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AN EXPERIMENTAL EVALUATION OF ANALGESIC ACTIVITY OF *PARTHENIUM HYSTEROPHORUS* IN SWISS ALBINO MICE

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ABSTRACT

Context: *Parthenium hysterophorus*, a prolific weed belonging to Asteraceae family posses many significant medicinal properties. Plant has been found to be pharmacologically active as analgesic in muscular rheumatism, therapeutic for neuralgia and as vermifuge.

Aims: The study was planned to study the analgesic activity of *Parthenium hysterophorus* in swiss albino mice.

Material and Methods: Experimental study was planned in healthy adult swiss albino mice of either sex weighing 25-50 gm in the laboratory of tertiary care teaching medical college. Acetic acid induced writhing test was used to evaluate the analgesic activity of hydro-alcoholic extract of aerial parts of plant. The results were expressed as Mean ± Standard Deviation (SD). The differences between experimental groups were compared by one-way Analysis of Variance (ANOVA) followed by test.

Results: Plant extract at dose 200mg/kg was not significantly analgesic as compare to control. Extract at dose 400mg/kg was very significant analgesic as compare to control. At higher dose extract at dose 800mg/kg showed highly significant analgesic property as compare to control. Overall, there was dose dependent increase in analgesic activity.

Conclusions: *Parthenium hysterophorus* extract showed significant analgesic activity in terms of reduction in number of writhes in experimental analysis.

INTRODUCTION

Medical plants play an essential role in order to develop various drugs from our resources which can help in reducing the cost of medicine. Focus on plant research has increased all over the world and a large body of evidence has been collected to show immense potential of medicinal plants used in various traditional systems. Plants play an essential role in the health care needs for the treatment of diseases and to improve the immunological response against pathologies. Plant extracts are potentially curative. Some of these extracts can boost the humoral and cells mediated immunity against viruses, bacteria, fungi, protozoa and cancer and provide the potential cure. [1] Indeed, about 25% of prescriptions contain at least one active ingredient derived from plant material. Medicinal plants thus have become important for human existence with growing tendency all over world to shift from synthetic to natural based products.

One among such plants is *Parthenium hysterophorus*, a prolific weed belonging to Asteraceae family. The decoction of P. hysterophorus has been used in traditional medicine to treat fever, diarrhoea, neurologic disorders, urinary tract infections, dysentery, malaria and as emmenagogue. [2] It is used by some tribes as remedy for inflammation, eczema, skin rashes, herpes, rheumatic pain, cold, heart trouble and gynaecological ailments. Plant has been found to be pharmacologically active as analgesic in muscular rheumatism, therapeutic for neuralgia and as vermifuge. [3] Parthenin, the major constituent of the plant, exhibits significant medicinal attributes including anticancer property. [4] The flowers showed significant anti tumour activity and parthenin exhibited cytotoxic properties against T cell leukaemia, HL-60

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and Hela cancer cell lines. [5] It also has hypoglycaemic activity against alloxan-induced diabetic rats. So, flower extract of this weed can be used for developing drug for diabetes mellitus. [6]

They are also easily available locally. Hence this study was conducted to evaluate analgesic properties of *Parthenium hysterophorus*.

MATERIAL & METHODS

Animals

The Healthy adult swiss albino mice, weighing 25-50 gm of either sex were caged in polyvinyl wire mesh cages in the animal room. They were maintained under standard laboratory condition (12 hour light and dark cycle and temperature of 22^0 C $\pm$ 3^0 C), humidity (60 ± 10 %) with access to food and water ad libitum according to OECD guidelines, revised draft guidelines 425 and by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Social Justice and Empowerment, Government of India. [7] The animals were allowed to adapt to the new surrounding by giving rest of one week before subjecting them to experimentation.

Fresh *Parthenium hysterophorus* plants were collected from the nearby area and authenticated by local botanist. Aerial parts were shade dried and powdered in the department of pharmacology.

Preparation of extract

The powders (Aerial parts) were macerated for 24 hours in 70 % v/v ethanol. The hydro-alcoholic extracts were obtained by percolation using 70 % v/v ethanol as a solvent. Percolated solution was again shade dried and extract was obtained. Fresh solution was prepared by dissolving extract in distilled water before each experiment.

Ethical clearance

Ethical clearance was taken from Institutional Animal Ethics Committee prior to the initiation of study.

METHODS

Writhing test [8-12]

The Swiss albino mice of either sex were divided into five groups with six animals in each group. Group 1 received distilled water and served as control group. Groups 2, 3 & 4 received the hydro-alcoholic extracts of plant in the doses of 200, 400 & 800 mg/kg orally respectively. Group 5 received Aspirin (100mg/kg) orally and served as standard group.

Writhing was induced by intraperitonealy injection 0.6% acetic acid (10 ml/kg). Response was observed as abdominal contraction and relaxation with hind limb extension. The animal who failed to produce writhing were discarded. Test and standard drugs were given 60 min before the acetic acid injection. The number of writhes was counted for 30 min immediately after the acetic acid injection. The percentage inhibition was calculated.

