

PHYTOPHARMACOLOGICAL ASPECT OF PUNGAM VERPATTAI OIL IN RELEVANCE TO WOUND HEALING

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ABSTRACT

This Siddha system of medicine is one of the ancient system. The unique nature of this system is its continuous service to humanity for more than five thousand years in combating diseases and in maintaining its physical, mental and moral health long long ago. *Pungam verpattai* oil is one of the siddha formulation have been used as an external application for wound healing. Wound healing process includes the stages of anti-inflammatory, proliferation and remodeling. The ingredients of *pungam verpattai* oil contains *pungam ver pattai*, coconut kernel juice and *rasa karpooram* which can be applied to *sori*, *sirangu* and *pun*. The phytopharmacological aspect suggests that the

flavanoids, tocophorols, phenols and lauric acid were present in the oil. It has anti-inflammatory, bactericidal, anti-allergic, cytotoxic and anti-oxidant activity. Moreover its effect on fibrin lytic system, cell migration, growth factor activation, fibroblast proliferation enhances the wound healing procedure. Thereby *pungam verpattai* oil can be used as a care for wound healing.

KEYWORDS: *Pungam verpattai* oil, wound healing, phytopharmacological aspect.

INTRODUCTION

In Siddha system of medicine treatment is consider in a holistic approach for upliftment of the body. Treatment wise there were two wings; one, Internal medicine 32 types, the other external medicines 32 types. The drug *pungamver pattai* oil one among the external medicine (Pillai, 2012).

Siddha Medicine has immense potential for the management and treatment of wounds. There are plenty of medicines for the acute and chronic wound conditions, Several Siddha formulation have been experimentally used in this medicine to treat wound injuries. Nowadays promoting wound healing will save patients from amputation and other complications (Pillai, 2012).

Pungam verpattai oil also one among the wound healing medicine which can be practice especially for the Siddha hospital for chronic wound conditions, as per the Siddha literature several medicines available for the wound condition. It includes *Pungam verpattai* (Root bark of *pogamia pinnata*) Juice, coconut milk and calomel. So far no work has been done with this reference (Narayanaswami, 1995).

Wound healing consists of an orderly progression of events that re-establish the integrity of the damaged tissue: inflammatory, cell proliferation and remodeling stages (Batool, 2012).

The wet coconuts are subjected to pressing to ooze the oil out along with coconut milk. This is processed afterwards without employing heat, shear, chemicals, refining and is known as virgin coconut oil (Gopalakrishna, 2009).

Phenolic acid fraction of the coconut oil prepared by boiling coconut milk (traditional coconut oil) was more complex compared with that of coconut oil prepared by pressing copra (commercial coconut oil) (Gopalakrishna, 2009). Calomel has been used in medicine since the 16th century. The compound is also used in the construction of calomel electrodes for potentiometric titration.

MATERIALS AND METHODS

Review of classical literature and various works done – the published details are the major source.

PREPARATION OF PUNGAM VER PATTAI OIL

This classical formulation is described in Pharmacopeia of hospital of Indian medicine, page no 140, and suggests *pungamverpattai* oil can be treated for wounds, *sori* and *sirangu*. It contains *Pungam verpattai* (Root bark of *pongamia pinnata*) Juice, coconut milk and calomel. It is prepared as follows:

3.1. Preparation

Pungam verpattai- 3lb

Coconut kernel juice-3lb

Rasa karpooram-1palam

Add the first two and boil till the oil comes out. Filter add the last.

PHYTOCHEMISTRY

4.1. *Pongamia pinnata*

Flavonoid constituents of root bark of *P. pinnata* resulted isolation of 18 flavonoid compounds. The flavonoids and related compounds are flavones, furanoflavonoids, chromenochalcones, coumarones, flavone glucosides, sterols, triterpenes and a modified phenylalanine dipeptide (Arya, 2011).

