Vol 4 (1), January 2013; 50-58

Anti-nociceptive activities of medicinal plants: A Review

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ABSTRACT

Medicinal plants are traditionally used in worldwide as analgesic and for treatment of inflammatory disorders. In the present review, the antinociceptive effects of plants have been discussed. Medicinal plants are gaining popularity among population due to low cost and best efficacy. Pain is symptom of various illnesses and drugs that relive pain is a subject of pharmaceutical research. Objective of this article is to document the plants having anti-nociceptive activities. Material for this review was taken mostly from textbooks & electronic journal Up to date. To collect publication PubMed, google scholars and the Cochrane database of systematic reviews was used. Some other relevant references were collected from personal database of papers on antinociceptive. A total of 76 reports on plants have been found to report such activities. While 7 reports were explained in detail, 69 plants were mentioned having activities. This review will summarize medicinal plants or their constituents with analgesic-like activity from the chemical and pharmacological perspectives. The data show that these medicinal plants have potential to treat pain and may be helpful for therapeutic purposes.

Keywords: Anti-nociceptive, Medicinal plants, Anti-inflammatory, Efficacy, Literature review

INTRODUCTION

Antinociceptive agents are being used in Unani system of medicine since ancient times. Medicinal plants have potential to treat pain and are prescribed by Unani Physician in all over the world. Anti-nociceptive are drugs that control pain. A medicinal plant have been used in Unani system of medicine since ancient times and is the major source of drugs of herbal origin of most of the population of World. It covers about 70-80% population of World that relies on herbal medicine. This knowledge has been transmitted from generation to generation. The present review demonstrates the anti-nociceptive effects of commonly used medicinal plants in Unani system of medicine. Now there is need to document the plants that have been proven pharmacologically and clinically effective. Various anti-nociceptive drugs are available in market that are effective but they exert side effects such as heart burn and gastric ulcer etc. Therefore there is need to search new therapy with no or fewer side effects. This paper is intended as a review of the current literature on plant-based preparations having antinociceptive (analgesic) activity (Table I). Western pharmacology frequently derives inspiration from traditional medicine. The best example of the bioinspired analgesic drug is perhaps aspirin. Thus a review summarizing the current research on the subject is very useful.

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MATERIALS AND METHODS

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Cochrane database of systematic reviews was used. Some other relevant references were collected from personal database of papers on antinociceptive.

RESULTS AND DISCUSSION

A total of 76 reports on plants have been found to report such activities. While 7 reports were explained in detail, 69 plants were mentioned having activities.

Medicinal plants having activity

Achillea millefolium

Family: Asteraceae, **Parts used:** Flowers and seeds. **Chemical constituents:** Azulenes, achilleine, stychydrine, tannins. **Study:** Antinociceptive effect of hydroalcohol extract of *Achillea millefolium* L has been investigated (Pires *et al*. 2009), and it was found that the doses of 500 and 1000 mg/kg significantly inhibited abdominal contortions

Euphorbia thymifolia L.

Family: Euphorbiaceae, **Parts used:** Whole plant, **Chemical constituents:** Essential oil, cymol, carvacrol, limonene, salicylic acid and 5,7,4 trihydroxy flavone -7-glycoside. It is used to treat hematuria. **Study:**Antinociceptive activity of methanolic extract of *Euphorbia thymifolia* has been reported. Pain was induced by injecting acetic acid intraperitoneally. Measurement of writhing times was noted. Extract was given orally and acetic acid injection was given after one hour of extract administration. Dose of extract was 400 mL/kg body weight. The extract exhibited significant antinociceptive activity. Extract was effective in inhibiting the abdominal writhing 40.9% at a dose of 400 mg/kg body weight. While aspirin a standard was exhibited 49.0% inhibition at a dose of 200 mg/kg body weight. This anti-nociceptive activity of extract validates the use of this plant in traditional system of medicine for treatment of pain (Rahahmatullah *et al*. 2012).

Hemidesmus indicus

Family: Asclepiadaceae, **Local Name:** Anantmool, Part used: Root. **Study:** Antinociceptive activity of alcoholic extract of *Hemidesmus indicus* R.Br. in mice has been reported. Anti-nociceptive activity of this plant was investigated. For this purpose, ethanolic extract was used. Dose of extract was 25, 50 and 100mg/kg orally. Pain was induced by three method; acetic acid, formaline and hot plate test in mice. This extract was given one hour before induction of pain. Neurogenic and inflammatory pain was inhibited by use of this extract. This anti-nociceptive response was comparable to reference drug (Verma *et al*. 2005).

