Available online at www.journalijmrr.com

INTERNATIONAL JOURNAL OF MODERN RESEARCH AND REVIEWS

ISSN: 2347-8314

Int. J. Modn. Res. Revs.
Volume 3, Issue 1, pp 604-607 January, 2015

ORIGINAL ARTICLE

WOUND HEALING ACTIVITY OF *MALLOTUS PHILIPPENSIS* IN EXPERIMENTAL ANIMALS

[1]S. Nithyapriya, *[2]A.C.Tangavelou and [1]S. Karthikeyan

[1]PG & Research Department of Botany, Mannai Rajagopalaswami Government **Arts** College**,** Mannargudi 614 001
*[2]PG & Research Department of Botany, Periyar Arts College, Cuddalore 607 001

Article History: *Received 15th December,2014, Accepted January 30th 2015, Published 31st January,2015*

ABSTRACT

The acetone extracts of fruits of an ethnomedicinal plant, *Mallotus philippensis* (Lam.) Muell. Arg., (Euphorbiaceae) was tested for wound healing activity by excision wound model in experimental rats. The results showed significant reduction in the wound area and the percentage of wound healing was very high in 10% (w/w) extract ointment treated animals compared to other three ointments tested. At the same time, it showed complete healing potential on the 16th day itself compared to standard and simple ointments on the 18th day. Thus the present study proved to claim the traditional usages of this plant against any skin and wound infections.

Keywords: *Mallotus philippensis*, fruit, wound healing, drug development

1.INDRODUCTION

Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicine (Cragg and Newman, 2001; Lopez, 2011). About 80% of the world population relies on Traditional Medicine for their primary health care needs (Farnsworth and Soejarto, 1991; Pei, 2001; WHO, 2011). A total of 122 biomolecules have been isolated from 94 species of plants and 80% of these compounds were used for the same (or related) ethnomedicinal purposes (Fabricant and Farnsworth, 2004). Because these compounds are derived from only 94 species of plants, there should be an abundance of drugs yet to be discovered in other plants.

The genus *Mallotus* Lour., (Euphorbiaceae) comprises of about 150 species in the world, of which 20 species has been reported from India (Santapau and Henry 1973) and 11 species with 2 varieties were reported from Tamil Nadu state (Henry *et al*., 1987). An Indian ethnomedicinal plant, *Mallotus philippensis* (Lam.) Muell. Arg., locally known as *Kaatusiruvembupatchilai*, *Kaatuthakadipatchilai* (Viswanathan et al., 2006) has been used medicinally in South India. Various tribal communities in India used the fruits of this ethnomedicinal plant *M. philippensis* for various diseases such as bleeding, impotency (Kadavul and Dixit, 2009), intestinal worms in children (Shanmugam et al., 2009), purgative (Kadavul and Dixit, 2009), piles (Viswanathan et al., 2006), rheumatism (Viswanathan et al., 2006; Lalitha rani et al., 2011), skin affection (Jothi et al., 2008), spermatorrhea (Kadavul and Dixit, 2009). Several classes of compounds have been also reported from fruits such as flavonoids including 2'-Me-3'-(3,3-dimethyl allyl, 3'-Me-5',6'-(2,2- dimethylchromeno, 4',5 '-(2,2-dimethylchromeno) and 6-Methyl-7,8-(2,2-dimethylchtomeno) (Barron and Ibrahim, 1996), triterpenoid namely kamaladiol-3-acetate (Mahato and Sen, 1997) chalcone dimers namely Kamalachalcones A and B (Tanaka *et al*., 1998), a chalcone compound namely mallotophilippen C (Li *et al*., 2006) from fruits. In the present study, an effort was undertaken to carry out the in vitro wound healing activity to claim the traditional uses against skin infections.

2. MATERIALS AND METHODS

Plant Material and Preparation of the Extracts

The fruits of *M. philippensis* (Lam.) Muell, Arg. (Euphorbiaceae) were collected from the tirunelveli hills, Tamil Nadu, its botanical identity was confirmed by the second author and the herbarium specimen was prepared for future reference. The fruit glands were dissolved in acetone by cold percolation method and thus acetone extracts prepared were collected and distilled off on a water bath at

*Corresponding author: **Dr. A.C.Tangavelou,**
PG & Research Department of Botany,
Periyar Arts College, Cuddalore 607 001

atmospheric pressure and the last traces of the solvents were removed *in vacuo*. The acetone extract in different doses were used for present investigations.

