ANTI-INFLAMMATORY ACTIVITY OF *TRITICUM AESTIVUM* ON CARRAGEENAN INDUCED PAW EDEMA IN WISTAR RATS

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Summary

The aqueous, methanolic & acetone extract of the Triticum aestivum (wheat grass) was investigated for its anti-inflammatory activities in animal models. The extract 1.43 gm/kg body weight reduced significantly, the formation of oedema induced by carrageenan. (1) These results were also comparable to those of Diclofenac, the reference drug used in this study. Anti-inflammatory activity determined by carrageenan induced paw edema using plethysmometer in albino wistar rats were carried out, following the sub cutaneous administration of aqueous, methanolic and acetone extract of triticum aestivum. (1.43 gm/kg body weight). The anti-inflammatory activity of methanolic extract of triticum aestivum was significant. The maximum anti-inflammatory activity was observed at 5 hr and was comparable to that of standard Diclofenac sodium and the percentage of edema inhibition effect was 73.38%. Acetone and water extract of Triticum aestivum has also shown significant anti-inflammatory activity but less than the methanolic extract and standard drug. The activity was attributed to the presence of phytoconstituents in the tested extract.

Keywords: Anti-inflammatory activity, Triticum aestivum, wheat grass, plethysmometer, Diclofenac sodium, Carrageenan, Paw edema

Introduction

Drugs which are in use presently for the management of pain and inflammatory conditions are either narcotics e.g. opioids or non-narcotics e.g. salicylates and corticosteroids e.g. hydrocortisone. All of these drugs present well known side and toxic effects. Moreover synthetic drugs are very expensive to develop since, for the successful introduction of a new product approximately 3000-4000 compounds are to be synthesized, screened and tested, whose cost of development ranges from 0.5 to 5 million dollars. On the contrary many medicines of plant origin had been used since long time without any adverse effects. It is therefore essential that efforts should be made to introduce new medicinal plants to develop cheaper drugs. (2) Plants represent a large untapped source of structurally novel compounds that might serve as lead for the development of novel drugs (3)

Herbal medicines derived from plant extracts are being increasingly utilized to treat a wide variety of clinical diseases, though relatively little knowledge about their mode of action is available. There is a growing interest in the pharmacological evaluation of various plants used in Indian traditional systems of medicine. Thus, the present investigation was carried out to evaluate the anti-inflammatory potential of *Triticum aestivum (F: Graminae)* in experimental animal models. (4)

Wheat, (*Triticum* species) a cereal grass of the *Gramineae* (*Poaceae*) family, is the world's largest edible grain cereal-grass crop. It is commonly 60-150 cm. in height, but may be as short as 30 cm. stem is tufted, erect or semi-erect to prostrate, generally hollow with thin walls, in stem nodes are present generally 5-7 at 3-4 cm. leaves are long and narrow having glabrous or hairy on one or both surface.(4, 5)

Scientific reports on nutritional analysis of wheatgrass have been published frequently in various journals (6, 7, 8). These reports and the chemical analyses undertaken reveal that wheatgrass is rich in chlorophyll, minerals like magnesium, selenium, zinc, chromium, antioxidants like beta-carotene (pro-vitamin A), vitamin E, vitamin C, antianemic factors like vitamin B_{12}, iron, folic acid, pyridoxine and many other minerals, amino acids and enzymes, which have significant nutritious and medicinal value. (4)

Wheatgrass juice has been proven over many years to benefit people in numerous ways: cleansing the lymph system, building the blood, restoring balance in the body, removing toxic metals from the cells, nourishing the liver and kidneys and restoring vitality as claimed by Dr. Ann Wigmore, U. S. A. founder director of the Hippocrates Health Institute, Boston, U.S.A. She claimed that wheatgrass is a safe and effective treatment for ailments such as high blood pressure, some cancers, obesity, diabetes, gastritis, ulcers, anemia, asthma and eczema (1).

Wheat grass contains chlorophyll. Chlorophyll solutions provide significant relief of pain, reduction of inflammation, and the control of odor for patients with serious mouth diseases, used successfully to treat chronic and acute sinusitis, vaginal infections, and chronic rectal lesions (9).

Materials And Methods

Plant Material

Triticum aestivum was collected locally during the November and December. The institutional animal ethics committee clearance was obtained prior to the commencement of the study. The green grass was macerated with water, methanol and acetone. The extract was concentrated and dried. In whole experiments 1.43 gm/kg dose of triticum aestivum were tested. (10),(11).

Extraction of Plant Material

Preparation of various Extract

For preparation of methanolic extract, dried powder obtained from 100 gram of fresh wheatgrass was crushed thoroughly, using mortar and pestle. The crushed wheatgrass was completely exhausted by adding small quantities of methanol and filtering off every time in a successive manner, and allow drying to yield dried extract.

