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Original Research

Antipyretic, Analgesic and Anti-Inflammatory Activity of *Qurs Afsanteen Saghir* (A Polyherbal Unani Tablet) in Experimental Animals

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Abstract

Qurs Afsanteen Saghir is a polyherbal Unani formulation in the form of tablet. This formulation consists of multiple medicinal plants like Afsanteen (*Artemisia absinthium* L.), Badam Talkh (*Prunus dulcis* (Mill.) D.A.Webb), Asaroon (*Asarum europaeum* L.), Anisoon (*Pimpinella anisum* L.) and Tukhm-e-Karafs (*Apium graveolens* L.). The clinical adult dose of study drug is 3.5 –7 g per day as mentioned in Unani literature. The present study evaluated the antipyretic, analgesic and anti-inflammatory potential of Qurs Afsanteen Saghir using different animal models. Antipyretic activity was measured using yeast-induced pyrexia model in rats at 360 and 720 mg/kg bw dose of test drug and paracetamol (70 mg/kg bw p.o.) as standard control. Analgesic effect was evaluated using acetic acid-induced writhing test in mice using test drug at dose 720 and 1440 mg/kg bw and diclofenac sodium (15 mg/kg bw p.o.) as standard control. Eddy's hot plate test was conducted in rats using test drug at the dose of 360 and 720 mg/kg bw and buprenorphine (0.10 mg/kg s.q.) as standard control. Anti-inflammatory activity was assessed by carrageenan-induced paw edema model in rats with the dose of 360 and 720 mg/kg of test drug and Indomethacin (10 mg/kg p.o.) as standard control. The study drug significantly reduced the temperature and pain at both dose levels in a time-dependent manner as compared to normal control. However, the reduction of inflammation was observed at low dose (360 mg/kg bw) only after

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3 hours of carrageenan administration. These findings indicated that tested drug showed potential activity as antipyretic and analgesic; whereas the drug may not be considered quite effective as an anti-inflammatory agents.

Keywords: Polyherbal; Unani; *Apium graveolens; Artemisia absinthium; Asarum europaeum*

Introduction

There is sharp drift by the people which exemplifies the vast use of herbal products as an alternative to western medicine globally. The utilization of plants in indigenous culture of various countries laid a foundation of a vital socioeconomic base. Currently, the consumption of herbal products is progressively finding more relevance, exclusively when no cure is available or when faces challenges for the treatment of chronic illness like chronic kidney disease (CKD). Therefore, scientific research on plant-based medicine has augmented globally in order to generate evidence for the safe and effective utilization of potential medicinal plants [1]. The conventional medications act fast but usually they are costly, inaccessible, and noxious in nature. For example, Non-steroidal anti-inflammatory drugs (NSAIDs) are related with a number of unwanted adverse effects i.e. gastrointestinal effects, hepatic injury and toxicity, altered renal function, effect on blood pressure, and platelet inhibition which may leads to increased bleeding [2]. It has documented that 25% of NSAID users develop gastric ulcer and bleeding or perforation occurs in 2-4% of them. Furthermore, cyclooxygenase-2 (COX-2) inhibitors and other NSAIDs have also shown cardiovascular risk [3]. Additionally, low cost and easy accessibility of paracetamol has made it an omnipresent analgesic and antipyretic drug in the world [4]. It has been reported to cause renal insufficiency in about 1-2% of individuals. It is also found that paracetamol causes nephrotoxicity, hepatotoxicity and cardiovascular complications [5,6]. Traditional system of medicine with holistic approach provides a safe and effective alternative to modern system of medicine especially for non-communicable diseases (NCD), and chronic diseases. Unani system of medicine, a traditional system of medicine was originated in Greece and developed by Arabs into a developed medical science based on the framework of teachings of Buqrat (Hippocrates) and Jalinoos (Galen) and is known as Greeko-Arab Medicine [7]. The principle of Unani system depends on the humoral theory (*Nazriya Akhlat*) that comprise of four basic fluids (Akhlat) viz. Dam (blood), *Balgham* (phelgm), *Safra* (yellow bile) and *Sauda* (black bile). Maintenance of the correct humoral balance in the body is done by power of self-preservation called *Quwwat-e-Mudabbira* Badan or simply *Tabiat* (Homeostasis) and when this gets disturbed, manifests innumerable pathologies [8].

