

Comparative Food Intake Inhibitory activity of *Sida cordifolia* L. and *Withania somnifera* L. in rats

Abstract

Objective: The purpose of the present study was to evaluate food intake inhibitory activity of aqueous extract of *Sida cordifolia* (AESC) and alcoholic extract of *Withania somnifera* (AEWS). Both *Sida cordifolia* Linn. (Malvaceae) and *Withania somnifera* Linn. (Solanaceae) are widely growing medicinal plants and have been reported to possess number of medicinal properties. **Materials and methods:** The food intake inhibitory activity of different concentrations of AESC and AEWS (0.5% w/w, 1% w/w and 1.5% w/w) were evaluated by supplementing them with normal feed of rats for seven days, measuring their body weight and food intake daily and compared with the control. **Results:** There was a significant decrease in food intake ($P<0.001$) and body weight ($P<0.01$) with 1 % w/w and 1.5 % w/w of AESC while decrease in food intake and body weight with 0.5 % w/w of AESC was not significant. AEWS showed a significant ($P<0.05$) decrease in food intake only, but no significant decrease in body weight was observed with AEWS at any dose level. **Conclusion:** Both extracts were found to have significant food intake inhibitory activity. However when compared to AEWS, AESC was found to be more effective in reducing the food intake and bodyweight.

1.Introduction

The term ‘appetite suppressant’ is used to denote drugs that act primarily on the neurochemical transmitters of the central nervous system to reduce food intake [1]. Drugs that act primarily on the neuro chemical transmitters of the central nervous system play a major role in food intake and thereby helpful in treating obesity, which is an important public health problem in India. There are number of medicinal plants which

were found to have food intake inhibitory activity due to the presence of constituents which influence the action of central monoamines.

Sida cordifolia Linn. (Malvaceae), popularly known as ‘White mallow’ or ‘Silky white mallow’, is a bush of 2 m in height. The plant has light green, cordiform, serrated, oval-elongated leaves and pedunculated flowers

arranged in axillary or terminal racemes. The plant is used in folk medicine for the treatment of stomatitis, blenorrhea, asthmatic bronchitis and nasal congestion [2]. Phytochemical analysis of the leaves of *Sida cordifolia* has mainly demonstrated the presence of sympathomimetic amines, ephedrine and pseudo ephedrine (a potent vasoconstrictor), vasocinone [3] and vasicine as major alkaloids [4].

Withania somnifera Linn. (Solanaceae), commonly known as 'Ashwagandha', is distributed in the northern parts of India, Mediterranean regions and in Africa [5]. The roots are used in cough, dropsy, rheumatism and gynecological disorders [6]. The roots also possess nootropic activity [7].

There is a paucity of data to substantiate food intake inhibitory activity of the above two plants. The objective of present investigation was to evaluate the food intake inhibitory activity of aqueous extract of *Sida cordifolia* (AESC) and alcoholic extract of *Withania somnifera* (AEWS).

2. Materials and Methods

2.1 Plant Material

The leaves of *Sida cordifolia* and *Withania somnifera* were collected from Madurai, Tamil Nadu and Dehradun, Uttaranchal in the month of August and January respectively. The plants were authenticated by Society for Health, Environment and Research on Biodiversity, Pondicherry and voucher specimen deposited. The leaves were air dried under shade, pulverized and stored in airtight containers.

The powdered *Sida cordifolia* leaves were extracted several times by boiling with water for three hours. The extracts were pooled together, filtered, concentrated and dried under vacuum. *Withania somnifera* leaves were powdered and extracted several times by boiling

with alcohol for three hours. All the extracts of both the plants were pooled together separately, filtered, concentrated and dried under vacuum.

2.2 Acute toxicity studies

Acute toxicity studies were carried out for the two extracts following OECD guidelines [8]. Overnight fasted, healthy Wistar Albino rats (n=3) were administered orally the extract dissolved in water in the dose of 2000 mg / kg body weight and observed continuously for 2 h and 24 h for mortality. No visible change was observed in any test animal and all animals survived beyond 24 h.

2.3 Assessment of Food intake inhibitory activity

Adult male Wistar rats weighing 300-350 g were divided in to six groups of each containing six rats and were housed under normal laboratory conditions (22°C, 40 % to 60 % relative humidity, light from 08:00 h to 20:00 h, free access to water and food). Normal food was provided as meal for seven days for all six groups in specially designed managers to avoid spilling. Food intake and body weight were measured daily to obtain the control food intake and body weight; they were then given food-supplemented with different concentrations (0.5%w/w to Group-I, 1% w/w to Group-II and 1.5% to Group-III) of AESD and AEWS to the respective groups for further seven days. The difference in body weight and food intake compared to control were expressed as percentage decrease in food intake and body weight.

