Possible anorectic effect of methanol extract of *Benincasa hispida* (Thunb). Cogn, fruit

A. Kumar, R. Vimalavathini*

**ABSTRACT**

**Objective:** To investigate the anorectic effect of the methanol extract of *Benincasa hispida* (MEBH) in Swiss albino mice.

**Material and Methods:** Fasted mice were administered with various doses of MEBH (0.2-1 g/kg, i.p.), and the food intake was measured hourly for a period of 7 h. In another experiment, the percentage of gastric emptying at 4 th h was determined after the administration of MEBH (0.2-1 g/kg, i.p.) in different set of mice which had free access to preweighed food for either 1, 2 or 4 h.

**Results:** MEBH significantly reduced the cumulative food intake over a 7 h period in a dose-dependent manner. The percentage reduction of cumulative food intake at 7 th h for MEBH with 0.2, 0.6 and 1 g/kg was 27%, 38% and 54% respectively. The 4 h gastric emptying was not significantly influenced by MEBH when compared to control.

**Conclusion:** The present study reveals for the first time a possible anorectic activity of *Benincasa hispida*, most probably mediated through the CNS without affecting the gastric emptying. However, further studies are required to find its potential as an antiobesity agent.

**KEY WORDS:** Food intake, gastric emptying

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**Introduction**

*Benincasa hispida* (Thunb.) Cogn (Cucurbitaceae) fruit is widely used as a vegetable in India and other tropical countries. The fruit *B. hispida* is an important ingredient of “Kusmanda lehyam” (Ayurvedic medicine) which is widely used in epilepsy and other nervous disorders. Some of the important isolated constituents of *B. hispida* reported were triterpenes, sterols and glycoside and volatile oils. The methanol extract has been shown to exert a mast cell stabilizing effect, diuretic activity and nephroprotective activity against mercury poisoning in rats. Previous work in our lab with the methanol extract of *B. hispida* revealed significant antiulcer activity, protection against histamine-induced bronchospasm, nootropic and antidepressant activity. Here we report the possible anorectic activity in Swiss albino mice with acute doses of methanol extract of *B. hispida*.

**Material and Methods**

**Plant material**

*Benincasa hispida* fruit was obtained from the local market in the months of August / September 2002 and identified by the Department of Botany, Captain Srinivasamoorthy Drug Research Institute, Chennai, India taxonomically. The preparation of the extract was carried out as described elsewhere.

The methanol extract of *Benincasa hispida* (MEBH) was dissolved each time in distilled water for pharmacological testing and administered to the mice (0.1 ml/10 g bw, i.p.).

**Animals**

Male Swiss albino mice (18-22 g) were used. The animals were bred and housed under standard experimental conditions. The animals were fed with readymade standard diet (Hindustan Lever Ltd., India) and water *ad libitum*. The experiments were carried out after obtaining prior approval from Institutional Animal Ethics Committee (IAEC).

**Measurement of food intake in mice**

Mice fasted for 18 h (with free access to water) were placed in individual cages. One h later mice received vehicle (distilled water) or MEBH (0.2-1 g/kg). Immediately, preweighed food was placed and at every hour the food was replaced by removing all the solid pellets and also the spill. The intake was
determined by the difference between the preweighed food and the weight of food and spill left at the end of each hour for a period of 7 h.9

Food intake and gastric emptying of solid meal in mice

Mice divided into 12 groups of 6 each were fasted for 18 h but had access to water before and during the experiment. Fasted mice were placed in individual cages 1 h before and then received either vehicle or MEBH (0.2, 0.6 or 1 g/kg). Immediately after the injection the mice had free access to preweighed food for either 1, 2 or 4 h. The animals were sacrificed at the 4th h by excess dose of thiopentone sodium. The stomach was identified and the pyloric and the cardiac ends were ligated. The isolated stomach was cut open, the contents were removed and wet weight was weighed. The gastric emptying was calculated according to the formula

\[
\text{% Gastric emptying (GE) = \left(1 - \frac{\text{wet weight of food recovered from the stomach}}{\text{weight of food intake}}\right) \times 100}
\]

Statistical analysis

Data analysis was done using one-way analysis of variance (ANOVA) followed by Dunnett’s multiple comparison. *P<0.01, ** P<0.001 vs control (Dunnett’s multiple comparison).

Results

The methanol extract of B. hispida significantly reduced the cumulative food intake over a 7-h period in mice, in a dose-dependent manner (Table 1). For MEBH 0.2, 0.6 and 1 g/kg, from the fifth hour, there was a significant reduction in cumulative food intake when compared to control. At the seventh hour the percentage reduction of food intake was 27%, 38% and 54% with 0.2, 0.6 and 1 g/kg of MEBH respectively (Table 1). The total intake of food was also significantly (P<0.01) reduced with all doses of MEBH-treated mice.

The fourth hour gastric emptying by MEBH (0.2, 0.6 and 1 g/kg) was not statistically significant when compared to control (Table 2). Control animals exposed to food for 1 h had %GE of 90±3.5 while 0.2, 0.6 and 1.0 g/kg of MEBH-treated animals had 83±8.1, 62±10.9 and 83±8.5 of 4th h % GE respectively (F=2.24; df =3, 23; P<0.1). Similarly, the MEBH (0.2-1.0 g/kg) treated animals exposed to food for 4 h had 4th % GE of 51±8.2, 49±6.9 and 59±11.1 respectively which was not significant when compared to control, 51 ± 5.4 (F = 0.3; df = 3, 23; P=0.81).