The fast emerging viral infection like dengue, chikungunya and influenza has become major health problem in recent time. These viral dis-

eases destroy the immune system and cause fever, malaise, headache, muscle aches and pain; other symptoms include sore throat, rhinorrhea, watery eyes and cough associated with common cold and influenza; while thrombocytopenia is present in dengue and chikungunya [9,10]. Therefore, in order to develop a safe and effective herbal formulation which may be indicated for pyrexia, pain and inflammation, the current study was planned on *Qurs Afsanteen Saghīr* (QAS) which is a polyherbal Unani tablet indicated for the treatment of fever, pain and inflammation. There are five ingredients which are present in this tablet i.e. Afsanteen (*Artemisia absinthium* L.), Badam Talkh (*Prunus dulcis* (Mill.) D.A.Webb), Asaroon (*Asarum europaeum* L.), Anisoon (*Pimpinella anisum* L.) and Tukhm Karafs (*Apium graveolens* L.). Hence, the combination of these ingredients called as QAS which was evaluated for the antipyretic, analgesic, and anti-inflammatory activity using different animal models.

Materials and Methods

The present study was undertaken at Pharmacology Research laboratory, National Research Institute of Unani Medicine for Skin Disorder Hyderabad. Study was initiated after getting approval from the Institutional Animal Ethics Committee (IAEC) of National Research Institute of Unani Medicine for Skin Disorders (NRIUM-SD) Hyderabad. The IAEC approval number for the study was Protocol No. CRIUM/IAEC/2018/02/P02 dated 18/12/2018.

Collection of Test Drug

QAS includes five ingredients i.e. Afsanteen (*Artemisia absinthium* L.), Badam Talkh (*Prunus dulcis* (Mill.) D.A.Webb), Asaroon (*Asarum europaeum* L.), Anisoon (*Pimpinella anisum* L.) and Tukhm-e-Karafs (*Apium graveolens* L.) [11,12]. The drugs were purchased from local market of the Hyderabad and identified by Pharmacy Incharge of the Institute. The identity of the drugs samples were confirmed by Research Officer (Botany), Survey of Medicinal Plants (SMP) Unit, (NRIUM-SD) Hyderabad. The voucher specimens were preserved under SMPU/CRI-HYD 14139, 14140, 14141, 14142 and 14143 numbers, respectively, at SMP unit for the purpose of records and future reference. QAS was prepared in the GMP certified Pharmacy of the Institute as per classical method [13].

Experimental animals

Animal were procured from National Institute of Nutrition (NIN), Hyderabad. Male albino rats of Sprague Dawley (SD) strain (8-10 week) weighing 200- 250 g and Swiss albino mice male (6-8 weeks) were taken for the study.

Housing and Feeding Conditions

Animals were housed in groups of six in polypropylene cages at an ambient temperature of 23 ± 2°C and 45-55% relative humidity, with a 12 h artificial illumination cycle. Animals were given free access to standard dry pellet and water ad *libitum*. The rats and mice were acclimatized to laboratory conditions at least one week prior to their use for experiments. The body weights of the rats were measured periodically.

Dose calculation

The clinical dose of the QAS, mentioned in the literatures is 3.5-7 g per day [11,12]. Considering lower clinical dose (3.5 g) for conversion and the equivalent rat dose comes about 360 mg/kg (x) on the basis of body surface area [14]. Therefore, the study was conducted at two dose levels as:

For rats the equivalent doses were:

• 360 mg/kg bw/day (x)
• 720 mg/kg bw/day (2x)

Accordingly, for mice the equivalent doses were:

• 720 mg/kg bw/day (x)
• 1440 mg/kg bw/day (2x)

Preparation of QAS

The crude drugs were put in drying chamber at 40°C for about 30 min to dry the moisture if any on its surface, and grounded thereafter in an electric grinder to prepare a fine powder. The powder was then filtered with 120 no. mesh to get a uniform powder of micro fine grade.

Preparation of the suspension of the test drug

0.30 g of carboxymethyl cellulose (CMC) powder was dissolved in 100 mL of distilled water to make aqueous solution of 0.3% of CMC. The powder of QAS was suspended in 0.3% CMC and administered orally by stainless steel oral gavage at two dose levels, i.e. 360 mg/kg bw/day and 720 mg/kg bw per day in rats; as well as 720 mg/kg bw/day and 1440 mg/kg bw per day in mice.

