

Two Synergetic Effects of *Sonchus arvensis* L. Leaves Decoction in Calcium Oxalate Bladder Stone Therapy on Male Wistar Rat

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ABSTRACT

The anticalculi effect of *Sonchus arvensis* L. decoction on rat bladder stone has been done. The objective of the research is to determine its effect in bladder stone therapy. Bladder stone was done by matrix-glycolic acid induction method, used silk string matrix which inserted by surgical in bladder and two day afterwards given per orally glycolic acid at the dosage 500 mg/kg BW/day during 7 days. Preventive group was treated with 1.30 mg/kg BW/day decoction. The curative group 8 days later received the same treatment during 8 days. The result was measured with the weight of bladder stone which was deposited on string matrix and were statistically analyzed by Student's t-test. In prevention occurred 47.48% ($p \leq 0.05$) the inhibition effect. In curative occurred the inhibition and dissolving effects of existed bladder stone 46.50% ($p \leq 0.02$) and 4.02% respectively. In conclusion two effects can be shown namely (1) preventive measure: by the inhibition effect, it inhibits the formation of bladder stone and (2) curative measure: by the inhibition of bladder stone enlargement and dissolving of existed bladder stone.

Key word: Bladder stone, decoction, *Sonchus arvensis* L., synergetic effects

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INTRODUCTION

Traditional medicine of bladder stone is an ancestor inheritance of Indonesian people. Many herbs have anticalculi effect, for example *Orthosiphon aristatus* (Bl.)Miq. leaves, *Sonchus arvensis* L. leaves, *Phyllanthus niruri* L. herb, *Strobilanthes crispus* (BL.), *Plantago major* L., *Imperata cylindrica* (L.) Beauv., and more (Syamsuhidayat et al., 2001).

Extracorporeal Shockwave Lithotripsy (ESWL) is the modern cure for urinary tract stones, but the equipment in the big hospital, this treatment needs high cost, in general the patient have to stay in the hospital to anticipation if occurs complication (Health Technology Assessment, 2005). Therefore traditional medicine for treatment urinary tract stones still needed while the modern cure has already developed.

Sonchus arvensis L. is one of the popular plants for treatment urinary tract stones. The chemical compounds are phenolics acid and its derivates cafeic acid (Bramwell et al., 1971), flavonoids luteolin and luteolin 7-*O*-glucoside (Bramwell et al., 1971, Dhianawaty et al., 2003), apigenin and apigenin 7-*O*- glucoside (Dhianawaty et al., 2004, Xia et al., 2010), Kaempferol (Bramwell et al., 1971, Mansour et al., 1983), quercetin-3-*O*- α -L-rhamnoside and kaempferol-3, 7- α -L-dirhamnoside (Qu et al., 1996), terpene: α -amyrin, β -amyrin, lupeol, taraxasterol and pseudo-taraxasterol (Hooper et al., 1982), coumarins: aesculetin, scopoletin, isoscopoletin (Bramwell et al., 1971, Mansour et all., 1983, Xia et al., 2010), lipids: 1,2-dilinolenyl-3-*O*- β -D-galactopyranosyl-*sn*-glycerol (1), 1,2-dilinolenyl-3-*O*-(α -D-galactopyranosyl-(1 \rightarrow 6)-*O*- β -D-galactopyranosyl-*sn*-glycerol (2) and 1-linolenyl-3-*O*- β -D-galactopyranosyl-*sn*-glycerol (3) (Baruah et al., 1983), steroids and phenols [ergost-6, 22-diene-3 β , 5 α , 8 α -triol (1), stigmast-5-ene-3 β , 7 α -diol (2), stigmasta-5, 22-dien-3 β , 7 β -diol (3), 3 β ,5 α , 6 β -trihydroxystigmast- 7, 22-diene (4), stigmast-6 β -hydroxy-4, 22-diene-3-one (5), β -sitosterol (6), daucosterol(7), emodin(10) (Qu et al., 1996), Two new sesquiterpene lactones, 1 β ,15-diacetoxy-5,7 α ,6,11 β (*H*)-eudesm-3,4-en-6,12-olide (1) and 1 β -hydroxy-3,4-en-15-*O*- β -glucopyranosyl-5,7 α ,6,11 β (*H*)-eudesman-6,12-olide (2) (Xia et al, 2012), bis (2-etilheksil) ester (Sukadana et al, 2011).

Pharmacology activities, in vitro water extract increased and fasted of calcium oxalate dilution, the mechanism of calcium oxalate dilution is surface inhibition (Sjuib et al., 1989), in vivo of ethanol extract had diuretic effect (Dhianawaty et al., 2004), as antibacteria on *Staphylococcus aureus* and *Escherichia coli* (Sukadana et al., 2011).

