ANTIINFLAMMATORY ACTIVITY OF AN INDIAN TRADITIONAL MEDICINE

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Summary

Synergistic reactions play a vital role in Ayurvedic therapy. Ayurveda always recommends the use of whole extracts rather than isolated compounds. Trikatu is one of the important formulations mentioned in Ayurveda which is prescribed individually as well as is a content of a numerous formulations. In the present study the attempt has been made to prove the synergistic effect of individual ingredients of Trikatu Churna and for this the simple model of anti-inflammatory activity is selected. Zingiber officinale and Piperine possesses the anti-inflammatory activity so the individual ingredients activity is compared with the total formulations anti-inflammatory activity by using carrageenan induced paw edema in experimental animals. The result proved that the formulation has a significant activity as compared to the activity of individual ingredients.

Keywords: Trikatu, Piperine, Synergistic action, Ayurvedic formulations.

Introduction

Synergistic reactions play an important role in the traditional system of medicine. Ayurvedic practitioners recommend the use of whole plant extracts rather than the use isolated compounds. Therefore the many Ayurvedic drugs are often prescribed with Pippali which contains Piperine –a bioavailability enhancer. Trikatu is also one of the formulations which are always prescribed by the physicians for the synergistic action.
Trikatu is the Sanskrit word which means combination of three spices. Trikatu contains equal amount of fine powder of rhizomes of *Zingeber officinale* (Zingiberaceae), fruits of Piper longum and *Piper nigrum* (Piperaceae)[1]. Out of the 370 compound formulations listed in the Handbook of Domestic Medicine and Common Ayurvedic Remedies, 210 contain either Trikatu or its individual components [2]. Trikatu has gained importance in the traditional system of medicine due to its chief chemical constituent Piperine and Gingerol. Literature has revealed a number of pharmacological properties of Piperine, one of them being its anti-inflammatory activity [3] and Gingerol also posses the different pharmacological activities along with anti-inflammatory [4].

To prove the synergistic effect of the Trikatu churna was studied by evaluating its anthelmintic, antimicrobial and analgesic activity [5,6]. To support this data present study was undertaken for the comparison of anti-inflammatory activity of the individual component of Trikatu and Trikatu Churna and again proved the theory of synergistic effect behind the ayurvedic prescription.

Material and Methods

Collection of Plant material:
The plant materials were collected from local market, authenticated and voucher specimens were deposited at Agharkar Research Institute, Pune, Maharashtra India. The deposited voucher specimen no. are *Zingiber officinale* (Zingiberaceae), R-106 *Piper longum* (Piperaceae) F-145, *Piper nigrum* (Piperaceae) F-144.

Preparation of Trikatu Churna:
The formulation was prepared as per the Ayurvedic Formulary of India part I. Rhizomes of *Zingiber officinale-ZO* (Zingiberaceae), fruits of *Piper longum-PL* and *Piper nigrum-PN* (Piperaceae) were powdered, passed through no. 80 sieve and then equal parts of these three powders were mixed uniformly[1].

Preparation of the extract:
About 10 gm of the formulation and its ingredients were extracted with 95% methanol by kinetic maceration method .The methanol was evaporated under reduced pressure. The residue was dissolved in distilled water by sonication to prepare the suspension.

Chemicals: Carrageenan (Sigma Chemical Co., St. Louis, MO, U.S.A), Indomethacin.

Animals:
Male wistar rats weighing 150-200 g were employed for anti-inflammatory tests. They were maintained under standard environmental conditions and had free access to feed and water *ad libitum* during quarantine period. Groups each with 6 animals were used. This study complied with current ethical regulations on animal research and related rules of our Institute and all animals used in the experiment received human care.