Antipyretic Activity

Yeast-Induced Pyrexia

Male SD rats (8-10 weeks) were randomly divided into four groups of six animals in each group. The normal body temperature of each rat was measured rectally using digital thermometer by inserting the probe about 2cm into rectum. Pyrexia was induced by 20 ml/kg of Brewer's yeast (20% (w/v) aqueous solution) injected by subcutaneously below the nape of neck. The room temperature was kept at 22-24ºC. Immediately after yeast administration, food was withdrawn. Rectal temperature was measured for 60 s and then animals returned to their housing cages. After 18 h of yeast injection, rectal temperature was recorded and repeated after 30 min. Only animals that showed an increase in body temperature of at least 0.5ºC were taken into the test [15,16,17].

After 18 h of yeast injection, normal saline solution (0.9 % w/v) was given orally to the control group (group-I). Standard control group (group-II) received standard drug Paracetamol (70 mg/kg body weight) p.o.; while the treatment group received QAS in two doses, 360 mg/kg and 720 mg/kg orally (group III and IV, respectively). Rats were restrained for recording rectal temperature at the 18 h, immediately before drugs/vehicle administration, and again at 30, 60, 120,180 and 240 min after drug administration.

Analgesic Activity

Acetic Acid-Induced Writhing Test

Acetic acid-induced writhing test was carried out as per method given by Whitkin 1962 methods. Albino mice were divided into four groups, each group consisting of six animals. First group, serving as control group, received 0.9% w/v normal saline (p.o.); second standard

group received drug diclofenac sodium (15 mg/kg, p.o.). Group III and IV received test drugs (QAS) at the dose level of 720 and 1440 mg/kg p.o., respectively. Thirty minutes after oral administration of various treatments/ vehicle, a single i.p. injection of 0.6% acetic acid (10 mL/kg) was given to each mouse. The number of writhing response was counted for 20 min after 5 min of acetic acid injection by keeping the individual mouse in observation cage without bedding material [16,18,19].

Based on the number of writhes, percentage inhibitions were calculated using the following formula:

Equation1.

$$\% \text{ Inhibition} = \frac{[(NW_C - NW_t) \times 100]}{NW_C}$$

Where NW_c = Number of writhes in control group and NW_t = Number of writhes in treatment group

Eddy's Hot Plate Test

Eddy's Hot-plate test was carried out by the method given by Eddy et al., 1950. Rats used for this study were randomly divided into four groups, each group consist of six animals. First group served as control, second group served as standard control treated with buprenorphine injection 0.10 mg/kg s.q., another two groups for the test drug (QAS) in two doses of 360 and 720 mg/kg administered orally. After 12h of fasting, test groups were received QAS (360 and 720 mg/kg bw) p.o.; while control group received 0.9 % w/v normal saline p.o. and standard control buprenorphine injection 0.10 mg/kg, respectively. Each animal was placed on a hot plate (Analgesiometer/ Eddy's Hot Plate; Ugo Basile, Italy) maintained at 55°C, at pre-dose (0), 30, 60, 90 and 120 min after administration of the test drugs. The time taken for the rats to respond to the thermal stimulus (usually by jumping) was noted as the latency (in second). Analgesia was defined by prolongation of latency without licking or flicking of hind limb or jumping. A cut-off time of 20 s was used to avoid tissue injury. The effect of QAS, buprenorphine and control were determined at 0, 30, 60, 90 and 120 min, respectively [15].

Anti-inflammatory Activity

Carrageenan-Induced Paw edema

Carrageenan-induced hind paw edema model was used for determination of the anti-inflammatory activity as described by Winter et al., 1962 and Chouhan *et al*., 2014. Adult healthy SD rats weighing 120-200 g, were randomly divided into four groups, each group consist of six animals. First group was control group, second group served as standard control and another two groups for test drug, QAS at two dose levels. The control group received 5 mL/kg of 0.9% w/v saline solution and the standard group received 10 mg/kg indomethacin (p.o.). The test groups of rats were administered per oral with 360 and 720 mg/kg of QAS. After 30 min of various treatments, 0.1 mL of 1% w/v carageenan was injected into the right paw of each rat under the sub-plantar region. The paw volume was measured at different time interval i.e. 0, 1, 2, 3, 4, 6 and 24 h after carrageenan injection using a digital plethysmograph appa-

ratus and was compared with the control animals. The percentage inhibition of edema was calculated by the formula given by Newbould (1963) [20,21,22].