Extracts, Formulations and Standard Used

Acetone extract of glandular fruits of *M. philippensis* was used for experiments. Two types of formulations were prepared from each extracts *viz*. 5% (w/w) and 10% (w/w) ointment where 5g and 10g of extracts were incorporated in 100g of simple ointment base B.P. (Anonymous, 1953). The extracts ointments and the simple ointment 0.5g each were applied once daily to treat different groups of animals respectively. Nitrofurazone ointment (2%w/w, Smithkline-Beecham) was used as a standard drug for comparing the wound healing potential of the extracts.

Excision wound model

Wound healing activity was carried out by following the method of Morton and Malone, (1972), Udupa *et al*., (1994). Four groups with six animals in each group were anaesthetized by the open method with anaesthetic ether. The rats were depilated on the back. One excision wound was inflicted by cutting away a 500mm^2 full thickness of skin from the depilated area, the wound was left undressed to open environment. Then the drugs, i.e, the reference standard, (0.2%w/w) Nitrofurazone ointment, simple ointment B.P. (Anonymous, 1953) and acetone extract ointments of 5% and 10% (w/w) were administered till the wound was completely healed (Chatterjee and Chakravarty, 1993). This model was used to monitor wound contraction and wound closure time. Wound contraction was calculated as percent reduction in wound area. The progressive changes in wound area were monitored planimetrically by tracing the wound margin on graph paper every alternate day. The wound contraction percentage was calculated as percent reduction in wound area.

Grouping of Animals

Four groups with six animals in each group were taken
After wound creation by Excision wound model, experimental rats were divided into four groups with six animals in each group.
Group 1 : wounds treated topically with simple ointment base B.P.
Group 2 : wounds treated topically with Nitrofurazone ointment (0.2% w/w)
Group 3 : wounds treated topically with acetone extract ointment (5% w/w)
Group 4 : wounds treated topically with acetone extract ointment (10% w/w)

Statistical Analysis

Data are expressed as mean ± SEM and subjected to student t test by comparing with the control (Woodson, 1987).

3. RESULTS

The results of wound healing potential were given in the Table 1. Significant increase in the wound healing potential was observed in the animals treated with the acetone extract compared with that of reference standard and control group of animals. Among the extract ointments treated, 10% (w/w) showed high reduction in the wound area (P<0.001) while 5% (w/w) treated animals showed moderate reduction in the wound area (P<0.001) compared to the control.

The reduction of wound area in the animals treated with 10% (w/w) of acetone extract recorded were 231 ± 11.9 mm^2 on the 6th day, 105±10.7 on the 8th day, 57±6.2 on the 10th day, 38± 6.9 on the 12th day and 10±3.7 on the 14th day while 5% (w/w) of acetone extract showed the reduction of wound area recorded were 230±12.3 on the 6th day, 160±11.7 on the 8th day, 80±5.1 on the 10th day, 51±2.1 on the 12th day, 21±7.4 on the 14th day and 10±1.1 on the 16th day. The reference standard drug Nitrofurazone showed the reduction of wound area as 262±21.2 on the 6th day, 189±18.4 on the 8th day, 101±8.1 on the 10th day, 62±3.9 on the 12th day, 27±2.7 on the 14th day and 11±3.6 on the 16th day respectively. The percentage of wound healing observed in the animals treated with 10% (w/w) of acetone extract were 55.31, 79.69, 88.97, 92.64, 98.06 and 100% on the 6th, 8th, 10th, 12th, 14th and 16th day respectively and the 5% w/w of acetone extract were 55.85, 62.28, 84.64, 90.21, 95.96, 98.08 and 100% on the 6th, 8th, 10th, 12th, 14th, 16th and 18th day respectively. While 50.95, 64.0, 80.76, 88.19, 94.85, 97.90 and 100% were observed with Nitrofurazone on the 6th, 8th, 10th, 12th, 14th, 16th and 18th day respectively.

Thus the wound area was significantly reduced and the percentage of wound healing was very high in 10% (w/w) extract ointment treated animals compared to other three ointments tested. At the same time, it showed complete healing potential on the 16th day itself compared to standard and simple ointments on the 18th day.

Table 1. Wound healing potential of acetone extract of glandular fruits of *M. philippensis* by excision wound model (N=6).