Same way for the preparation of aqueous and acetone extract, dried powder obtained from 100 gram of fresh wheatgrass was crushed thoroughly, using mortar and pestle. The crushed wheatgrass was completely exhausted by adding small quantities of double distilled water and acetone respectively and filtering off every time in a successive manner, and allow drying to yield dried extract.

Animals

Albino wistar rat weighing between 150-200 gm and maintained under standard condition in the animal house of the college were used for the study. All the animals were fasted overnight with water.(12)

Anti-inflammatory activity:

Carrageenan induced rat Paw Oedema

Twenty albino wistar rats of either sex were divided into five groups. Group 1 receives normal saline and served as control. Group 2 receive Diclofenac sodium (5 mg/kg) and served as standard. Group 3, 4 and 5 received the acetone, methanolic and aqueous extract respectively. One hour after the administration (as per the experimental protocol), 0.05 ml of 1% carrageenan solution was introduced by sub cutaneous route of the right hind paw of all animals. (12,13,14,15,16,17,18) For the assessment of the anti-inflammatory activity, the volume of the paw was measured with the help of mercury plethysmometer at 0 h and at 1 h interval for a period of five hours and at 24 hr after the carregeenen treatment.(11)

Results and Discussion

Carrageenan induced oedema is a multimediated phenomenon that liberates diversity of mediators. It is believed to be biphasic the first phase (60 min) involves the release of serotonin and histamine while the second phase (over 60 min) is mediated by prostaglandins, the cyclooxygenase products, and the continuing between the two phase is provided by kinins (19). Development of oedema induced by carrageenan is commonly correlated with early exudative stage of inflammation. This study has shown that the methanolic, aqueous and acetone extract of the *Triticum aestivum* possessed a significant anti-inflammatory effect against paw edema induced by carrageenan. Since carrageenan induced anti-inflammation model is a significant test for anti-inflammatory agent acting by the mediators of acute inflammation. The results of this study showed that *Triticum aestivum* can be effective in acute inflammatory disorder.

Table-1: Effect of various treatment on carrageenan-induced paw edema in rats

Effect of vehicle on carrageenan-induced paw edema in rats			
Animal no.	**Initial Paw Volume (ml)**	**Paw volume after 5 hr (ml)**	**Difference in paw volume (Edema)**
1	69	133	64
2	72	142	70
3	73	124	51
4	75	144	69
5	74	135	61
6	71	143	72
Mean ± SEM	72.33333 ± 0.8819	136.8333 ± 3.156	64.5 ± 3.17
Effect of Diclofenac (5 mg/kg) on carrageenan-induced paw edema in rats			
1	73	90	17
2	75	86	11
3	76	90	14
4	80	96	16
5	79	85	6
6	71	81	10
Mean ± SEM	75.67 ± 1.406	88 ± 2.113	12.34±1.687
Effect of Acetone extract of *Triticum aestivum* (1.43 gm/kg) on carrageenan-induced paw edema in rats			
1	70	110	40
2	68	105	37
3	82	111	29
4	72	105	33
5	69	87	18
6	66	100	34
Mean ± SEM	71.16667 ± 2.31	103 ± 3.58	31.84 ± 3.156
Effect of Methanolic extract of *Triticum aestivum* (1.43 gm/kg) on carrageenan-induced paw edema in rats			
1	68	81	13
2	74	95	21
3	65	86	21
4	55	74	19
5	69	84	15
6	64	78	14
Mean ± SEM	65.83333 ± 2.60	83 ± 2.966	17.166 ± 1.47

Effect of Water extract of *Triticum aestivum* (1.43 gm/kg) on carrageenan-induced paw edema in rats			
1	63	83	20
2	73	101	28
3	65	84	19
4	53	75	22
5	67	89	22
6	61	90	29
Mean ± SEM	63.66667 ± 2.716	87 ± 3.549	23.34 ± 1.70

Table-2: Effect of various treatments on carrageenan-induced paw edema in rats at various time intervals

Time in hours	**% Inhibition after x hour**			
	Diclofenac	Acetone extract	Methanolic extract	Water extract
1	35.01	1.89	14.52	8.52
2	37.47	14.70	29.42	20.91
3	43.48	16.74	30.42	35.84
4	68.32	33.70	59.05	46.60
5	80.87	50.64	73.38	63.81
24	96.08	90.31	86.52	96.08