METHOD

Material:

Sonchus arvensis L., the size of this plant harvested varied from 20-30 cm. They were identified at Herbarium Bogoriense. The plants materials were dried and grounded to make fine powder.

Decoction, *Sonchus arvensis* powder was boiled at 90⁰C during 30 minutes, the dosage was 2.60 mg/kg body weight/day in 50 ml of 2% Arabic gum solution.

Male adult Wistar albino rats of (170-200 g) from School of Pharmacy Bandung Institute of Technology were housed in the cages with food and drink provided freely. Bladder stone was induced by surgical implantation of silk string matrix in the urinary bladder of rats and everyday glycolic acid solution (500 mg/kg body weight of rat) was administered orally.

Experimental Details:

Diuretic activity (Wattimena et al., 1993), the tail base was pressed to empty the bladder free of urine. The control rats received 50 ml/kg body weight of water orally, while the treated group received the same volume of water and the decoction was feed orally at the dosage of 2.60 mg/kg BW/day of rat.

Furosemide from Dexa Medica (3.55 mg/kg body weight of rat) served as the reference drug. Rats were separately kept in metabolic cages. The urine was measured every hour for 6 hours.

The results were statistically analyzed by Student's t-test.

Antiuro lithiatic activity (Aleykutty et al., 1993, Wattimena et al., 1993), the rats were divided into two treatment groups, i.e. preventive and curative treatments. Each treatment used two groups of six animals, the positive control and the test groups (preventive and curative treatment groups). Bladder stone of all rats were induced by surgical insertion silk string in the bladder and administered the glycolic acid solution (at a dosage of 500 mg/kg BW/day of rat) by oral route.

Induction of bladder stones, one day before and after the insertion of silk string into the bladders, rats were fasting, then each rat was housed in individual cage. Two days after the induction, all rats were grouped based on their treatment. The preventive treatment had two groups: the positive control group and the preventive test group. The curative treatment had two groups: the positive control group and the curative test group.

RESULT AND DISCUSSION

Table 1: Diuretic activity of *Sonchus arvensis* L. leaves decoction on male rats at a dosage 2.60 mg/kg body weight/day

Treatment		(%) EUV, after (hour)						pH urine
Sample	Dosage mg/kg body weight /day	1	2	3	4	5	6	
1. Control	0.00	5.20 ± 2.40	25.40 ± 2.50	39.80 ± 3.00	54.90 ± 2.80	66.70 ± 2.60	72.50 ± 2.90	7.00
2. Furosemida (reference)	3.55	10.20 ± 3.40	42.90 ± 2.50	73.60 ± 3.10	92.50 ± 2.90	94.50 ± 3.20	100.90 ⁰ ± 2.80	7.10
3. <i>Sonchus arvensis</i>	1.30	11.60 ± 2.80	58.10 ± 2.70	78.30 ± 3.30	78.30 ± 3.30	83.10 ± 2.90	85.20* ± 2.70	7.10

Notes:

% EUV (Excreted Urine Volume) \geq 80%

The result obtained were statistically analyzed by Student's t-test

⁰. $p \leq 0.001$: Reference group compared with control group

*. $p \leq 0.05$: *Sonchus arvensis* leaves decoction group compared with control group.

Diuretic activity test of *Sonchus arvensis* L. decoction at a dosage of 1.30 mg/kg body weight of rat gave EUV 85.20 %, and it is statistically significant from control group as $p \leq 0.05$.

Table 2: Antiurolithiatic activity of ethanol extract of *Sonchus arvensis* (Bl.)Miq. leaves at a dosage of 1.3 mg/kg body weight/day of rat on male rats

Treatment	The stone weight (mg), n = 6		
	Initial condition	Final condition	
	Initial group (Xo)	Control (+) group (Xa)	Test group
I. Preventive	0.0000	0.9625 ± 0.3329	0.5055 ± 0.1616 (-47.48% vs Xa)*
II. Curative	0.9625 ± 0.3329	1.6484 ± 0.3605 (+54.95% vs Xo)*	0.8819 ± 0.3027 (-4.02% vs Xo) (-46.50%, vs Xa) ^{o*}

Note:

- a. (+) or (-) is increase or decrease in the weight of stone (%)
- b. Xo is the average weight of stone that deposited on initial condition, the initial condition at preventive treatment, the bladder stone did not deposit (Xo = 0), but at curative treatment, the stone deposited. (Xo > 0).
- c. Xa is the average weight of stone that deposited on control (+) group after 7 days bladder stone induction, without being treated.
- d. Xa is the average weight stone that deposited on control (+) group after 15 days bladder stone induction, without being treated.
- e. The number in the bracket explains % difference of the bladder stone weight of the test group compared with Xo or Xa .
- n. number of rats

The result obtained were statistically analyzed by Student's t-test

Antiurolithiatic activity of the *Sonchus arvensis* L. decoction on preventive group showed 47.48% ($p \leq 0.05$) inhibition of bladder stone weight increment to positive control group (Xa), on curative group showed 46.50% ($p \leq 0.02$) inhibition of bladder stone weight increment to positive control group (Xa) and dissolving 4.02 % of existed bladder stone (initial group).