% Inhibition= *Control- Test/ Control x 100*

Statistical analysis

All the results were expressed as Mean ± Standard Deviation (SD). The differences between experimental groups were compared by one-way Analysis of Variance (ANOVA) followed by test. The results were considered statistically significant when $p < 0.05$, very significant when $p< 0.01$-, highly significant when $p< 0.001$- as compared to control.

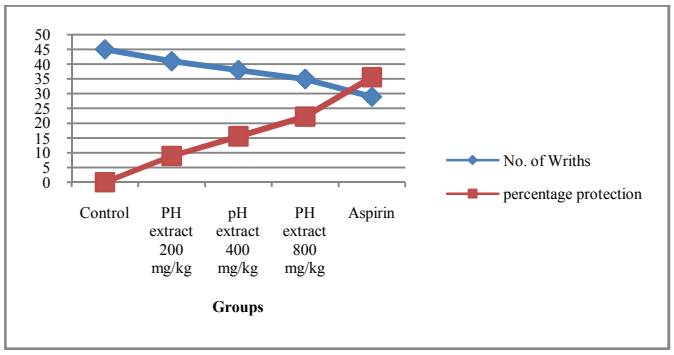
RESULTS

There was decrease in number of writhes in group 2 (PH extract 200mg/kg p.o.) which was not significant as compare to control. However decreased in number of writhes in group 3 (PH extract 400mg/kg p.o) was very significant ($p < 0.01$) as compare to control. Whereas decreased in number of writhes in group 4 (PH extract 800mg/kg p.o) and in group 5 (aspirin-standard drug) was highly significant ($p< 0.001$) as compare to control. The percentage protection was 8.88%, 15.55%, 22.22 % and 35.55% in group 2, 3, 4 and 5 respectively. (Table 1 and graph 1)

Table 1 Analgesic activity of Parthenium Hysterophorus extract extract on mice by Writhing test

Groups	Dose mg/kg orally	No. of writhing movements	Percentage protection
1-ControlDistilled water	2ml	45 ± 3.559	-
2- PH extract	200	41 ± 3.125	8.88 %
3- PH extract	400	38 ± 4.400**	15.55%
4- PH extract	800	35 ± 4.792***	22.22%
5-Standard Aspirin	100	29 ± 7.508***	35.55 %

*Number of animals n=6; PH- Parthenium Hysterophorus; Results are expressed in Mean ± SD; *P<0.05-significant, ** P <0.01- very significant ***P < 0.001- Highly significant compare to control*



Graph 1 Analgesic activity of PH- Parthenium Hysterophorus extract on mice by writhing test

DISCUSSION

Any injury or tissue damage is associated with pain and inflammation. Analgesics can act on peripheral or central nervous system. Peripherally acting analgesics act by blocking the generation of impulses at chemoreceptors site of pain, while centrally acting analgesics not only raise the threshold for pain, but also alter the physiological response to pain and suppress the patient's anxiety and apprehension.

Literature survey has revealed that plant metabolites like Luteolin, Parthenolide, Pathenolid, Reynosin, Santamarin, Santin, Apigenin etc. may play an important role in many of the activities like analgesic activity. [13-17]

Acetic acid writhing test was used because of its sensitivity that could provide different grades of noxious stimuli in chemically induced tissue damage. The acetic acid test has an ability to mimic human clinical pain conditions and productions of tonic stimulus. [18] Acid acetic-induced abdominal constrictions are useful experimental tool in the testing of new analgesic drugs. [19] It is proposed that the acetic acid acts indirectly by inducing the release of

endogenous mediators which stimulate the nociceptive neurons sensitive to non-steroidal anti-inflammatory drugs (NSAIDs. [20] Abdominal injection of acetic acid in mice has been attributed to the release of arachidonic acid, which results the synthesis of prostaglandin via the cyclooxygenase (COX) enzyme. [21] The special nerve endings that sense pain are very sensitive to prostaglandin. When prostaglandin is released, the nerve endings respond to it through prostaglandin E2 (PGE2) receptor by picking up and transmitting the pain and injury messages through the nervous system to the brain and cause visceral writhing stimuli in mice. [22-23] Therefore, it has been suggested that the inhibition of prostaglandin synthesis is remarkably efficient as an anti-nociceptive mechanism in visceral pain. [24] Since, *Parthenium hysterophorus* extract at a dose of 400 mg/kg and 800mg/kg (Table 1 and graph 1) showed significant ($P<0.01$ and $P<0.001$) inhibition of acetic acid induced writhing response of mice, thus it can be suggested that the Parthenium hysterophorus extract has potential peripheral analgesic activity. Though the exact mechanism of action is yet not clear, but it can be suggested that this effect may be due to inhibition of prostaglandin synthesis by Parthenium hysterophorus extract.

CONCLUSION

There is a necessity to strengthen the research for evolving new herbal products and their production in satisfactory way and scientifically. *Parthenium hysterophorus* extract showed significant analgesic activity in this model, indicating peripheral analgesic activity as that of standard drug (aspirin). In this study we tried to explore the mechanism peripheral analgesic activity in Writhing test *Parthenium hysterophorus* extract showed significant reduction in number of writhes, it can be suggested that this effect may be due to inhibition of prostaglandin synthesis by *Parthenium hysterophorus* extract indicating its peripheral analgesic activity.

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