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Original Article

Effect of Basil Extract on Intestinal Motility of Albino Rats

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ABSTRACT

Ocimum sanctum has been in used for thousands of the years because of its diverse healing properties in various conditions including bronchitis, bronchial asthma, dysentery, dyspepsia, skin diseases, chronic fever, helminthiasis and ring worm etc. For past few decades extensive work has been done on biological activities of O. sanctum. This study was carried out to provide scientific basis for the use of O. sanctum in gastrointestinal disorders. Animals used in this study was divided into 6 groups (Group- I to Group-VI), based on the dose and time interval between administration of O. sanctum/vehicular fluid to administration of $BaSO_4$. Each group further divided into two sub groups (Group A and Group B) containing 6 rats each group. Group A control ang group B experimental. Group A were given vehicular fluid (0.9% NaCl) while the rats in Group B were administered O. sanctum intragastrically in the dose of 350mg/kg of body weight and 700mg/kg of body weight suspended in normal saline. After the administration of O. sanctum there was increased in the length of small intestine traversed by $BaSO_4$ in all the experimental groups as compared to control groups. These data suggests that O. sanctum increases the intestinal motility in Albino rats and this may partly explain the traditional use of O. sanctum in different gastrointestinal disorders eg- IBS, abdominal cramps, dyspepsia, constipation etc.

Keywords*: Osimum sanctum , intestinal motility.*

INTRODUCTION

Ocimum Sanctum [commonly known as Holy Basil] is a herbaceous plant found throughout the southern Asian region. It is also known as the Queen of Herbs. It is widely cultivated for food in many homes and temple gardens due to its religious significance, especially in India . Ocimum Basilicum L. also cultivated as culinary , industrial and medicinal plant in many countries. It has been in use for thousands of years in traditional medicine for its diverse healing properties(1-2). Ayurvedic practice recommends Tulsi in several formulations to enhance immunity and metabolic functions. Ocimum Basilicum is a well known edible natural compound with aromatic terpenoids, essential oils, phenolic acids and flavonoids. Analgesic , antispasmodic, anti-ulecerogenic, anti inflammatory, hepatoprotective, anti-oxidant, and immune-modulatory effects of Ocimum Basilicum leaves providing a good potential for the treatment of IBD, however , for basil seeds are used for Tokhmi Sharbati, Tukmeria Falooda in various cuisines(3-10).

Very minimal studies have been done so far to find the effects of Ocimum Sanctum on intestinal motility on healthy rats , either in-vivo or in-vitro . Hence , the present study aimed to find the effect of Ocimum Sanctum, on intestinal motility of Wistar Albino rats by in-vivo study.

MATERIALS AND METHODS

Albino rats of wistar strain, weighing 150-200 gm, of either sex, raised under standard laboratory conditions. The animals were fed standard rat pellet diet and RO water ad libitum. All experiments in rats were carried out in accordance with the recommendation of guidelines for care and use of laboratory animals approved by Institutional Animal Ethical Committee.

Drugs
Basil extract was obtained in the form of capsule containing orgsnic holy basil powder (leaf) 500mg (Brand name- Inlife Tulsi Holy basil extract.
$BaSO_4$-(Brand Name -Microbar suspension) purchased from local medical store.

Dosage
Dose of O. sanctum was calculated as per gm/kg body weight (13). The capsule containing 500 mg of O. sanctum was dissolve in normal saline (0.9% NaCI) to make 5ml suspension of the drug, so that each ml of the suspension consist of 100 mg of O. sanctum.

Barium sulphate
Barium sulphate (Trade name-Microbar- HD manufactured by Eskay Fine Chemicals) was purchase from local medical store.

Measurement of intestinal length
A metal meter scale fitted on hard board was used to measure the length of intestine and distance traveled by the barium.

Acute toxicity study
Six rats were taken to study the acute toxic effect of O. sanctum. The rats were fasted overnight and the O. sanctum was administered intragastric in the dose of 2 gm/kg body weight. Rats were observed continuously for first 3 hr and were monitored for three days for mortality and general behavior of animals, signs of discomfort and nervous manifestations. No mortality and adverse effects were observed with this dose(5).

Motility study
Seventy two rats were divided into 6 groups (Group I Group VI), based on the time interval between administration of O. santum 350 mg/kg body wt)/ vehicular fluid to administration of barium sulphate (Group 1 hr, Group II- 6 hrs, Group III-5 days treatment with O. sanctum), And O. sanctum 700mg/kg body wt/ vehicular fluid to administration of $BaSO_4$ (Group IV- 1 hrs. ,Group V- 6 hrs and Group VI- 5 days treatment with O. sanctum). Each group was further divided into two sub-groups, Group A (control) and Group B (experimental), containing 6 rats each. Rats in Group B were administered O. sanctum intra-gastrically in the dose of 350mg/kg body weight and 700mg/kg body wt, suspended in normal saline while rats in Group A were given vehicular fluid (0.9% NaCl) in equal volume as that of O. sanctum suspension given to experimental group(5).