Increase in paw volume in control (Pc) = Pt – P0

Increase in paw volume in treated (PT) = Pt – P0

Percentage inhibition = [(Pc – PT)/Pc] × 100

Where, Pt is the paw volume at time t, P0 is initial paw volume.

Statistical analysis

The different values determined were compared with each other and comparison was made by using statistical test analysis of variance (ANOVA), followed by Tukey's test using Graph-pad Prism Version 5.0 software. Values were represented as mean ± SEM and $p < 0.05$ was considered as statistically significant.

Statistical analysis

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Results

Antipyretic Activity

Subcutaneous injection of yeast markedly increases the rectal temperature approximately by 1°C in all treatment groups after 18 h of yeast injection as shown in figure 1. Paracetamol administered orally at the dose of 70 mg/kg bw caused significant ($p < 0.05$) reduction of temperature 30 min after drug administration as compared to control group. Two-way ANOVA analysis (treatment × time) revealed significant effect ($F3, 147 = 31.9$, $p < 0.001$) of QAS (360-720 mg/kg bw) on yeast induced pyrexia. Follow up analysis with Tukey's multiple comparison test revealed statistical significance at doses QAS (360 mg/kg bw) which showed significant reduction in rectal temperature i.e. ($p < 0.001$) vs. control at 60 min, ($p < 0.01$) vs. control at 120 min and ($p < 0.05$) vs. control at 180 min after test drug administration. Likewise, the high dose of QAS (720 mg/kg bw) caused significant reduction in pyrexia i.e. ($p < 0.001$) vs. control at 60 min and ($p < 0.05$) vs control at 120 min after drug administration.

Analgesic Activity

(a) Acetic acid-induced writhing in mice

There was no sign of abdominal constrictions in all treatments group before acetic acid injection. 0.6% acetic acid (10 mL/kg) was given to all animals intraperitoneally. 20 min after acetic acid injection (21.33 ± 3.82) writhes were observed in control animals. Diclofenac (15 mg/kg p.o) caused significant ($p < 0.05$) reduction in number of writhes (9.00 ± 1.6) which is 57.80% as compared to normal control group. QAS at both tested dose levels showed marked reduction in writhing which was found significant ($p < 0.05$) as compared to normal control. QAS (720 mg/kg bw) suppressed the abdominal constrictions and stretching of hind limbs by 47.80% (11.13 ± 2.38); while QAS (1440 mg/kg bw) caused

53.90% (9.83± 1.45) reduction as compared to control mice. No statistical significance was observed for reduction of writhing response among positive control (diclofenac-treated mice) and QAS-treated mice. The observations are shown in figure 2.

(b) Eddy's Hot Plate Test

The subcutaneous administration of buprenorphine (0.1 mg/kg bw) produced antinociceptive effect by increase in latency response to thermal stimulus 30 minute after treatment as compared to normal control animals. Two-way ANOVA analysis (treatment × time) revealed significant effect ($F (3, 110) = 23.50$, $p < 0.001$ and $F (4, 110) = 9.076$, $p < 0.001$) of QAS (360-720 mg/kg bw) on paw withdrawal latency. Follow up analysis with Tukey's multiple comparison test revealed statistical significance at doses QAS (360 mg/kg bw) 30 min after treatment which was found to be statistically significant ($p < 0.01$) as compared to control. Similarly, the standard control buprenorphine showed significant ($p < 0.01$) increase in latency as compared to normal control. The recording of latency time 60 min after treatment showed highly significant changes ($p < 0.001$) in QAS (360 mg/kg bw) treated animals as compared to normal control and ($p < 0.05$) as compared to buprenorphine control as shown in figure 3. Further observations showed that 90 min after treatment, QAS (360 mg/kg bw) caused significant ($p < 0.05$) increase in paw withdrawal latency as compared to normal control. Similarly, QAS (720 mg/kg bw) resulted in significant ($p < 0.01$) increase in latency as compared to normal control. QAS (720 mg/kg bw) also showed significant ($p < 0.01$) increase in latency as compared to standard control (buprenorphine) at 90 min duration. Tested drug (QAS) showed antinociceptive effect even at 120 min after treatment which found to be highly significant ($p < 0.001$) at the dose QAS (360 mg/kg bw) and ($p < 0.01$) at the dose QAS (720 mg/kg bw) as compared to normal control. Additionally, QAS (360 mg/kg bw) showed significant ($p < 0.01$) rise in latency as compared to standard control at 120 min of duration.

