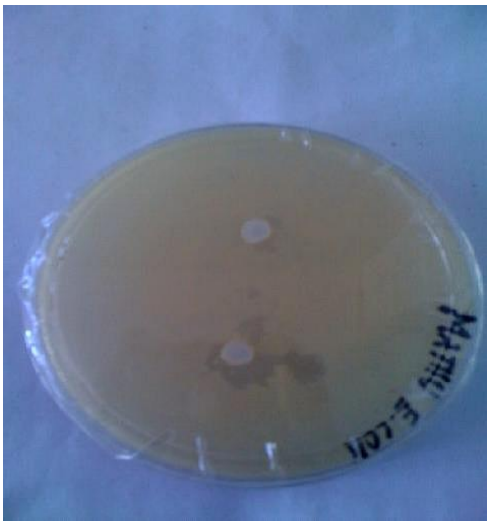

Figure 3a: Antibacterial activity (E.coli)

Momo inositol - use of a compound that specifically inhibits the lipolytic activity of HSL, or a pharmaceutically acceptable salt thereof, for the preparation of a medicament for the treatment of a disorder where a decreased level of plasma FFA is desired. The amount of glycosides compounds present in the sample was quantified using spectrophotometer. The results show 2.89% of glycosides present in 3ml of extract.
The 100µl of leaf extract was tested against E.coli, Shigella, Staphylococcus, Salmonella typhi, and Vibrio cholera. The result showed little activity against E.coli and Shigella. Good results can be obtained by increasing the concentration of the leaf extract.
The seed extract of Thevetia peruviana was done previously by Omolara (2007), and the amount of cardiac glycosides was compared in dry seed meal and in extraction. The result showed that the protein content was increased in seed after treated with different quantities of alcohol and this protein amount was compared with untreated seed sample. The protein obtained from the treated sample can therefore serve as a protein source for

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animal feed formulation. The compound 2,3-Dihydro-3,5-Dihydroxy-6- Methyl-4H-Pyran-4-one and mome inositol analyzed by GC/MS has an anti-cancerous and anti-proliferate property. This anti-proliferate and pro-apoptotic effects of 2,3 dihydro-3,5-dihydroxy- 6-methyl-4H-pyranone through inactivation of NFkappaB in human colon cancer cells was previously done and proved by Ban et al. (2007). These compounds can be isolated and used for further studies using MTT assay.

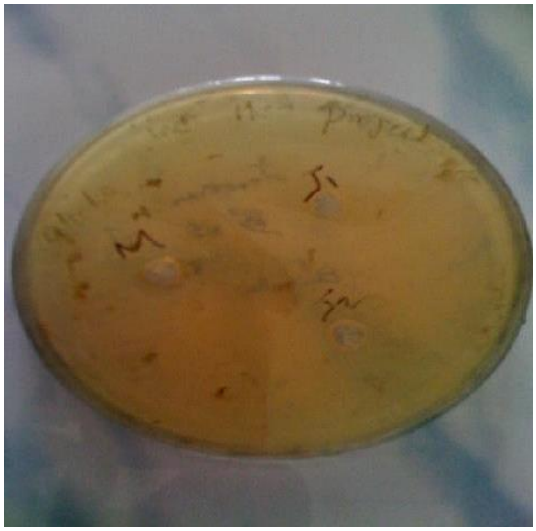

Figure 3b: Antibacterial activity (Shigella)

Present investigation suggests that leaf extract of Thevitia peruvaina contain higher amount of protein and lesser amount of Glycosides. GC mass analysis shows 11 novel compounds were present in leaf extract. Leaf extract showed antimicrobial activity against E.Coli and Shigella. Presence of 2,3-Dihydro-3,5-Dihydroxy-6-Methyl-4H-Pyran-4 proves its antibacterial activity. Among the 11 compound 2,3-Dihydro-3,5-Dihydroxy-6-Methyl- 4H-Pyran-4-one and mome inositol has an anticancerous and anti-proliferate property.