2.4 Statistical analysis

The experimental results are represented as mean $\pm$ SEM of seven values. Student's 't' test was used to compare the data and P<0.05 was considered as significant. For comparative study, ANOVA followed by Newmans-Keul multiple comparison test was followed.

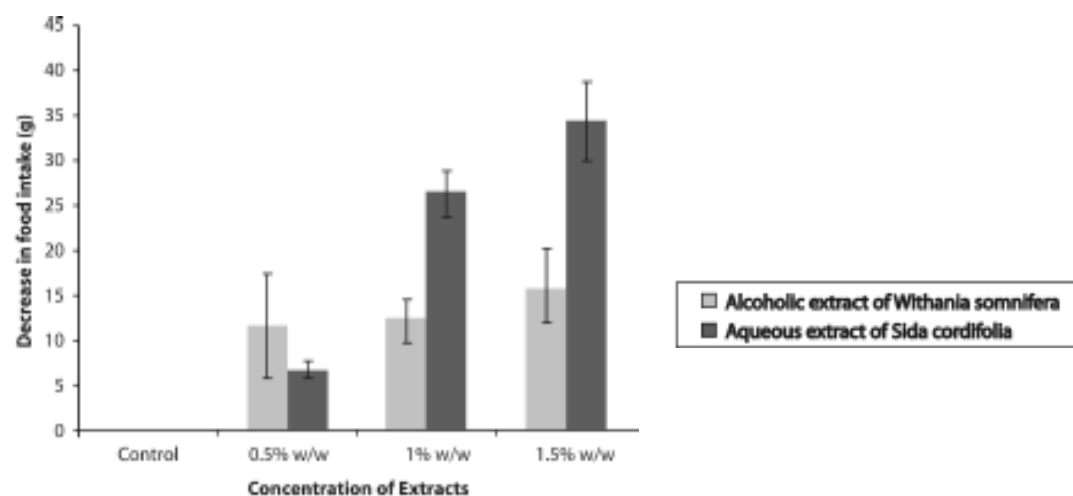


Fig. 1. Comparative food intake inhibitory activity of *Sida cordifolia* L. and *Withania somnifera* L. extracts. Values are expressed as mean $\pm$ SEM of 7 values (7 days). ANOVA followed by Newmans-Keul multiple comparison test. ** $p < 0.01$, *** $p < 0.001$ compared to control.

Table 1. Effect of aqueous extract of *Sida cordifolia* L. on food intake and body weight in rats.

Parameter	Group I		Group II		Group III	
	Normal	0.5% w/w AESC	Normal	1% w/w AESC	Normal	1.5% w/w AESC
Food Intake	57.86 $\pm$ 4.06	51.43 $\pm$ 5.95	72.86 $\pm$ 4.86	46.43 $\pm$ 2.37**	80.71 $\pm$ 4.56	46.43 $\pm$ 4.46**
% Decrease in food intake		11 %		36 %		42 %
Difference in Body weight	+1.61 $\pm$ 4.38	-2.13 $\pm$ 2.49	+3.93 $\pm$ 1.67	-3.54 $\pm$ 1.17*	+ 4.64 $\pm$ 2.28	-3.28 $\pm$ 0.99*
% Decrease in Body Weight		2 %		3 %		3 %

Student's paired 't' test, * $p < 0.01$, ** $p < 0.001$ when compared to control, '+' increase in body weight, '-' decrease in body weight, Values are mean $\pm$ SEM of 7 values (7 days)

Table 2. Effect of alcoholic extract of *Withania somnifera* L. on food intake and body weight in rats.