Anti-inflammatory Activity

Carrageenan Induced paw Oedema Test

The carrageenan 0.1 mL of 1% w/v was injected into sub-plantar region in right hind paw caused inflammation in all treatment groups. Two way ANOVA analysis revealed significant effect of treatment vs time ($F (3, 160), = 9.13$, $F (7, 160) = 6.09$)). Further data analysis followed with Tukey's multiple comparison test showed significant inhibition in paw volume (71.76% with paw volume 0.12 ± 0.04) in indomethacin group and (69.41% with paw volume 0.13 ± 0.05) in QAS 360 mg/kg bw which was observed at 03 h after carrageenan injection as compared to normal control animals as shown in figure 4. The results indicated that paw volume was reduced in animals treated with QAS 360 and 720 mg/kg bw measured at all times points after carrageenan injection as compared to normal control animals. However, the changes were not found statistically significant except at 03 h. Like the percentage inhibition at 04 h in QAS 360 mg/kg bw (46.74%) and QAS 720 mg/kg bw (41%) as

compared to control seemed quite good; however, the changes in mean value was not found statistically significant.

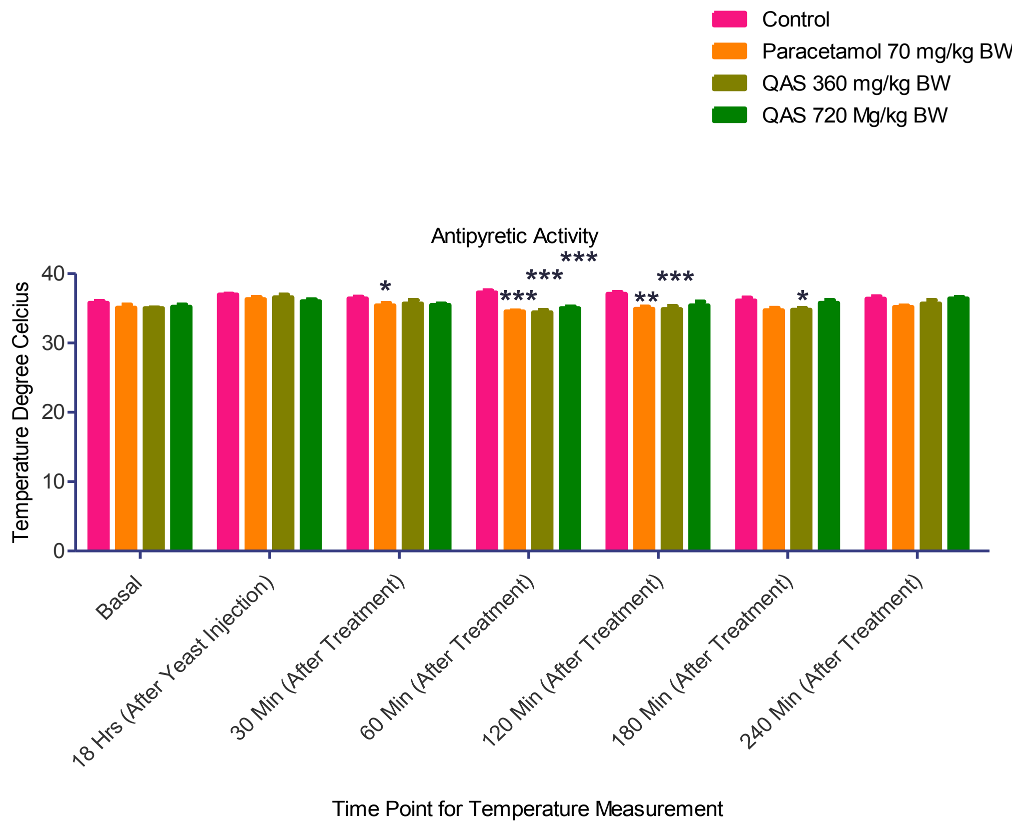

Figure 1. Effect of QAS on rectal temperature in yeast-induced pyrexia. Two-way analysis of variance was followed by Tukey's multiple comparisons of various treatments with control at: *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