Post-wounding Days	Wound area (mm^2) ± S.E.M. and percentage of wound contraction			
	Simple ointment	Nitrofurazone 2%(w/w)	Acetone extract 5% (w/w)	Acetone extract 10% (w/w)
0	528 ±32.5 (0.0)	525 ± 34.7 (0.0)	521 ± 24.6 (0.0)	517 ± 30.4 (0.0)
2	504 ± 23.4 (4.5)	452 ± 32.8 (13.90)	464 ± 15.7 (10.94)	421 ± 24.3 (18.56)
4	448 ± 19.5 (15.15)	313 ± 21.2* (40.38)	357 ± 13.7 (31.47)	319 ± 19.8* (38.29)
6	424 ± 17.2 (19.69)	262 ± 21.2* (50.95)	230± 12.3* (55.85)	231 ± 11.9** (55.31)
8	364 ±15.2 (31.60)	189 ±18.4** (64.0)	160 ± 11.7** (62.28)	105 ± 10.7** (79.69)
10	341 ± 12.9 (35.41)	101 ± 8.1** (80.76)	80 ± 5.1* (84.64)	57 ± 6.2** (88.97)
12	255 ±09.1 (51.70)	62 ± 3.9** (88.19)	51 ± 2.1** (90.21)	38 ± 6.9** (92.64)
14	201 ± 07.1 (61.93)	27 ± 2.7 ** (94.85)	21 ± 7.4** (95.96)	10 ± 3.7** (98.06)
16	174 ± 6.5 (67.04)	11 ± 3.6** (97.90)	10 ± 1.1** (98.08)	0.0** (100)
18	167 ± 3.2 (68.37)	0.0** (100)	0.0** (100)	

P values versus respective control by students t-test. *P<0.01 Vs Control; ** P < 0.001 Vs Control

4. DISCUSSION

Wound healing is a complex biological process that is initiated whenever tissues integrity is breached (Bennett and Schultz, 1993a and 1993b; Grazul-Bilska *et al*., 2003). Wound healing involves cellular interactions to promote processes such as phagocytosis, chemotaxis, mitogenesis, angiogenesis, apoptosis and numerous other factors (Bennett and Schultz, 1993a; Schiffer and Nanney, 1996; Bates and Jones 2003; Dielgelmann and Evans 2004; Kumar *et al*., 2004; Rai *et al*., 2005). Healing of chronic lower extremity wounds is a global problem especially in the developing world, and the development of new drugs would be possible only through the knowledges of traditional medicines such as Ayurveda, Ethnomedicines, Folkmedicines, etc. Biswas and Mukherjee (2003) enumerated about 164 Indian medicinal plants with wound healing properties mentioned in Ayurveda while Ryan (2003) discussed its utilization, safety and efficacies. In addition, several studies were carried out on medicinal plants with wound healing properties (Biswas and Mukherjee 2003; Biswas *et al*., 2004) on the basis of medicinal uses documented through various Traditional medicines. Several classes of compounds have been reported from fruits such as flavonoids including 2'-Me-3'-(3,3-dimethyl allyl, 3'-Me-5',6'-(2,2- dimethylchromeno, 4',5 '-(2,2-dimethylchromeno) and 6-Methyl-7,8-(2,2-dimethylchtomeno) (Barron and Ibrahim, 1996), triterpenoid namely kamaladiol-3-acetate (Mahato and Sen, 1997) chalcone dimers namely Kamalachalcones A and B (Tanaka *et al*., 1998), a chalcone compound namely mallotophilippen C (Li *et al*., 2006) from fruits. These compounds may be involved in the wound healing ability caused in experimental rats. At the sametime, the present study provides an evidence to claim against the skin affections used by various tribals of Tamil Nadu state.

5. REFERENCES

Anonymous, 1953. *British Pharmacopia*. General Medical Council. The Pharmaceutical Press, 17 Bloomsbury Square, London, WCI.P.

Barron, D. and Ibrahim, R.K. 1996. Isoprenylated flavonoids - A Survey. *Phytochemistry* 43: (5): 921-982.

Bates, D. O. and Jones, R. O. P. 2003. The role of Vascular Endothelial Growth factor in wound healing. *International J. Lower extremity wounds* 2(2): 107-120.

Bennett, N. T. and Schultz, G. S. 1993a. Growth factors and wound healing: biochemical properties of growth factors and their receptors. *Am.J. Surg*. 165: 728-37.

Bennett, N. T. and Schultz, G. S. 1993b. Growth factors and wound healing: Part II. Role in normal and chronic wound healing. *Am. J. Surg*. 166: 74-81.

Biswas, J. K., Maity, L. N. and Mukherjee, B. 2004. The clinical evaluation of *Pterocarpus santalinus* Linn. Ointment on lower extremity wounds – A preliminary report. *International J.Lower extremity wounds* 3(4): 227-232.

Chatterjee, T. K. and Chakravorty, A. 1993. Wound healing properties of the new antibiotics (MT81) in mice. *Indian Drugs* 30(9): 450-452.

Cragg, G.M. and Newman, D.J. 2001. Medicinals for the millennia. *Ann. New York Acad. Sci*. 953: 3-25.

Diegelmann, R.F. and Evans, M.C. 2004. Wound healing: An overview of acute, fibrotic and delayed healing. *Frontiers in Biosci*.9: 283-289.

