### ANTI-DIARRHEAL ACTIVITY OF WHOLE PLANT

### OF ANNONA SQUMOSA

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**ABSTRACT**

The antidiarrheal activity of the methanolic extract of the whole plant of *Annona squamosa*belonging to the family Annonaceae was investigated by castor oil-induced diarrhea method on rats. Like loperamide (5mg/kg body weight), *Annona squamosa*methanolic extract (400 mg/kg body weight) produced a significant decrease in the severity of diarrhea. The percentage protection in extract-treated animals showing diarrhea was compared with castor oil-treated and loperamide-treated animals. The activity was found to be dose-dependent. The results revealed that the methanolic extract significantly reduced diarrhea in rat with reduction in weight of stools.

**KEY WORDS:** *Annona squamosa*, Castor oil induced Diarrhea model, Methanolic extract.

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**INTRODUCTION**

Herbal drug consists of definite parts of single plant or mixture of plants which may be further processed through crushing, drying, powdering, etc, or extracting the juice either through pressure or by means of water at room temperature or by the application of heat. The product that is obtained is a very complex mixture of components that is belonging to different chemical classes the bio acting of which combined to give an effect, which is delivered from the synergistic or antagonistic effects of individual component. So the drug to be evaluated is a complex mixture both chemically from the point of view of individual bioactivity combining to produce a particular effect [1]. Nature always stands as golden mark to exemplify the outstanding phenomena of symbiosis. Nature serves humans with medicines which were used to maintain health, to treat and heal many ailments. For the treatment of human diseases basic products from Natural products like plant, animal and minerals were used. Medicinal plants are of great importance to the health of individuals and communities [2]. Medicinal plants has a potential source of therapeutic aid has attended a significant role in health system all over the world for both human and animals not only in the diseased condition but also has potential material for maintaining proper health. Man ever since his first appearance on earth, has used plant throughout his historical development as a source of medicines. Herbal medicine is a triumph of popular therapeutic diversity [3]. The world is now moving towards the herbal medicine or system, which can then properly fight foreign invaders, and help to destroy offending pathogens without toxic side effects [4]. The world health organization in the early 1970’s had encouraged government to effectively utilize local knowledge of herbal medicines for disease prevention and health promotion [5]. WHO has showed great interest in documenting the use of medicinal plants used by tribal’s from different parts of the world [6]. The plant kingdom still holds many species of plants containing substances of medicinal values, which have yet to be discovered. We are all aware that India is one of the richest sources of medicinal plants. Interest in medicinal plants has increased enormously over the last two decades. From the academic view point it is apparent that students of botany, phytochemistry and pharmacology have now also come to expect some in –depth studies relating to medicinal plants. The use of modern isolation techniques and pharmacological testing procedures means that new plant drugs usually find their way into medicine as purified substances rather than in the form of galenical preparations. For these new drugs it is important that the pharmacist, rather than be fully conversant with the macroscopically and histological characters of the dried plant, is able to carry out the chromatographic and other procedures necessary for the identification and determination of purity of the preparation supplied. The plants used in the traditional system of medicine of India and China as now receiving much scientific attention [7].

Diarrhea is a symptom marked by rapid and frequent passage of semisolid or liquid fecal material through the gastrointestinal tract and involves both an increase in the motility of the gastrointestinal tract along with increased secretions and a decrease in the absorption of fluid and thus a loss of electrolytes particularly Na+ and water23. Diarrhea is also called loose motions. Diarrhea is not itself a disease, but can be a symptom of several diseases. It is one of the most common clinical signs of gastrointestinal disease, but also can reflect primary disorders outside the digestive system [8]. The main causes of diarrhea are overeating or eating of wrong foods, putrefaction of food in the intestinal tract, fermentation caused by incomplete carbohydrate digestion, nervous irritability, use of antibiotic drugs, and excessive intake of laxatives. The main aim of present research work was focused on determinination of antidiarrheal activity of the methanolic extract of the leaves of *Annona squamosa*by castor oil induced diarrhea model.

**MATERIALS AND METHODS:**

**PLANT MATERIALS**: *Annona squamosa* is one of the most economically and ecologically important tree species in arid and semi-arid zones of the world. *Annona squamosa* belongs to the family Annonaceae and it having 44 species of which 40 are native to the Americas, three to Asia and one to Africa. The tropical Andean region is home to six species and eight species are found in the texas area, seven of them being endemic. These species are having the several properties such as soil binders, sand stabilizers, as well as its ability to grow in the poorest soils. The tree is believed to have existed in the Vanni and Mannar regions for a long time [10]. In the western extent of its range in Ecuador and Peru, *Annona squamosa* readily hybridizes with Prosopispallida and can be difficult to distinguish from this similar species or their interspecific hybrid strains [11].



