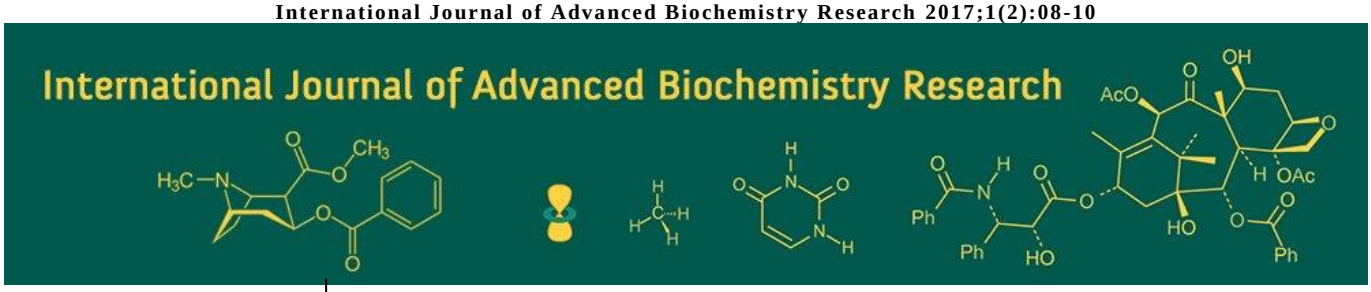

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2017; 1(2): 08-10
www.biochemjournal.com
Received: 16-05-2017
Accepted: 20-06-2017

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Analgesic activity of methanolic *Physalis micrantha* Link. extract

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DOI: https://doi.org/10.33545/26174693.2017.v1.i2a.96

Abstract
The present study aimed to investigate the analgesic effect of *Physalis micrantha* methanol extract (MEPM) in *Mus musculus*. Findings suggest that MEPM at 250 and 500 mg/kg (p.o.) showed a significant analgesic effect on the test system in comparison to the control (vehicle) groups. *P. micrantha* (Family: Solanaceae) might be a good source of plant-based analgesic agents. Further studies are needed to isolate and quantify chemical constituents present in this plant and to evaluate possible mechanisms of action for analgesic activity in suitable test systems.

Keywords: *Physalis micrantha*, *Mus musculus*, analgesic effect

Introduction
Analgesics constitute anti-inflammatory agents that work on sensory messengers inside the peripheral nervous system nerves despite affecting cognition (Stein *et al*., 2003) [18]. Narcotic and non-narcotic analgesics are available (Forman *et al*., 2005) [8]. Primate suffering research poses moral, intellectual, as well as technological issues (Backonja *et al*., 1998) [2]. The analgesic properties of non-steroidal anti-inflammatory drugs (NSAIDs) are largely achieved by primarily inhibiting cyclooxygenase (COX) (e.g., COX-2) enzymes, which reduces mediator production (Bindu *et al*., 2020) [3]. Colorectal malignancies have even been demonstrated to somehow be reduced using COX-2 selective NSAIDs (coxibs) and aspirin, possibly through prostaglandin (PG)-inhibition pathways (Patrignani *et al*., 2005) [17]. Aspirin's effects appeared to be both peripheral and systemic (Allegaert *et al*., 2013) [1]. Most cerebral impacts are assumed to be transmitted via modification of endogenous opioid suppression mechanisms, whereas the peripheral responses have been assumed to be transmitted by downstream COX regulation (Chu *et al*., 2008) [6]. For moderate to severe pain, NSAIDs, aspirin, and topical painkillers are useful yet typically safe bets (Meng *et al*., 2018) [16]. NSAID usage is linked to a decreased rate of malignancy in human cancers, according to many constant growth results of the meta, with the decrease calculated to be between 20 and 40% (Lytras *et al*., 2014) [15]. This research heavily centred upon paracetamol and coxibs, but the findings might be applied to certain other NSAIDs too (Green *et al*., 2001). Prostaglandin production directly correlates to colon tumorigenesis through tumorigenesis, tumor growth, and apoptotic suppression (Greenhough *et al*., 2009) [10]. Kumar *et al*. (2014) [14] suggest that paracetamol may modulate cerebral pain perception along with peripheral neuropathic processing and transmission. Most analgesic categories have such a role in psychotherapy; the kind of suffering, underlying data foundation for their usage, or the individual's as well as pharmacological features also influence that (Cheville *et al*., 2007) [5]. This study evaluates the analgesic effect of methanolic *Physalis micrantha* extract in *Swiss* mice.

Materials and Methods
Plant collection and identification
For this study, *P. micrantha* was collected from the hills of the Forest Research Institute; Chittagong and Rangunia; Chittagong, Bangladesh in October 2014 at day time and was identified by the Forest Research Institute; Chittagong, Bangladesh.