Discussion

The present investigation carried out on the effect of methanol extract of Benincasa hispida on the 7 h cumulative food intake study reveals that MEBH produces reduction of food intake in mice, suggestive of the anorectic action of MEBH. However, the mechanism through which MEBH causes this effect is to be established. Although the role of hypothalamus in feeding is well known, peripheral factors too play a significant role in affecting the feeding behavior. Therefore it was of interest to see whether gastric emptying caused reduced food intake as this also plays an important regulatory role in food intake.10,11 Rapid gastric emptying of food has a casual relationship with overeating and obesity10 whereas delayed gastric emptying reduces food intake or produces satiety.11,12 Interestingly, the result from the 4 h gastric emptying study in mice did not reveal any significant change in gastric emptying in the extract-treated animals compared to the control. In the present study the stomach contents were lesser in quantity in MEBH-treated mice than the vehicle-treated group probably due to decreased food intake but had similar gastric emptying time. Therefore the data indicates that the MEBH-induced reduction of food intake during the first 4 h is not related to the gastric volume-related satiety signal. Hence, it can be suggested that gastric emptying does not play a major role in producing satiety or reduction of food intake suggesting a central role for MEBH in causing the reduction of food intake. Although it is beyond the realm of the present study to elucidate the mechanism through which the extract reduces food intake.

Table 1

**Table 1**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose (mg/kg, i.p.)</th>
<th>1 h</th>
<th>2 h</th>
<th>3 h</th>
<th>4 h</th>
<th>5 h</th>
<th>6 h</th>
<th>7 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>-</td>
<td>0.44±0.04</td>
<td>0.73±0.08</td>
<td>1.04±0.10</td>
<td>1.38±0.11</td>
<td>1.88±0.05</td>
<td>2.13±0.07</td>
<td>2.37±0.05</td>
</tr>
<tr>
<td>MEBH 0.2</td>
<td>(5)</td>
<td>0.42±0.04</td>
<td>0.69±0.05</td>
<td>0.93±0.08</td>
<td>1.21±0.13</td>
<td>1.39±0.14</td>
<td>1.56±0.10</td>
<td>1.73±0.11</td>
</tr>
<tr>
<td>MEBH 0.6</td>
<td>(27)</td>
<td>0.32±0.08</td>
<td>0.55±0.08</td>
<td>0.67±0.11</td>
<td>0.94±0.11</td>
<td>1.20±0.12</td>
<td>1.35±0.16</td>
<td>1.48±0.19</td>
</tr>
<tr>
<td>MEBH 1.0</td>
<td>(73)</td>
<td>0.12±0.02</td>
<td>0.31±0.13</td>
<td>0.43±0.08</td>
<td>0.62±0.08</td>
<td>0.82±0.11</td>
<td>0.94±0.10</td>
<td>1.08±0.11</td>
</tr>
<tr>
<td>One-way</td>
<td>F</td>
<td>7.23</td>
<td>7.21</td>
<td>8.11</td>
<td>9.29</td>
<td>15.76</td>
<td>18.43</td>
<td>18.76</td>
</tr>
<tr>
<td>P</td>
<td>0.001</td>
<td>0.001</td>
<td>0.00098</td>
<td>0.00047</td>
<td>0.000001</td>
<td>0.000005</td>
<td>0.000004</td>
<td></td>
</tr>
</tbody>
</table>

Values are mean±SEM and those within parentheses represent the % reduction of food intake. n=number of mice per group. *P<0.01, **P<0.001 vs control (Dunnett’s multiple comparison).
intake, it is noteworthy to point that MEBH at similar doses exhibited prominent antidepressant activity and the mechanism proposed was similar to selective serotonin reuptake inhibitors (SSRI). Although it would be very tempting to suggest further investigation on this mechanism of action of MEBH, its role of serotonin reuptake inhibition in the reduction of food intake cannot be overlooked.

As physiological mechanisms which regulate the food intake and body weight are complex, further studies are needed to determine the mechanism through which MEBH causes reduction in food intake and its therapeutic potential as an antiobesity agent.

### Table 2
Effect of methanol extract of *Benincasa hispida* (MEBH) on 4 h gastric emptying (GE) at various duration of exposures to food in mice

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose (g/kg, i.p.)</th>
<th>Exposure to food (h)</th>
<th>4h % GE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (water)</td>
<td>0.1 ml/10 g</td>
<td>1</td>
<td>90 ± 3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>96 ± 1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>51 ± 5.4</td>
</tr>
<tr>
<td>MEBH</td>
<td>0.2</td>
<td>1</td>
<td>83 ± 8.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>73 ± 14.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>51 ± 8.2</td>
</tr>
<tr>
<td></td>
<td>0.6</td>
<td>1</td>
<td>62 ± 10.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>78 ± 7.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>49 ± 6.9</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>1</td>
<td>83 ± 8.5</td>
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<td>2</td>
<td>74 ± 4.4</td>
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<tr>
<td></td>
<td></td>
<td>4</td>
<td>59 ± 5.4</td>
</tr>
</tbody>
</table>

All values are mean ± SEM, n=6 in each group.

### Acknowledgements

Authors are thankful for the support and encouragement rendered by Mrs. Grace Rathnam, Principal, C. L. Baid Metha College of Pharmacy, Chennai, India.

### References