Costus speciosus

Family: Costaceae, **Local name:** Khongban takhellei/ Okchak khombi, **Parts used:** Rhizome. Anti-nociceptive efficacy of *Costus speciosus* rhizome in swiss albino mice has been reported (Sanjib et al. 2010). **Study:** Bhattacharya *et al*, reported the anti-nociceptive efficacy of *Costus speciosus* rhizome in swiss albino mice. Aqueous and ethanolic extracts were used for study. This study was conducted in Swiss albino mice. Pain was induced by acetic acid. Anti-nociceptive activity was checked by tail flick method. There was significant anti-nociceptive activity of both extracts. Aqueous extract was active at the dose of 75 and 150 mg/kg body weight and ethanol extract was active at the dose of 150 mg/kg body weight. Ethanol extract was significant in flick method test while aqueous extract was ineffective (Bhattacharya *et al*. 2010).

Romarinus officinalis

Family: Lamiaceae, **Part used:** Leaves. **Study:** Antinociceptive effects of *Rosmarinus officinalis* L. essential oil in experimental animal models have been reported. Acetic acid-induced writhing and hot plate tests in mice were used for assessment of anti-nociceptive efficacy rosemary essential oil. In the hot plate test, rosemary essential oil was administered at three different level 125, 250, and 500 mg/kg that exhibited unremarkable effects on response latency, whereas significant anti-nociceptive effect was observed in control group. In the acetic acid induced abdominal writhing, rosemary essential oil was administered at doses of 70, 125, and 250 mg/kg that exhibited significant antinociceptive effect as

Table I: Plants having anti-nociceptive activity

No	Plants	Family	References
1	*Syzygium jambos*	*Myrtaceae*	*Ávila et al. 2007*
2	*Phyllanthus amarus*	*Euphorbiacea*	*Santos et al. 2000*
3	*Clusia columnaris*	*Guttiferae*	*Bittar et al. 2000*
4	*Mentha microphylla*	*Lamiaceae*	*Atta et al. 2004*
5	*Rubus hirtus*	*Rosaceae*	*Erdemoglu et al. 2003*
6	*Papaver somniferum*	*Papaveraceae*	*Calixto et al. 2000*
7	*Alpinia zerumbet*	*Zingiberaceae*	*Dearaújo et al. 2005*
8	*Phyllanthus urinaria*	*Phyllanthaceae*	*Santos et al. 1995*
9	*Equisetum arvense*	*Equisetaceae*	*Domonte et al. 2004*
10	*Pancratium maritimum*	*Amaryllidaceae*	*Cakici et al. 1997*
11	*Zataria multiflora*	*Lamiaceae*	*Jaffary et al. 2004*
12	*Salvia officinalis*	*Lamiaceae*	*Qnais et al. 2010*
13	*Sempervivum tectorum*	*Crassulaceae*	*Kekesi et al. 2003*
14	*Flaveria trinervia*	*Asteraceae*	*Hoskeri et al. 2011*
15	*Nidularium procerum*	*Bromeliaceae*	*Amendoeira et al. 2005*
16	*Teucrium polium*	*Lamiaceae*	*Abdollahi et al. 2003*
17	*Ipomoea involucrate*	*Convolvulaceae*	*Ijeoma et al. 2011*
18	*Bauhinia macrostachya*	*Casalpiniaceae*	*Gadotti et al. 2005*
19	*Pinus densiflora*	*Pinaceae*	*Choi et al. 2007*
20	*Alternanthera philoxeroides*	*Amaranthaceae*	*Khatun et al. 2012*
21	*Polygala sabulosa*	*Polygalaceae*	*Ribas et al. 2008*
22	*Pterodon polygalaeflorus*	*Fabaceae*	*Duarte et al. 1996*
23	*Balbisia calycina*	*Vivianiaceae*	*Miño et al. 2002*
24	*Muntingia calabura*	*Muntingiaceae*	*Sani et al. 2012*
25	*Euphorbia heterophylla*	*Euphorbiaceae*	*Vamsidhar et al. 2000*
26	*Premna corymbosa*	*Verbenaceae*	*Karthikeyan et al. 2010*
27	*Geoffroea decorticans*	*Fabaceae*	*Reynoso et al. 2012*
28	*Eupatorium arnottianu*	*Asteraceae*	*Clavin et al. 2000*
29	*Garcinia achachairu*	*Clusiaceae*	*Dal et al. 2012*
30	*Urtica urens*	*Urticaceae*	*Marrassini et al. 2010*