**Fig.No.1: Plant of *Annona squamosa***

**RESULTS AND DISCUSSION**

The various chemical agents that are present in it show the medicinal value that may alters certain physiological actions in the human body. The several biochemicals present in the plant are terpenes, alkaloids, flavonoids and phenolic compounds. Terpenes are used as insecticides and their pharmacological properties include antibacterial, antifungal, anthelmintic, antimalarial and molluscicidal [12]. Extracts of *Annona squamosa* seeds and leaves have several *in vitro* pharmacological effects such as anti-bacterial, anti-fungal and anti-inflammatory properties [13].

Since it is a main source of fuel for both urban and rural poor in the country, this plant provides more than 90% of the fuel wood in some Indian villages because *Annona squamosa* wood has excellent burning qualities. Thus, it is called wooden anthracite. It also has high calorific value. The wood obtained from this plant doesn’t need storage and drying process [14].

**Preparation of Plant Extract:** We have collected methanolic extract of *Annona squamosa* through Soxhlet apparatus by hot continuous extraction method. The use of commercially available Soxhlet apparatus is a convenient way to prepare crude plant extract. The dried and powered drug was packed [15]. Soxhlet apparatus is an automatic, continuous method that does not require further manipulation. This method is not time-consuming, as, for a standard-sized sample (50 g), extraction time is 48 h. The yield of methanolic extract was 9.52%. The extract was stored in refrigerator until further studies[16].

**Drugs:** Loperamide,castor oil, acetic acid (ASES Chemical Works, Jodhpur), and Sodium chloride (ASES Chemical Works).

**Procurement of Animals:** Male Wistar rats weighing (100–150 g) were obtained. They were housed in ventilated cages and fed with a normal pellet diet and water ad libitum[17]. All experiments were in agreement with ethical guidelines for investigations of experimental plant in conscious animal. Research protocol was approved by the Institutional Animal Ethics Committee.

**Anti-diarrheal activity**

*In vivo* anti-diarrheal activity Castor oil-induced diarrhea in rats Diarrhea was induced according to the method described by Teke et al, with some modifications [18]. Animals were fasted for 24 h prior to the experiment, but had free access to water. Rats were randomly assigned to one of the following groups (n=10): Group 1 served as control and received distilled water (10 ml/kg),
group 2 received the reference drug, loperamide at a dose of 5.26 mg/kg, groups 3 received MEAS at the respective doses of 400 mg/kg. All drugs were administered by gavage as a single bolus. One hour after administration of the above drugs, 10 ml/kg of castor oil were orally administered to all groups. Animals were kept in separate metabolic cages with transparent plastic container beneath the cage and lined with Whatman paper to collect faces. Following castor oil administration, parameters such as latency time, frequency of defecation, total surface of impregnation and fresh total stools weight were measured for an 8 h period and compared with those of the control. Fresh stools were then dry overnight in an oven to determine water content.

**Table 1: Effects of the aqueous extract of *Annona squamosa*  (MEAS) on castor oil-induced diarrhea:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment**  | **Dose (mg/kg)**  | **Latency time (min)**  | **Frequency of defecation (stools/8h)**  | **Inhibition of defecation (%)**  | **Total surface of impregnation (cm2)**  | **Total weight expense of deposit (g)**  |
| Water  | 10ml/kg  | 70.62 ± 5.63  | 4.00 ± 0.50  | 0.00  | 98.11 ± 25.39  | 6.12 ± 0.68  |
| Loperamide  | 5.26  | 147.62 ± 5.28  | 1.37 ± 0.46  | 65.62  | 27.85 ± 12.38  | 2.07 ± 0.49  |
| MEAS  | 400  | 296.00 ± 21.50  | 1.50 ± 0.50  | 62.50  | 18.69 ± 6.89  | 2.48 ± 0.43  |

Each value represents the mean ± SEM of 10 animals; ap < 0.05, bp < 0.01,cp < 0.001, significantly different compared to negative control group (distilled water); Loperamide.

**DISCUSSION**

Castor oil has been widely used for induction of diarrhea in antidiarrheal activity studies because it releases ricinoleic acid, a metabolite that causes diarrhea, upon metabolism in the gut. Ricinoleic acid initiates diarrhea via mechanisms such as irritation of GI mucosa, leading to the release of prostaglandin which stimulates gastrointestinal motility and electrolyte secretion, reducing electrolyte absorption from the intestine and colon; these are similar to the pathophysiologic processes resulting in diarrhea.

**CONCLUSION:** The plant extract contains pharmacologically active substances with antidiarrheal properties. This antidiarrheal activity probably results from the spasmolytic or may be due to a possible antisecretory effect of the plant extract on the intestinal smooth muscle. Thus, this lends some credence to its widespread traditional use by the tribal local population as an antidiarrheal agent. The plant seems safe based on the results of acute toxicity testing.