Parameter	Group I		Group II		Group III	
	Normal	0.5% w/w AEWS	Normal	1% w/w AEWS	Normal	1.5% w/w AEWS
Food Intake	53.57 $\pm$ 7.21	42.14 $\pm$ 7.21	49.29 $\pm$ 4.14	37.14 $\pm$ 2.64*	52.86 $\pm$ 5.10	36.98 $\pm$ 3.59*
%Decrease in food intake		21 %		25 %		30 %
Difference in Body weight	+1.42 $\pm$ 1.10	-3.21 $\pm$ 3.87	+1.28 $\pm$ 1.10	-1.53 $\pm$ 1.71	+1.60 $\pm$ 2.76	-0.714 $\pm$ 1.36
% Decrease in Body weight		2 %		1.4 %		1.15 %

Student's paired 't' test, * $p < 0.05$ when compared to control, '+' increase in body weight, '-' decrease in body weight, Values are mean $\pm$ SEM of 7 values (7 days).

3. Results

3.1 Toxicity studies

Both AESC and AEWS were found to be safe up to 2000 mg / kg body weight.

3.2 Food intake inhibitory activity of AESC

The average daily food intake of control group I was 57.86 ± 4.06 and there was a decrease in food intake of 11 % with 0.5 % w/w of AESC. In control group II, the daily food intake was 72.86 ± 4.86 and the decrease in food intake was 36% in 1 % w/w AESC compared to group III (Control 80.72 ± 4.56), where there was a decrease of 42 % in 1.5 % w/w of AESC. There was a significant ($P < 0.001$) decrease in the food intake with 1 % w/w and 1.5 % w/w of AESC, but no significant decrease in food intake with 0.5 % w/w of AESC. There was also significant ($P < 0.01$) decrease in the body weight with 1% w/w and 1.5 % w/w of AESC and the decrease in body weight with 0.5 % w/w of AESC was not significant. There was a significant difference between 1.0 % w/w ($P < 0.01$) and 1.5 % w/w ($P < 0.001$) compared to 0.5 % w/w of AESC which indicates the dose-dependent activity of AESC.

3.3 Food intake inhibitory activity of AEWS

Like with AESC, there was a significant ($P < 0.05$) decrease in food intake with 1% w/w and 1.5% w/w of AEWS, but no significant decrease in food intake with 0.5% w/w of AEWS. The percentage decrease in food intake was found to be 21 %, 25 % and 30 % for 0.5 % w/w, 1.0 % w/w and 1.5 % w/w of AEWS respectively. However the decrease in the body weight was not significant with any of the AEWS treated groups. There was no significant difference between 1.0 % w/w and 1.5 % w/w compared to 0.5 % w/w of AEWS, which indicates that the activity of AEWS was not dose-dependent.

The results are shown as comparative graph (Figure 1) of food intake inhibition in g by increasing concentration of AEWS and AESC mixed in normal food (0.5 % w/w, 1.0 % w/w and 1.5 % w/w) obtained in adult male rats for seven days (Table 1 and Table 2). The anorectic effect of both the extracts were dose-related. The lower doses (0.5 % w/w) of both the extracts did not show either significant anorectic effect or decrease in body weight. AEWS (1 % w/w and 1.5 % w/w) showed significant anorectic effect but not decrease in body weight.

3.4 Comparison between AESC and AEWS

Food intake inhibitory activity of 0.5 % w/w AESC was comparable to that of 1.5 % w/w of AEWS.

4. Discussion

The present investigation carried out for AESC and AEWS as a food supplement revealed the significant reduction of food intake and bodyweight in Albino Wistar rats. The degree of reduction with AESC was dose-related whereas the same was not observed with AEWS. When compared to AEWS, AESC was found to be more effective in reducing the food intake and body weight. Neuropeptides, monoamines and many drugs involved in modulating food intake and fat stores have reciprocal effects on sympathetic activity. The reciprocal relation between food intake and sympathetic activity is robust, suggesting the beta-receptors in the periphery and brain may be involved in control of feeding and a reduction in food intake in human accounts for most of the weight loss with ephedrine and caffeine [9]. In the present study the reduction of food intake and bodyweight with AESC may be due to its principle constituent ephedrine and due to the presence of sympathomimetic amines in it.

It is reported that oral administration of antidepressant drugs produced decrease in food

intake during the total four day experimental study [10]. *Withania somnifera* is also reported to posses anxiolytic-antidepressant activity in experimental study [11] and this could be a reason for food intake inhibitory activity of AEWS in the present study. However decreased potency of AEWS compared to AESC has to be established.

Medicinal plants with decreased food intake and weight reducing property may be useful in treating obesity, which is an important public health problem in the world. The present investigation of weight reducing and food intake

inhibitory activity of the extracts of medicinal plants may support to formulate the herbal products for obesity. However, the present investigation requires the clinical trails to substantiate the report.

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