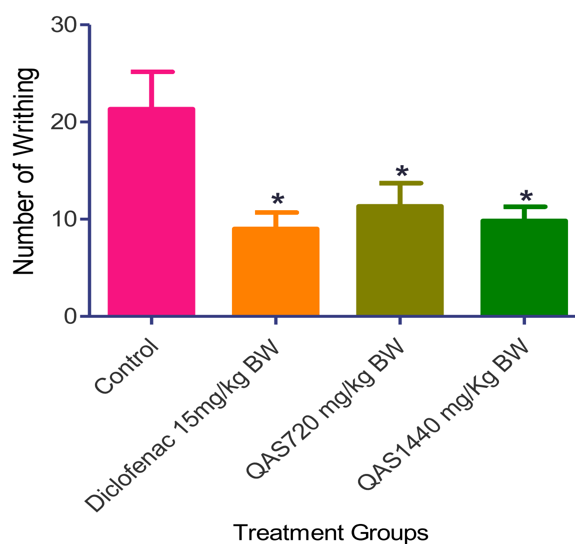

Figure 2. Effect of QAS on acetic acid induced writhing in mice. Significant difference was calculated using two way analysis of variance followed by Tukey's comparison of various treatments with control at: *, $P < 0.05$.

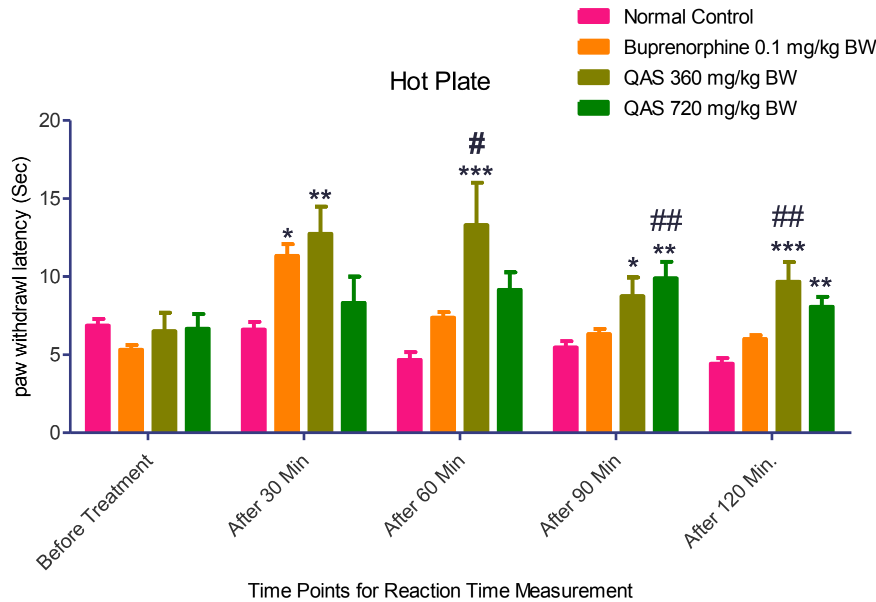

Figure 3. Effect of QAS on the latency of paw withdrawal. Significant difference was calculated using two way analysis of variance was followed by Tukey's multiple comparison test for various treatments with control at: *P < 0.05 , **P < 0.01, ***P < 0.001 and with standard control at: #P < 0.05 , ##P < 0.01