Experimental design:
The inhibitory effect of Trikatu Churna and its individual component's extracts on carrageenan-induced edema was evaluated by using method of Winter et al (1962) [7]. Briefly, 30 minutes prior to the carrageenan injection, hydroalcoholic extract of Trikatu Churna and it's individual component's extracts (ZO,PL,PN) were administered orally at different dose level (100, 200 and 400 mg/kg) to overnight fasted rats as a suspension in water, using 1% Tween 80 as a suspending agent. Edema was induced by injecting 0.1 ml of 1% Carrageenan in normal saline into the plantar region of right hind paw after 1 hr of administration of test drug. The reference group received Indomethacin (10mg/kg, *i.p.*) and the control group received an equal volume of solvent. The volume of paw was measured with a plethysmometer at 0 hr. (just after carrageenan injection), 1, 2, 3, 4 and 5 hr. Percentage inhibition was calculated by comparing the initial paw volume and paw volume after 5hr of carrageenan treated group and drug treated groups.

Statistical analysis:
Results are presented as mean ± SEM for 6 animals per group. The change in the paw volume of each rat was calculated as the difference between the paw volume at 5 hr and the paw volume immediately before the induction of the edema (0 hr baseline) and data is referred as differential paw volume (DPV).The percent inhibition in inflammation was calculated by following formula,
$[(DPV_{control} - DPV_{test\ group})/ DPV_{control}] \times 100$

Result and Discussion

Results of the anti inflammatory activity of Trikatu Churna and its ingredients on carrageenan induced edema, model for acute inflammation study supported the ayurvedic concept of synergism. ZO, PL and PN have the significant anti-inflammatory activity individually but % inhibition increases when all three drugs are given together. The scientific studies proved the role of Piperine as bioavailability enhancer; it increases the bioavailability of certain drugs [8]. Similarly it may enhance the bioavailability of the Gingerols and thus may increases the anti-inflammatory activity of the whole formulation. The polyherbal and Ayurvedic medicines are getting popularity because of is less side effects as compared to synthetic drugs [9]. Therefore it becomes mandatory to show that there are some features which are unique to phytotherapy and which are responsible for the both safety and efficacy of the polyherbal formulations. And one of the unique qualities is the synergy which offers the sum of the effect of individual ingredients in final formulation [10]. This is the one initial step to prove the synergetic actions of the Ayurvedic medicines and needs more scientifically based explanation.

Anti-inflammatory effect of Trikatu Churna and its individual components:

Group	Mean edema((ml) ± SEM (% inhibition) 1 hr	3hr	5hr
Control	1.618± 0.206	2.408± 0.080	2.970± 0.094
Indomethacin	1.31± 0.20** (70.33)	1.60±0.22** (66)	1.75±0.22** (68.86)
ZO 100 mg/kg	1.088 ± 0.088 (0.30)	2.330 ± 0.079 (4.16)	2.867 ± 0.108 (4.26)
ZO 200 mg/kg	1.503± 0.069 (4)	2.262 ± 0.069 (5.18)	2.765± 0.075 (6.76)*
ZO 400 mg/kg	1.508 ± 0.096 (8.33)	2.132±0.103** (17.77)	2.468±0.15 (24.06)**
PL 100 mg/kg	1.506 ±0.082 (0.433)	2.28±0.072 (2.62)	2.82±0.074 (2.65)
PL 200mg/kg	1.51±0.09 (1.96)	2.27±0.08 (4.54)	2.73±0.104 (8.815)
PL 400 mg/kg	1.52±0.096(4.633)	2.272±0.094(6.58)	2.83±0.11 (15.59)
PN 100 mg/kg	1.53±0.08 (1.96)	2.28±0.07(5.56)	2.78±0.07 (7.12)
PN 200 mg/kg	1.49±0.08 (4)	2.26±0.06 (4.67)	2.76±0.07* (6.40)
PN 400 mg/kg	1.50±0.09 (6)	2.13±0.10**(16.28)	2.49±0.11** (21.84)
TF 100 mg/kg	1.25±0.10*(50.25)	1.61±0.10**(52.52)	1.93±0.06**(49.41)
TF 200 mg/kg	1.198±0.057 (62.53)	1.461±0.066** (70)	1.693± 0.036**(68.77)
TF400 mg/kg	0.940±0.052*(69.960)	1.126±0.064** (73)	1.323±0.060** (71.18)

Values in the bracket represent the percent reduction in paw edema compared with only carrageenan treated group. Animals injected with carrageenan vehicle displayed no change in paw volume throughout the experiment. Significance relative to control values *< 0.05, ** < 0.01.

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