ANTI-TERMITE ACTIVITY

Toxicity and repellent effects of medicinal plant extracts on subterranean termites (Isoptera: Rhinotermitidae) have also been demonstrated. The presence of unsaturated linoleic acid in Yellow oleander oil), which has drying properties, makes Yellow oleander oil suitable for making a surface coating such as paint [71-75].

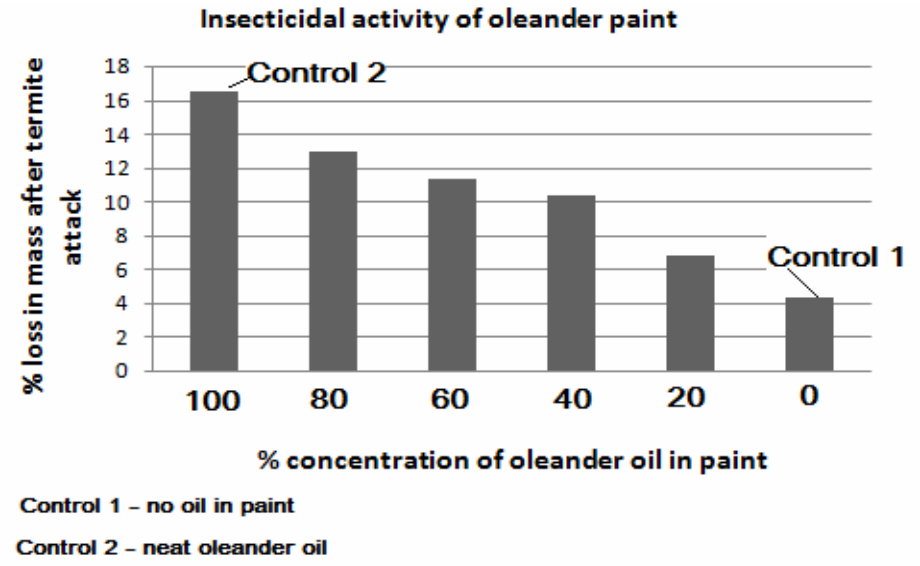

Figure 4: Repellent activity of Oleander paint towards *Microtermes* spp.

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Labeled dry plywood plates (6 x 6 inches) were painted on both sides, (in triplicate) with the formulated paints. One set of control plates was painted with neat oleander oil, while the other was painted with a paint in which Yellow oleander oil was not added. After drying to constant weight in the laboratory environment, each plate weight was determined. The wooden plates were then placed side by side and covered with foliage under a termite (Microtermes spp) nest and left for a period of one month. Moisture was constantly maintained by pouring water on the foliage within the exposure period, so as to maintain appropriate environmental conditions favourable to termites [76-78].

After the exposure period, the wooden plates were washed with clean water to remove soil and debris, and dried in the oven at 50°C to a constant weight. The mass of each plate was then determined and the average weight loss calculated [78-81].

RESULTS AND DISCUSSION

The Oleander paint inhibited the tested microbes in a concentration dependent manner. The control paint (containing 0.0% oil) did not inhibit the test bacteria and fungus. From these results, it was concluded that oleander paint was self-preserving against bacterial and fungal attack. Antibacterial and antifungal activity of T. peruviana plant extracts had been earlier established (Obasi and Igboechi, 1991; Gata et al., 2003) and collaborates with the present findings. From above figure it was evident that the oleander paint repelled Microtermes spp. The repellent action was highest when pure oleander oil was used. However, no termite deaths were reported in this study. Insecticidal and toxicity of Yellow oleander oil has been reported (McLaughlin et al., 1980; Panigrahi and Raut, 1994; Langford and Boor, 1966). Also anti-termite activity of medicinal plant extracts has been documented (Verena-Ulrike and Boor, 2001). The present findings demonstrate that paint made from T. peruviana plant oil extract could substantially protect timber from termite attack.