CONCLUSION

In conclusion, the decoction of *Sonchus arvensis* showed two effects on bladder stone therapy, in preventive group result: by the inhibition effect, it inhibits 47.48% the increment of bladder stone and in curative group result: by the inhibition effect, it inhibits 46.50% the increment of bladder stone and dissolving 4.02% of existed bladder stone.

The flow chart of two synergetic effects in antiurolithiatic therapy of *Sonchus arvensis* L. as below:

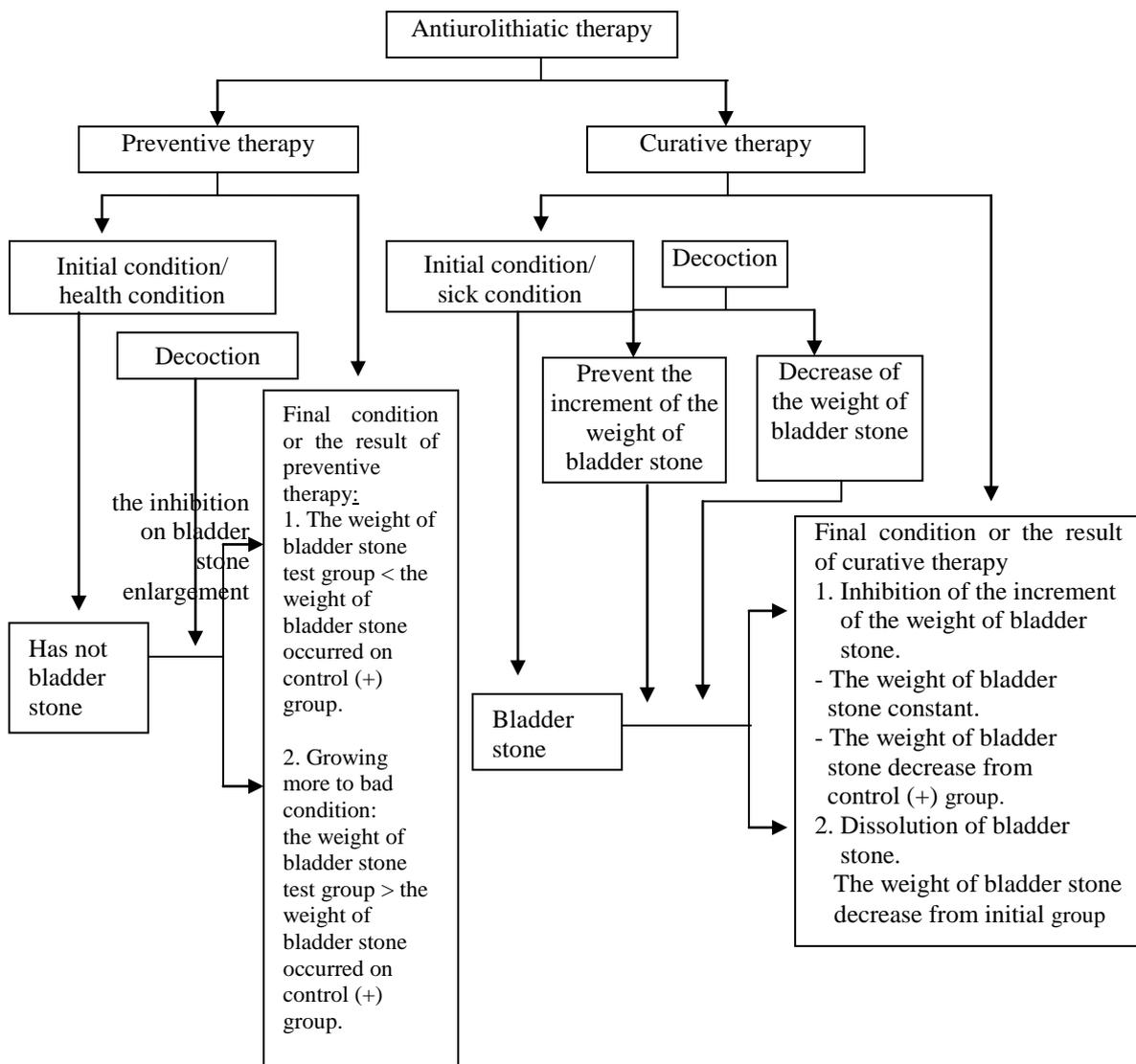


Figure 1: Flow Chart of Antiurolithiatic Therapy of *Sonchus arvensis* L

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