Nine new flavonoid components namely pongamones III-XI, obtained from its root bark. The new structures were determined to be (2S)-3',4'-dimethoxy-6'',6''-dimethylpyrano[2'',3'':7,8]-flavanone (III), (2S)-6,3',4'-trimethoxy-6'',6''- dimethylpyrano[2'',3'':7,8]-avanone (IV), (2S)-7-methoxy- 6-O- γ,γ -dimethylallyl-3',4'-methylenedioxy avanone (V), 2'- hydroxy-3,4,5'-trimethoxy-6'',6''-dimethylpyrano[2'',3'':4'3'] chalcone (VI), 2',4'-dimethoxy-3,4-methylenedioxy dioxhydrochalcone (VII), 2',5', β -trimethoxy-3,4- methylenedioxy-6'',6''-dimethylpyrano[2'',3'':4',3'] dihydrochalcone (VIII), 2, β -dimethoxy-3, 4-methylenedioxy-furano[2'',3'':4',3']-dihydrochalcone (IX), β -hydroxy-2',4',6'-trimethoxy-3,4-methylenedioxychalcone (X) and 3-methoxy-furano-[2'',3'':7,6] flavone (XI), respectively, by means of spectral analysis and synthesis. (Tanaka, 1992).

It contains a bitter alkaloid, resin, mucilage, sugar, but no tannin. And from the root bark of *Pongamia pinnata*, two new compounds, 3-methoxy-(3,4-dihydro- 3-hydroxy-4- acetoxy)-2,2-dimethylpyrano-(7,8:5,6)-flavone and 3- methoxy-(3,4-dihydro-4- hydroxy-3-acetoxy)-2,2- dimethylpyrano-(7,8:5,6)-flavone, were isolated, along with six known compounds, caryophyllene oxide, obovatachalcone, 8-hydroxy-6-methoxy-3-pentyl-1H- isochromen-1-one,6,7,2,2-dimethylchromono-8,- dimethylallylflavanone, isolonchocarpin, ovaliflavanone A. Their structures were determined on the basis of the spectroscopic data interpretation (Hao, 2006).

4.2. Virgin coconut oil

The total phenolic content and antioxidant compound in the VCO was obtained from an integrated wet process (IWP) of 16.02 ± 0.44 mg GAE / 100 g oil and 5.07 ± 0.19 mg/L, revealed that VCO extracted through a wet process has high phenolic contents. The antioxidant activity in VCO extract also has high radical scavenging activities, comparable to α -tocopherol (Marina, 2009).

VCO also contained minor component such as polyphenols, vitamin E and pro- vitamin A with significant radical scavenging activities to improve the wound healing process (Nevin, 2006).

Virgin coconut oil is considered a unique group of oil products called lauric oils, high content of saturated fatty acids (90%) (Yousefi, 2013). besides the earlier mentioned lauric acid, virgin coconut oil contains myristic acid, palmitic acid, caprylic acid and capric acid are also present at relatively high levels in virgin coconut oil (Mikolajczak, 2017).

It contains only 3 different sterol fractions in coconut oil - campesterol, stigmasterol and β -sitosterol. Their average content is 7.20, 12.30 and 38.97% respectively for campesterol, stigmasterol and β -sitosterol. The total tocopherols content in virgin coconut oil is 4.20 mg/100 g (Mikolajczak, 2017).

In the oil obtained by the fermentation method, 5 phenolic acids were found - vanillic 2.08 mg/kg, caffeic 0.12 mg/kg, syringic 0.45 mg/kg, ferulic 5.09 mg/kg and p-coumaric 75 mg/kg (Mikolajczak, 2017).

PHARMACOLOGICAL PROPERTIES OF *PUNGAMVERPATAI* OIL

5.1. *Pungam verpattai*

All extracts of the rootbark of *Pongamia pinnata* showed significant anti-inflammatory activity (compared to phenylbutazone) in carrageenin and PGE₁ induced oedema models. Possible mechanism of action could be prostaglandin inhibition, especially by ethanol and acetone extracts. It mainly reside in the intermediate polar constituents and not in lipophilic or extremely polar constituents (Singh, 1996).

The anti-inflammatory activity of aqueous extract of root bark of *Pongamia pinnata* in acute and chronic models of inflammation was evaluated in albino rats. Oral administration of the above extract (400, 800 mg/kg) exhibited significant anti-inflammatory activity in acute and

chronic (cotton pellet granuloma) models of inflammation. The extract of root bark of *Pongamia pinnata* hold significant anti-inflammatory activity without ulcerogenic activity (Nadagouda, 2010).

5.2. Virgin coconut oil

Vitamin E plays a significant role as a natural antioxidant. Decreases the susceptibility to unfavorable oxidation processes (Adam, 2007). Tocols are a building block of cell membranes.

The phenolic compounds have anti-inflammatory, bactericidal and anti-allergic properties, also they protect the skin from oxidative damage (Pandey, 2009).