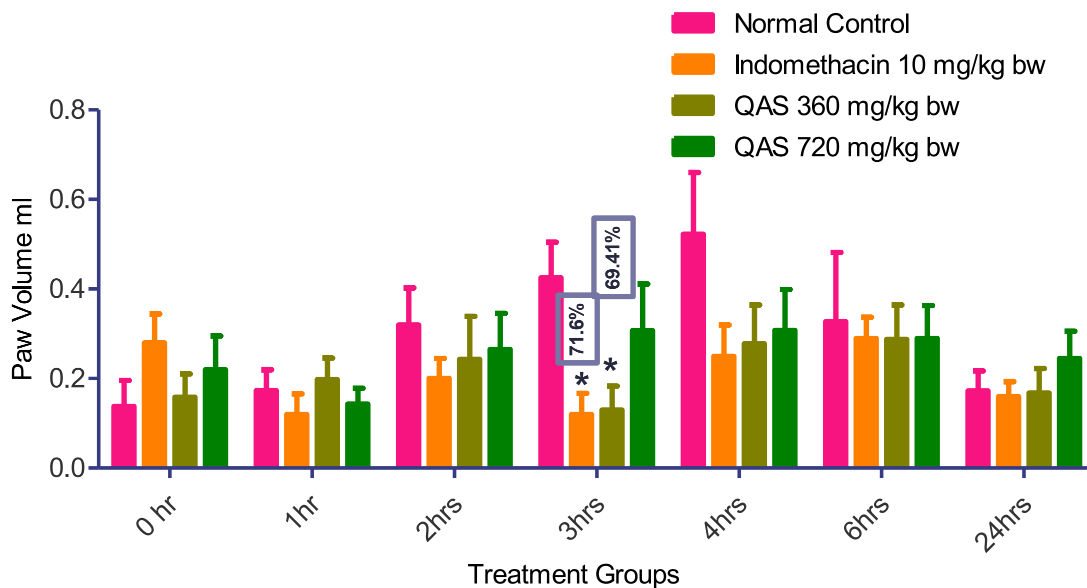

Figure 4. Anti- inflammatory effect of QAS in Carrageenan Induced Oedema. Two way analysis of variance for paw edema volume was followed by Tukey's multiple comparison of various treatments with control *P < 0.05 vs. control

Discussion

The present study was conducted after taking approval from institutional ethics committee at NRIUM-SD, Hyderabad. The main objective of the study was to evaluate the antipyretic, analgesic and anti-inflammatory potential of QAS using different animal models.

Antipyretic Activity

Fever is a secondary symptom of any kind of infection or inflammation. It is well known that infection or inflamed tissue trigger the release of proinflammatory markers like interleukin (IL)-1 and tumor necrosis factor (TNF)-α which sensitize the hypothalamus to cause the elevation of body temperature by increasing synthesis of prostaglandins (PGE2) near optic hypothalamus area. Hence antipyretic activity is a common therapeutic effect of drugs which have inhibitory effect on biosynthesis or release of PGE2 [18,23]. The current study evaluated the antipyretic activity of QAS against Brewer's yeast induced pyrexia in male SD rats. The findings of the study demonstrated that tested drug QAS showed significant antipyretic effect in a dose dependent manner at both QAS dose levels (360 and 720 mg/kg bw) as compared to normal control group. The reduction of fever initiated 60 min after drug administration which prolonged up to 120 min in QAS 720 mg/kg bw group; while the same effect initiated at 30 min and prolonged up to 180 min in QAS 360 mg/kg bw treated animals as compared to normal control animals. There is a study reported on one of the constituent of QAS i.e Afsanteen (*Artemisia absinthium* L.) which was conducted in 1987 by Zafar et .al. the finding of this study showed anti-malarial and antipyretic activity of Afsanteen which possibly attributed due to presence of 24zeta-Ethylcholesta-7,22-Dien-3beta-ol chemical constituent [24]. Further, a study conducted on Ma-Xing-Gan-Shi-Tang (MXGST, Chinese herbal preparation) extract consists of amygdalin detected in high performance liquid chromatography. Amygdalin is also the constituent of QAS found in Prunus dulcis (Badam Talkh) [25]. Traditionally Chinese physician use MXGST to treat fever caused by pneumonia. The anti-pyretic activity of MXGST extract was evaluated against lipopolysaccharide (LPS)-induced hyperthermia in rats. Fever was induced by intraperitoneal injection of 10 mL/kg of 100 μg/kg LPS. The rectal temperature was recorded using clinical thermometer immediately before MXGST treatment and immediately before and 1–6 h after LPS injection. MXGST extract, at 0.4 and 1.0 g/kg, produced significant anti-pyretic activity from 2 to 6 h after LPS injection in a dose-dependent manner. Therefore, it may be suggested that QAS showed antipyretic effect due to synergistic effect of medicinal components like 24zeta-Ethylcholesta-7,22-Dien-3beta-ol and amygdalin which may possibly mediated through modulation of PGE2 synthesis or release in the hypothalamus adrenal gland axis [25].

Analgesic Activity

The analgesic activity of QAS was evaluated using acetic acid-induced writhing test in mice and Eddy's hot plate test in rats. The results which are mentioned in figure 2 and 3 showed that QAS possess potential analgesic activity.