No	Plants	Family	References
31	*Punica granatum*	*Lythraceae*	*Ouachrif et al. 2012*
32	*Rheedia longifolia*	*Clusiaceae*	*Santos et al. 2011*
33	*Jatropha isabellei*	*Euphorbiaceae*	*Silva et al. 2013*
34	*Helicteres isora*	*Malvaceae*	*Venkatesh et al. 2007*
35	*Thalassia testudinum*	*Hydrocharitaceae*	*Garateix et al. 2011*
36	*Byrsonima intermedia*	*Malpighiaceae*	*Orlandi et al. 2011*
37	*Polygonatum verticillatum*	*Asparagaceae*	*Khan et al. 2011*
38	*Petiveria alliacea*	*Phytolaccaceae*	*Gomes et al. 2005*
39	*Melastoma malabathricum*	*Melastomataceae*	*Sulaiman et al. 2004*
40	*Hofmeisteria schaffneri*	*Asteraceae*	*Angeles et al. 2010*
41	*Russelia equisetiformis*	*Plantaginaceae*	*Awe et al. 2007*
42	*Sambucus ebulus*	*Adoxaceae*	*Ahmadiani et al.1998*
43	*Uncaria tomentosa*	*Rubiaceae*	*Jürgensen et al. 2005*
44	*Marrubium vulgare*	*Lamiaceae*	*Dejesus et al. 2000*
45	*Rosmarinus officinalis*	*Lamiaceae*	*Martínez et al. 2012*
46	*Petiveria alliacea*	*Phytolaccaceae*	*Delima et al. 1991*
47	*Zanthoxylum rhetsa*	*Rutaceae*	*Rahman et al. 2002*
48	*Loasa speciosa*	*Loasaceae*	*Badilla et al. 2003*
49	*Virola surinamensis*	*Myristicaceae*	*Carvalho et al. 2010*
50	*Ocimum basilicum*	*Lamiaceae*	*Venâncio et al. 2011*
51	*Xylopia parviflora*	*Annonaceae*	*Nishiyama et al. 2010*
52	*Croton cajucara*	*Euphorbiaceae*	*Campos et al. 2002*
53	*Incarvillea delavayi*	*Bignoniaceae*	*Nakamura et al. 2000*
54	*Kalopanax pictus*	*Araliaceae*	*Choi et al. 2002*
55	*Clitoria fairchildiana*	*Fabaceae*	*Leite et al. 2012*
56	*Achyranthes aspera*	*Amaranthaceae*	*Barua et al. 2010*
57	*Brugmansia suaveolens*	*Solanaceae*	*Parker et al. 2007*
58	*Neorautanenia mitis*	*Papilonaceae*	*Vongtau et al. 2004*
59	*Piper solmsianum*	*Piperaceae*	*Dasilva et al. 2010*

compared to control group. These data suggest that REO has antinociceptive activity (Takaki *et al.* 2008).

Barringtonia acutangula
Family: Barringtoniaceae, **Parts used:** Leaf, bark and seeds. It is used to treat diarrhea, dysentery, colic pain and asthma. **Study:** Antinociceptive activity of *Barringtonia acutangula* has been reported. Methanol extract of this plant was used for study. Dose of extract was 200 and 400 mg/kg; p.o. Pain was induced by acetic acid. Significant anti-noceceptive was exhibited by extract in acetic acid induced model. Anti-nociceptive activity validates its use in traditional medicine (Zafar *et al*. 2011).

Hilleria latifolia
Family: Phytolaccaceae. Anti-nociceptive activity of this plant was investigated. Ethanolic extract of this plant was used for study. Ethanolic extracts of plant together with morphine and diclofenac (positive controls), exhibited significant antinociceptive activity (Eric *et al*. 2011)

CONCLUSION

This review supports the fact that medicinal plants provide an excellent opportunity to find active molecules against various ailments. There is need to screen among the species mentioned to determine those which are efficacious and safe. The technology of processing, packaging and preserving traditional medicines for the treatment of diseases is very basic and needs improving. Unani Physicians are playing a significant role in primary health care delivery and this lends further justification for the ongoing research efforts to integrate the allopathic and traditional medicine systems.

ETHICS STATEMENT

This is a review article and there is no need of approval from ethical committee

CONFLICT OF INTEREST

There is no conflict of interest

DISCLOSURE STATEMENT

None of the authors have a financial or proprietary interest in the subject matter or materials discussed in the manuscript, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

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