**REFERENCES**

1. Chopra. R.N., Nayar. S.L., Chopra. I.C., “In Glossary of Indian medicinal plants”, CSIR, New Delhi, 1st ed, 1956, 197.
2. The Ayurvedic Pharmacoepiea of India, “Ministry of health and family welfare Department and Indian system of medicine and homeopathy”, New Delhi, 11, (1), 1999, 137-140.
3. Yue- Zhong Shu., “Recent natural products based drug development: A Pharmaceutical Industry Perspective”, **J. Nat. Prod**. 61, 1998, 1053-71.
4. Mukeshwar Pandey, Mousumi Debnath, Shobit Gupta, Surender K, Chikara, Phytomedicine: An Ancient approach turning into future potential source of therapeutics, **J, Pharmacog. Phytotherapy**, 3(3), 2011, 27-37.
5. Ravishankar. B., Shukla. V.J., “Indian system of medicine: A brief profile, **African Journal Traditional complement alternative medicine**, 4(3), 2007, 319-337.
6. Kaido. T.L., Veale. D.J.H., Havlik. I., and Rama. D.B.K., **J. Ethnopharm.** 55, 1997, 185-191.
7. Trease. G.E., and Evans. W.C., **Pharmacognosy**., 13th ed., 1992, 3-4.
8. M. G. Kelechi, E. I. Maxwell, E. I. Ihechiluru, U. E. Nkiru, U. A. Iheanacho, A. C. Stella. ntidiarrheal activity of Pterocarpus erinaceus methanol leaf extract in experimentally-induced diarrhea, *Asian Pacific Journal of Tropical Medicine*, vol. 5, no. 2, pp. 147–150, 2012.
9. Tripathi KD [2008]. Essentials of Medical Pharmacology, Sixth edition, Jaypee brothers medical publishers [p] ltd. pp.453.
10. [Chengyao ma](https://pubmed.ncbi.nlm.nih.gov/?term=Ma+C&cauthor_id=28659034), [yayun chen](https://pubmed.ncbi.nlm.nih.gov/?term=Chen+Y&cauthor_id=28659034), [jianwei chen](https://pubmed.ncbi.nlm.nih.gov/?term=Chen+J&cauthor_id=28659034), [xiang li](https://pubmed.ncbi.nlm.nih.gov/?term=Li+X&cauthor_id=28659034), [yong chen](https://pubmed.ncbi.nlm.nih.gov/?term=Chen+Y&cauthor_id=28659034) “A Review on Annona squamosa L.: Phytochemicals and Biological Activities**” Am J Chin Med** . 2017;45(5):933-964.
11. T. V. Nguyen, P. L. Van, C. L. Huy, K. N. Gia, and A. Weintraub, “Etiology and epidemiology of diarrhea in children in Hanoi, Vietnam,” *International Journal of Infectious Diseases*, vol. 10, no. 4, pp. 298–308, 2006.
12. J. D. Snyder and M. H. Merson, “The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data,” *Bulletin of the World Health Organization*, vol. 60, no. 4, pp. 605–613, 1982.
13. S. Alam and S. Bhatnagar, “Current status of anti-diarrheal and anti-secretory drugs in the management of acute childhood diarrhea,” *The Indian Journal of Pediatrics*, vol. 73, no. 8, pp. 693–696, 2006.
14. S.Gajalakshmi, R.Divya, v.Divya Deepika, Mythili sathiavelu “**Pharmacological activities of Annona squamosa : A review” international journal of pharm. Sciences review and research.** 10(2):24-29, 2011.
15. Rajsekhar Saha Pharmacognosy and pharmacology of Annona squamosa : A review” , Int. J. of Pharm. & Life Sci. 2(10): Oct.: 2011, 1183-1189 1183.
16. D. R. Diniz-Santos, L. R. Silva, and N. Silva, “Antibiotics for the empirical treatment of acute infectious diarrhea in children,” *The Brazilian Journal of Infectious Diseases*, vol. 10, no. 3, pp. 217–227, 2006.
17. Ryu. S.D., Park. C.S., Baek. H.M., Baek. S.H., Hwang. S.Y., Chung. W.G.. “Anti diarrheal and spasmolytic activities and acute toxicity studies of Soonkijangquebo, a herbal anti diarrheal formula”, **J. Ethnopharmacol**. 91, 2004, 75-80.
18. Shiferie F, shibeshi W. In vivo Antidiarrheal and ex-vivo spasmolytic activities of the aqueous extracts of the roots of Echinops kebericho in rodents and isolated guinea pig ileum. **Int. J.Pharm. pharmacol**. 2013, 2, 110-6.
19. Antidiarrhoeal activity of leaf extracts *Anogessisus accuminata*”. K.Hemamalini, Umavasireddy, NagarjunGoud. AHarinath.K, Vamshi.G, Raghu.H and SharthGoud. T**IJPRD** 2011, 3(6), 55-57.