Virgin coconut oil (VCO) VCO-treated wounds healed much faster, as indicated by a decreased time of complete epithelization and higher levels of various skin components. Pepsin-soluble collagen showed a significant increase in VCO- treated wounds, indicating a higher collagen cross-linking (Karger, 2010). Glycohydrolase activities were also found to be increased due to a higher turnover of collagen. Antioxidant enzyme activities, and reduced glutathione and malondialdehyde levels were found to be increased. The lipid peroxide levels were found to be lower in the treated wounds (Karger, 2010).

VCO contain fatty acid that are "middle chain " fatty acids. The lauric acid control infection by destroying all micro-organisms. these must stimulate the production of collagen and thereby speeds wound healing with less scaring (Sanford, 2011).

Cells from the fibroblast cell line (HSF 1184) were exposed to increasing concentrations of VCO extracts for 24hrs and their viability was assessed using the MTT assay. More effect was noted for fibroblasts proliferation (Zunairah, 2017).

Higher concentrations of VCO were cytotoxic and caused a significant decrease of cell viability. This result showed that the VCO extract increased cell growth of the fibroblast cell lines but was still lower than ascorbic acid (as positive control) with 88 % of cell viability. Based on the results, VCO extract was able to enhance the proliferation and viability of human dermal fibroblast cells (Zunairah, 2017).

The ability of VCO extract to stimulate fibroblast proliferation and cell migration in enhancing wound healing activity was demonstrated using in vitro wound scratch test. The

VCO extract contains bioactive compounds such as phenolic compounds and antioxidants that induce fibroblast cell growth and proliferation to enhance the wound closure activity. Higher concentrations of VCO extract were used in the scratch assay, more phenolic and antioxidant compounds would be available to promote cell proliferation and closure rate (Zunairah, 2017).

The wound healing effect of coconut oil is influenced by antioxidant and antibacterial properties present in the oil. (Wilson, 2015) Medium chain fatty acids (MCFA), the major component of VCO, which is lauric acid (45 - 50 %) could contribute to stimulate the migration and proliferation of fibroblast cell. Fatty acids have been proven to promote cellular proliferation (Rose, 1994) and growth factor activities (Jiang, 1995).

The antioxidant and anti-inflammatory properties could help to protect the wound area from bacterial infection, reduced inflammation and induced cell proliferation to support the reconstruction of damaged tissue (Kulac, 2013) It has been found that the application of lauric acid do not only reduce bacterial growth, but also reduces the edema and inflammation (Kao, 2009).

5.3. Hydragyrum sub chloride

Calomel (Hg_2Cl_2), also called mercurous chloride or mercury (I) chloride, a very heavy, soft, white, odourless, and tasteless halide mineral. Once the most popular of cathartics, calomel has been used in medicine since the 16th century. However. The compound is also used in the construction of calomel electrodes for potentiometric titration in wound healing.

DISCUSSION

The *pungam verpattai* oil contains the *pungam verpattai*, coconut milk and calomel, Commonly these ingredients vastly contains Flavonoids, tocopherols, poly phenols, Lauric, Myristic, palmitic, caprylic acid with the following activities such as antioxidant, anti-inflammatory and wound healing.

The wound healing activity possess 3 stages such anti-inflammatory, cell proliferation and remodeling stages. These main process includes the release of growth factors, wound cell proliferation including the process of fibroplasia, matrix deposition, angiogenesis, re-epithelialization including cell migration with wound contraction.

As the *pungam verpattai* oil possessing decrease in the prostaglandin inhibition, as it causes anti-inflammatory activity without ulcerogenic activity, it causes anti-oxidant activity and decreases the unfavorable oxidation process and increase the anti-oxidant enzyme activation. It decreases the postprandial t-PA antigen system affect the fibrinolytic system, increase the collagen crosslinking, fibroblast proliferation (supports in reconstruction of damaged tissue) with epithelialization. Cell migration enhance the wound closure with minimizing scar formation. It building the blocks of cell membranes and growth factor activation. Also the lauric acid reduce the prevention of infection and decrease the edema. Also it contains the bactericidal, cytotoxic and anti-allergic properties these all processes enhance the wound healing activity.

CONCLUSION

It is interpreted that the composition of *pungamverpattai* oil possess the activity of wound healing ranging from anti-inflammatory to remodeling stage.

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