Extraction
The collected plant parts were separated from undesirable materials or plants or plant parts, sun dried at 35 to 50 °C, and ground into a coarse powder with the help of a suitable grinder. The powdered material (150 gm powder) was subjected to hot extraction with 97.7% methanol (800 mL) using a Soxhlet Apparatus (Quickfit, England). The obtained extract was collected, filtered, and made to evaporate the solvent below 50 °C.

Reagents and chemicals
The standard drug, diclofenac-Na, was collected from Square Pharmaceuticals Ltd., Bangladesh. Other required chemicals and reagents such as Tween-80 were purchased from Merck India Ltd.

Experimental animals
Young *Swiss* mice of either sex, with an average body weight of 18–21 gm, were purchased from the International Center for Diarrhoeal Diseases Research, Dhaka, Bangladesh (ICDDR, B), were used for this experiment. The animals were housed in a room with a temperature of 25 ± 2 °C, a humidity of 50 5%, and a 12 hour dark/light cycle. DIET and water *ad libitum* were provided to the animals. They were subjected to this study after seven days (an acclimatization period). The animals were randomly grouped into the test and control groups, and the food was withdrawn 12 hours before the experimental hours.

Analgesic activity study (*in vivo*)
Preparation of test samples
Diclofenac-Na at 9 mg/kg (i.p.) and MEPM at 500 mg/kg (p.o.) were prepared with 0.05% Tween-80 dissolved in 0.9% NaCl solution. 0.05% Tween-80 dissolved in 0.9% NaCl solution served as the vehicle group (p.o.). Mice were treated with a 10 mL/kg dose of the test or controls. Each group contained five (5) mice.

Study design
Mice were randomly divided into three groups: Gr-I (vehicle), Gr-II (standard, diclofenac-Na) and Gr-III (test sample, MEPM two doses). Only the standard drug was administered intraperitoneally. A thirty-minute interval was given to ensure proper absorption of the administered substances. Then each animal is placed on Eddy's hot plate under a regulated temperature. To obtain an animal response, licking of the forepaws or jumping off of the hot plate surface was recorded as the hot plate latency. Mice with baseline latencies <5s or >30s were eliminated from the study. The reaction time is noted by a stop watch, and the reaction time was redetermined after 0 and 30 min (Kumae *et al*., 2011) [13].

Statistical analysis
Values are expressed as mean ± standard deviation (SD). One-way ANOVA (analysis of variance) followed by a *post hoc* test by using Graph Pad Prism software (version: 6.0) at a 95% confidence interval considering $p<0.05$.

Results and Discussion
Most analgesic categories have quite a role in psychotherapy, but the kind of suffering, the underlying data foundation supporting their usage, as well as the individual's as well as pharmacological features also influence that. Their regular medications, on the other hand, had a stronger impact than the isolate. This acetic acid-induced twisting appears to be essentially a disclosure of periphery agony (Tahiri *et al*., 2022) [19]. Acetic acid stimulates the production of intrinsic biological analgesic transmitters such as PGE2 (Bueno *et al*., 1999; Hosogi *et al*., 2006) [4, 11] component P, serotonin, histamine, and bradykinin are all neurotransmitters that stimulate nociceptive synapses (Ebersberger *et al*., 1999) [7]. That interference effects pain by inhibiting the production of PGs, a process that is identical to that of paracetamol as well as other nonsteroidal anti-inflammatory drugs. Medicinal plants have analgesic potential (Karim *et al*., 2017) [12]. In our study, both the positive control and MEPM groups significantly ($p<0.05$) increased the latency period in experimental animals in comparison to the vehicle groups. The standard drug diclofenac administered at a dose of 9 mg/kg revealed a latent response of 22.05 ± 0.49 sec after 30 minutes, while MEPM at 500 mg/kg revealed 17.33 ± 0.81 sec. MEPM showed a dose-dependent analgesic effect in mice (Table 1).

Table 1: Analgesic effects of the test sample and control groups

Treatment groups		Mean latency (Sec)	
		0th Min	After 30 Min
Vehicle (10 mL/kg, p.o.)		4.50 ± 0.41	6.25 ± 0.20
PC (9 mg/kg, i.p.)		4.87 ± 0.18	22.05 ± 0.49*
MEPM	250 mg/kg, p.o.	4.12 ± 0.41	11.31 ± 0.78*
	500 mg/kg, p.o.	4.32 ± 0.33	17.33 ± 0.81*

Values are mean ± SD (n = 5); One-way ANOVA followed by *post hoc* test; *$p<0.05$ when compared to the vehicle group (0.05% Tween-80 dissolved in 0.9% NaCl solution); PC: Diclofenac-Na; MEPM: Methanol extract of*Physalismicrantha*

Conclusion
MEPM showed a dose-dependent and significant analgesic effect on *Swiss* albino mice. *P. micrantha* might be one of the good sources of analgesic agents.

Acknowledgement
We are thankful to the authorities at Southern University Bangladesh for providing the laboratory and economic support to conduct the study.

Conflict of interest
None declared.

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