The QAS at both tested dose levels significantly reduced the number of writhes as compared normal control animals. Similarly, QAS both tested dose demonstrated increased the pain threshold to hot plate in rats. These results suggested that QAS possibly displayed both peripheral (through writhing test) as well as central analgesic (through hot plate test) activity [26]. The analgesic effect may be attributed due to presence of different chemical constituents. Like Anisoon (*Pimpinella anisum* L.) one of the ingredients of QAS possesses potential analgesic activity supported by the study conducted by Tas et. al in 2006. This study demonstrated analgesic activity using tail flick test in Swiss albino mice showed *P. anisum* induce analgesic effect comparable to that of 100 mg/kg aspirin and 10 mg/kg morphine at 30th minute of the study [27]. Similarly, Tukhm-e-Karafs (*Apium graveolens* L.) also possess analgesic activity which is shown in findings obtained in the study performed by Atta in 1997. The results showed that ethanolic extract of A. graveolens reduced the number of acetic acid-induced writhes in mice with a protection percent ranging from 32% to 48%. The extract also significantly ($p < 0.001$) increased the latency to hot plate test in mice [28].

Further, *A. absinthium* (Afsanteen) another important ingredient of QAS, showed promising analgesic activity against acetic acid-induced writhing test and hot plate test in a study performed by Amrollahi et.al in 2014. The results showed that essential oil (EO) and aqueous extract (AE) of Artemisia were comparably reduced the abdominal constriction in acetic induced writhing test. Doses of 4 and 8 mg/kg of the EO significantly ($p < 0.05$) inhibited the writhing response induced by acetic acid by 82.31% and 94.68% respectively, and dose of 8 mg/kg of the AE significantly ($p < 0.05$) inhibited the writhing response by 88.41%. Similarly, the EO (2, 4 and 8 mg/kg) and AE (50, 100 and 200 mg/kg) significantly increased the reaction time of mice after 30 min treatment as compared to the control groups. There was a dose independent increase in response to thermal stimulation compared with control mice. The EO has more potency as an anti-nociceptive agent than AE in most cases [29]. Based on the above findings, it may be concluded that QAS being a polyherbal formulation consists of different chemical constituents like alkaloids, flavonoid, essential oils, and terpenoids which are responsible for its potential analgesic activity.

Anti-inflammatory activity

The anti-inflammatory activity was evaluated for QAS against carrageenan-induced paw edema model (a model for acute inflammation) in rats. The effectiveness of treatment was determined by significant inhibition of hind paw volume using digital plethysmometer. The results shown in figure 4 indicated that QAS low dose (360 mg/kg bw) and indomethacin (10 mg/kg bw) up on oral administration showed significant inhibition of paw edema (measured as changes in paw volume) as compared to normal control animals at 03 h after administration of carrageenan. The percentage inhibition observed was 71.76% in indomethacin and 69.41% in QAS 360 mg/kg bw treatment

group as compared to normal control. The anti-inflammatory activity was not prolonged corresponds to time point measured. However, animal study conducted to evaluate anti-inflammatory activities of *A. absinthium* (a primary constituent of QAS) using the same model demonstrated that EO of this plant at high dose (8 mg/kg bw) showed marked significant effect at all time measured which was prolonged and maintained for 5 h post injection of carrageenan [30]. Similarly, a study conducted by Ghlissi et.al demonstrated the effect of polysaccharide of *P. anisum* (PAP), another constituent of study formulation, using the same animal model. The results of this study showed that PAP significantly reduced paw edema extended up to 5 h post administration of carrageenan along with reduction of oxidative stress and amelioration of malondialdehyde (MDA) and superoxide dismutase (SOD) level [30]. The findings of the current study are not in concurrence with the results obtained in above discussed studies which were carried out on ingredients of study formulation (QAS). Hence it may be concluded that QAS may not be considered as promising anti-inflammatory drug.

Phytochemical screening for polyherbal formulations is an important step for the detection of bioactive principles present in particular multi-component formulation. The major limitation of the current study was unavailability of phytochemical analysis data of QAS which is required to establish relationship between pharmacological action and constituents present in formulation.

Conclusion

The study findings indicated that QAS have potential antipyretic and analgesic activity. QAS at both tested dose levels showed significant effect on reduction of temperature and pain. However, the anti-inflammatory effect may not be considered promising as significant reduction in inflammation found at QAS (360 mg/kg bw) at a single time point.

Conflict of Interests

None.

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None.

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