POPULARITY OF THEVETIA PERUVIANA WITH TIME

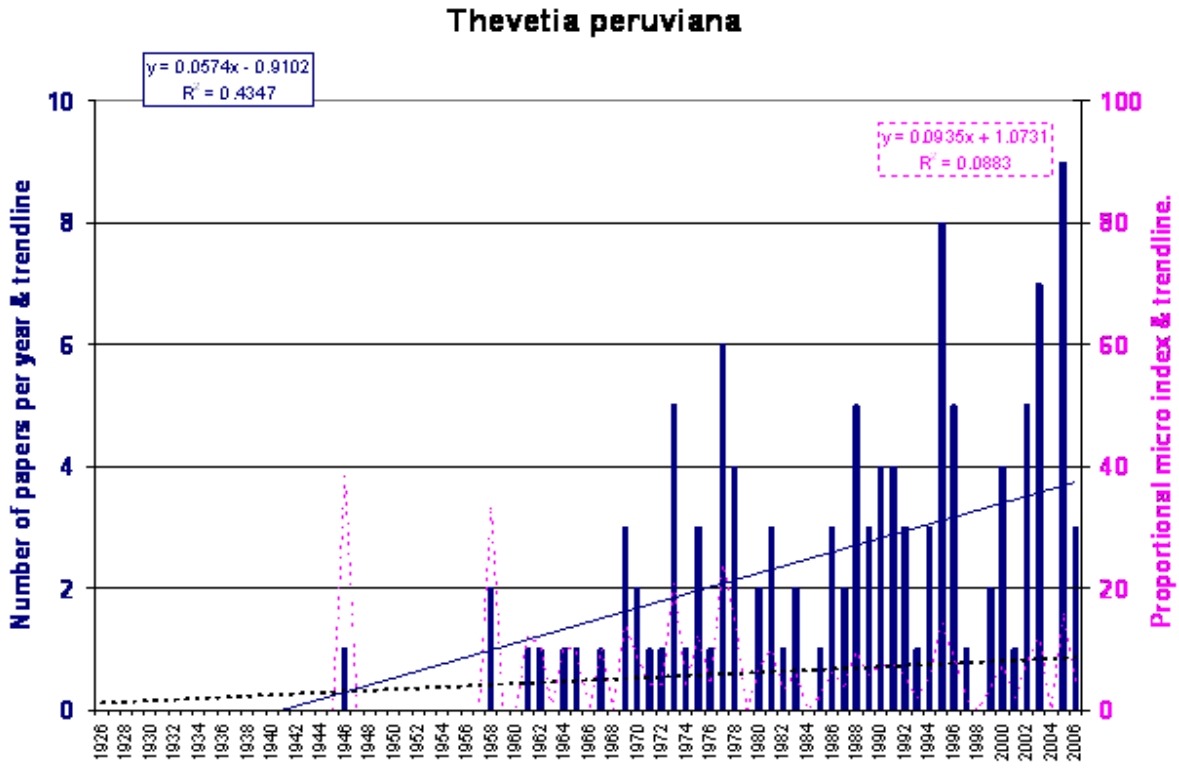

Figure 5: . [Plots of numbers of papers mentioning *Thevetia peruviana* (filled column histogram and left hand axis scale) and line of best fit, 1926 to 2006 (complete line, with equation and % variation accounted for, in box on the left hand side); Plots of a proportional micro index, derived from numbers of papers mentioning *Thevetia peruviana* as a proportion (scaled by multiplying by one million) of the total number of papers published for that year (broken

line frequency polygon and right hand scale) and line of best fit, 1926 to 2006 (broken line, with equation and % variation accounted for, in broken line box on the right hand side)]

CONCLUSION

Form all this it has been concluded that the plant T. neriifolia showed most potent activity on anti-microbial and anti-termite. Yellow oleander paint possesses antimicrobial and anti-termite activities. *T. peruviana* oil extract would serve as an environmentally friendly bactericide and fungicide for oil based paints. Both of the activity gave significant results.

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