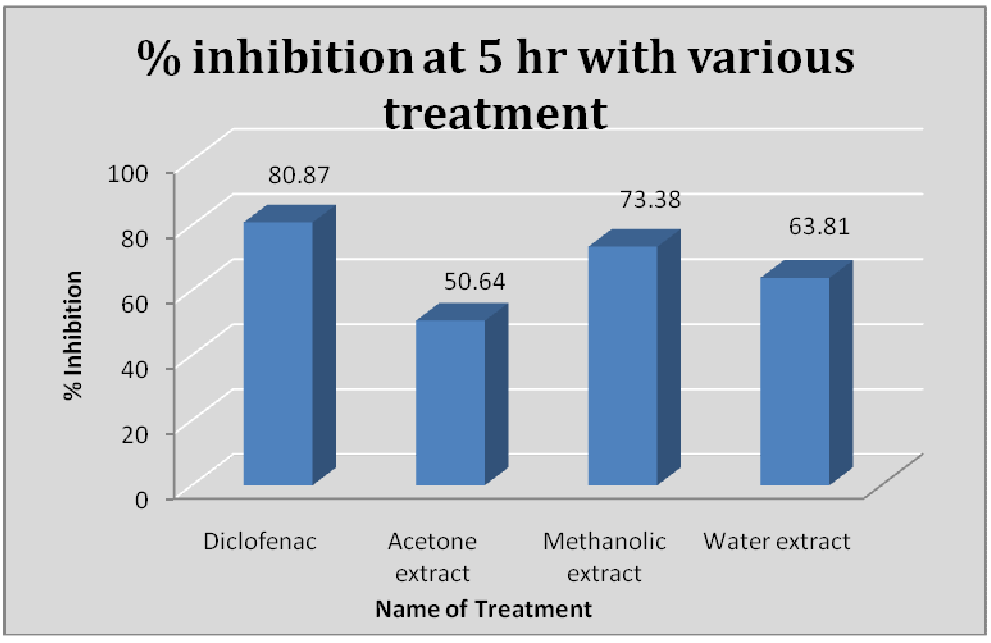

Fig.-1: % Inhibition with various treatments on carrageenan-induced paw edema in rats at 5 hour

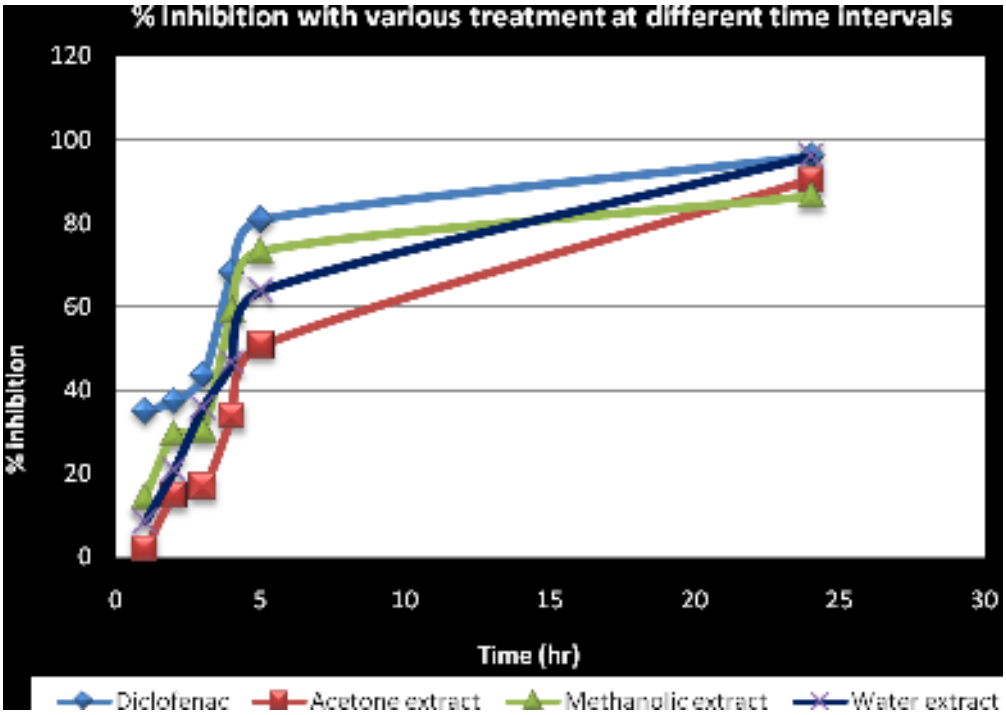

Fig.-2: Effect of various treatments on carrageenan-induced paw edema in rats at various time intervals

Experimental models selected to represent edema was carrageenan-induced hind paw edema in rats, which also served as primary screening method for anti-inflammatory activity.

The Carrageenan-induced paw edema test is widely accepted as a sensitive phlogistic tool for investigating potential anti-inflammatory agents, particularly the non-steroidal type (20). Mechanism of induction of carrageenan edema has been extensively investigated (20).

The mean paw volume at 5 hour after carrageenan administration showed immense inhibition, and after 24 hour mean paw volume is almost similar to mean paw volume at 0 hour with various treatment.

Conclusions

The results of the study have demonstrated that methanolic extract of *Triticum aestivum* showed strong anti-inflammatory activities on the animal models investigated. The study may come up with safe and effective treatments for inflammation.

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