Fabricant, D.S. and Farnsworth, N.R. 2004. The value of plants used in traditional Medicine for drug discovery. *Environmental Health Pers.* **109**: 69-75.

Farnsworth, N.R. and Soejarto, D.D. 1991. Global importance of medicinal plants. In: *The Conservation of Medicinal Plants* (ed. O. Akerele, V. Heywood and H. Synge), pp. 25-51. Cambridge University Press, Cambridge, UK.

Grazul-Bilska, A. T., Jhonson, M. L., Bilski, J. T., Redmer, D. A., Reynolds, L. P., Abdullah, A. and Abdullah, K. M. 2003. Wound healing: the role of growth factors. *Drugs of Today* 39(10): 787-800.

Henry, A.N., Kumari, G.R. and Chitra, V. 1987. *Flora of Tamil Nadu, India Series 1: Analysis.* Vol. II. Botanical Survey of India, Coimbatore, India. pp.1-260.

Jothi, G.J., Benjamin, A. and manickam, V.S. 2008. Glimpses of tribal botanical knowledge of Tirunelveli hills, western ghats, India. *Ethn. Bot. leaflets* 12: 118-126.

Kadavul, K. and Dixit, A.K. 2009. Ethnomedicinal studies of the woody species of kalrayan & Shervarayan hills, eastern ghats, Tamil Nadu. *Indian J. Trad. Knowledge* 8(4): 592-597.

Kumar, S., Wong, P. F. and Heaper, D. J. 2004. What is New in Wound healing?. *Turkey J. Medi. Sci*. 34: 147-160.

Lalitha Rani, S., Kalpana Dev, V., Tresina Soris, P., Maruthupandian, A. and Mohan, V.R. 2011. Ethnomedicinal plants used by Kanikkars of Agasthiarmalai Biosphere Reserve, Western Ghats. *J. Ecobiotech*. 3(7): 16-25.

Li, Y., Luo, Y., Huang, W., Wang, J. and Lu, W. 2006. Total synthesis of mallotophilippen C. *Tetrahed. Lett*. 47: 4153-4155.

Mahato S.B. and Sen, S. 1997. Advances in Triterpenoid Research, 1990-1994. *Phytochemistry* 44(7): 1185-1236.

Morton J. J. and Malone, M. H. 1972. Evaluation of vulnerary activity by an open wound procedure in rats. *Arch. Int. Pharmacodyn. Ther*. 196: 117-26.

Pei, S. 2001. Ethnobotanical approaches of traditional medicine studies: some experiences from Asia. *Pharm. Botany* 39: 74-79.

Rai, N. K., Tripathi, K. and Sharma, D. 2005. Apoptosis: A basic Physiologic process in wound healing. *Int. J. Lower Extremity wounds* 4(3): 138-144.

Robinson, T. 1963. *The organic constituents of higher plants*, Bargles, U.S.A. p. 107.

Ryan, T. J. 2003. Use of herbal medicine in wound healing: A perspective paper. *Int. J. Lower extremity wounds* 2(1): 22-24.

Santapau, H. and Henry, A.N. 1973. *A Dictionary of Flowering plants in India*. Council of Scientific and Industrial Research, New Delhi.

Schiffer, C. J. and Nanney, L. B. 1996. Cell biology of wound healing. *Int. Rev. Cytol*. 169: 151-181.

Shanmugam, S., Gayahtri, N., Sakthivel, B., Ramar, S. and Rajendran, K. 2009. Plants used as medicine by Paliyar tribes of Shenbagathope in Virudhunagar district in Tamil Nadu, India *Ethn. Bot. leaflets* 13: 370-378.

Tanaka, T., Ito, T., Iinuma, M., Takahashi, Y. and Naganawa, H. 1998. Dimeric chalcone derivatives from *Mallotus philippensis*. *Phytochemistry* 48: 1423-1427.

Udupa, S. L., Udupa, A. L. and Kulkarni, D. R. 1994. Antiinflammatory and wound healing properties of *Aloe vera*. *Fitoterapia* 65(2): 141-145.

Viswanathan, M.B., Prem Kumar, E.H. and Ramesh, N. 2006. Ethnobotany of the Kanis (Kalakkad-Mundanthurai Tiger Reserve) in Tirunelveli District, Tamil Nadu, India. Bishen Singh Mahendra Pal Singh, Dehradun.

WHO, 2011. *WHO Country Cooperation Strategy 2006-2011*. Supplement on Traditional Medicine. World Hel;ath Organizartion, New Delhi.

Woodson, R. R. 1987. Statistical methods for the analysis of biochemical data, series in probability and mathematical statistics, Wiley, New York, p.316.

*****