After requisite time as per Group I Group VI. in both, Group A and Group B. rats were administered 4 ml of barium sulphate suspension containing 3.2 mg of barium sulphate in isotonic saline. 30 min after barium sulphate administration the animals were sacrificed under anesthesia using ketamine 75mg/kg and xylazine 10mg/kg, administered intraperitoneally. Following anesthesia abdomen was opened by midline incision and ligatures were applied at the gastroduodenal junction and ileocecal junction. The small intestine was stripped of the mesentery and taken out of the abdomen and laid over a board fitted with a meter scale. The upper surface of board was kept continuously wet with normal saline. The length of the intestine was measured by placing it closely along the meter scale. The position of the barium head was located and measured from the point of gastroduodenal junction. To ascertain accurately the position of barium head, the intestine was cut open along its length. The position of barium head was visualized.

Statistical analysis
Mean and SD of all the observations were calculated and comparisons were done between experimental and control groups by applying Student's t test (unpaired). Comparisons of the effect of O. sanctum on the intestinal motility among different experimental groups were done using one- way ANOVA. All statistical analysis were carried out using statistical software such as SPSS version 25.0.

RESULTS
After the intra-gastric administration of single dose of Basil extract, there was increase in the length of small intestine traversed by $BaSO_4$. The increase in intestinal motility was maximum after 5 daily doses of Basil extract. On applying Student's T test, increase in length of small intestine traversed by $BaSO_4$ in Group 1 to group 6 was statistically significant.

Table 1. Comparison of effect of Basil extract on intestinal motility [Mean +- SD] following intra-gastric administration of basil extract in different groups.

Groups	% length of small intestine traversed by $BaSO_4$ control n = 6	% length of small intestine traversed by $BaSO_4$ experimental n = 6	P value

I	76.0 +- 0.6	79.2 -+ 0.6	0.001
II	75.0 +- 0.7	82.8 +- 0.4	<0.001
III	74.9 +- 0.9	80.1 +- 0.8	<0.001
IV	74.9 +- 0.7	86.6 +- 0.9	<0.001
V	76.1 +- 0.7	89.9 +- 0.2	<0.001
VI	74.9 +- 0.7	95.2 +- 0.6	<0.001

Comparison with control was done by t test

DISCUSSION

In the present study, intra-gastric administration of Ocimum sanctum resulted significant increase in the barium travel distance indicating enhanced gastrointestinal propulsion. This finding suggest a prokinetic effect of basil extract on intestinal smooth muscle activity and enteric neural regulation. Shasha Wang et al, showed the effect of S. collina [Ethyl acetate extract] has a significant prokinetic activity via a mechanism that mainly involves in modulating plasma GRL and GAS, the expression of GSHR and VIPRRe in the duodenum and activating M-cholinergic receptor.In vivo, S. collina was confirmed to promote gastric emptying and intestinal propulsion and the ethyl acetate extract was the most effective fraction. Gastrointestinal motility is internally regulated by gastrointestinal smooth muscle electrical activity, nervous system and gastrointestinal hormones. In particularly, gastrointestinal hormones, including GAS, MTL, GRL and VIP, play an important role (12). GAS, synthesized and secreted from G cells locally distributed in the gastric antrum, accelerated gastric emptying and gastrointestinal motility (26). EAE from S. collina significantly elevated plasma GAS level in rats. MTL and GRL, synthesized in the upper gastrointestinal tract, are similar in structure and promote gastrointestinal muscle contraction (12). Talita CM ,et al found that mangiferin ,a natural xanthone , accelerates gastrointestinal transit in mice involving cholinergic mechanism and Ca^{++} mobilization in the submucosal neurons thereby stimulating gut motility and secretion. Mangiferin is safer prokinetic profile as it has no diarrhea inducing effect(13). Day YN , et al found in their study that Amorphophallus paeoniifolius tuber(methanolic or aqueous extract) both increased gastric emptying and intestinal transit due to its weak 5-HT3 antagonistic and 5HT4 agonistic actions , they may have influence on serotonergic system in exhibiting gastrokinetic effect(14). Kim I, Jinsoo Bae, Byung Joo Kim demonstrated that Carthami flos induced the pacemaking activity depolarisations of ICC and this may induced depolarisations of smooth muscle cells therefore it increase the GI motility(15). Agarwal K. et al demonstrated in their study Cassia fistula (anthraquinones) have direct effects on enterocytes, enteric neurons and gastrointestinal smooth muscles to stimulate intestinal motility. Mechanisms includes activation of prostaglandins and NO pathways , platelet activating factor production and perhaps inhibition of Na^{+}-K^{+}ATPase pump(16).

Basil extract showed the prokinetic activity in GI Tract. The present finding of increase in intestinal motility following basil extract administration can be related to the above mentioned mechanisms, i.e., it may increase the synthesis and secretion of different GI hormones, ICC depolarization ,influence on serotonergic system etc, which can promote the GI motility(11).

CONCLUSION

Ocimum Sanctum increase intestinal motility through multiple modes of actions. It may be used as an adjuvant for the treatment of constipation and IBD and other gastrointestinal disorders.

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