Anti Fatigue Activity Of Pure Honey And Honey Mixed In Mice

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Abstract
Indonesia is rich in biodiversity originating from forests, one of which is honey. Honey is a natural product derived from insects, and has therapeutic, nutritional, cosmetic and traditional values. Honey activity also depends on geographical distribution and differences in food sources. The people of East Nusa Tenggara (NTT) use honey to heal wounds and burns, cough, lower blood pressure, overcome fatigue and as an encouragement but in reality honey sold by the community is not only pure honey but some are honey mixed with palm sugar from trees lontar / siwalan. This study aims to see the anti-fatigue effect using the Forced Swimming Test method using 4 groups of test animals that were given pure honey, honey mixed with palm sugar, pure palm sugar and controls that only received aquadest. Animals are given a load of 5% of body weight at the base of the tail and then inserted into a glass cylinder filled with water. Swimming resistance was measured from the time the mice began to swim until the mice sank, marked by mice below the surface of the water for 2 seconds without breathing. The results showed significant differences (p <0.05) pure honey group between pretest and posttest based on the Paired T test, so it can be concluded that from all the test groups, only pure honey had an anti-fatigue effect.

Keywords: Mixed honey, palm sugar, pure honey, WFST
INTRODUCTION

Honey is produced by honey bees (Apis sp; Family: Apidae) which suck a variety of flower extracts and fruit collected in their bodies and then taken to the nest and formed into honey. Honey is generally a thick liquid with a sweet, healthy taste and is often used as a medicine (Tirtawinata, 2006).

Honey is one of the non-timber forest products (NTFPs) used by the community in Timor Tengah Selatan (TTS) for various necessities of life (Wibowo, 2012). In previous studies, it was found that the activity of honey also depends on geographic distribution and differences in food sources (flower nectar), this proves that geographical location and biodiversity influence the quality of honey. (Taormina et al., 2001)

The people of East Nusa Tenggara (NTT) use honey to treat wounds and burns, cough, lower blood pressure, overcome fatigue, as an encouragement, aphrodisiac, stop hair loss, skin infections, overcome acne problems, arthritis and for several other chronic diseases.

The benefits of honey as a traditional medicine have been known since ancient times. The efficacy of honey as an energy enhancer is supported by studies that show the efficacy of honey as an enhancer of body stamina and proven to be able to improve the performance of sportsmen (Walji, 2001; Jarvis, 2001). honey from different species can also increase swimming time in preclinical and clinical testing and can also reduce lactic acid levels (Priastomo, 2014).

The presence of a large and varied chemical content in honey, allows honey to have many benefits (Moniruzzaman, 2013). The high consistency of fructose and glucose is believed to be the main component of stamina enhancer in activity. The people of NTT generally use palm sugar as a mixture with honey. Palm sugar from the Lontar / Siwalan tree (Borassus flabellifer L.) is also a typical food of the NTT community that is useful and has high nutritional value with a sweet and brownish taste (similar to honey). Palm sugar can also be used as a sweetener for drinks and food. Empirically palm sugar is used to treat
stomach pain and can also control blood fat levels.

MATERIAL AND METHOD

Albino mice weighing between 20 - 40g were housed under standard laboratory conditions and maintained on natural light and dark cycle and had free access to food and water. Animals were acclimatized to laboratory conditions before the experiment. Each animal was used only once.

Motor tests are carried out by testing the swimming of all mice in a cylindrical glass for 15 minutes. Animals that pass the motor test are forced to swim with a load of 3% calculated from body weight. Animals were divided into 4 groups, namely pure honey group, palm sugar group, mixed honey group and aquades group for 8 days before the final Weight Loaded Forced Swimming test (WFST).

This test aims to see the anti-fatigue effect in mice after receiving the test preparation. Animals will spontaneously swim to keep themselves from sinking. Swimming resistance is a measure of fatigue threshold values that can be measured from the time the mice begin to swim until the mice sink, which is indicated by mice below the water surface for 2 seconds without breathing. The data obtained were analyzed using the Paired sample T test to see the significance value.

RESULTS AND DISCUSSION

Organoleptic Test Results

Honey is a natural liquid that generally has a sweet taste, produced by honey bees, from plant flower extracts (floral nectar) or other parts of plants (extra floral nectar) or excretion from insects with high nutritional value.

Honey is a food with a sweet taste with different characteristics depending on the bee that produces it (Priastomo, 2014). Generally brown, pale yellow or translucent yellowish.

Because of its high economic value with a variety of nutritious substances, honey forgery often occurs. Honey can be fake in many ways, generally honey is mixed with a solution of sugar, granulated sugar (sucrose), artificial
sweeteners and several other products so it is dangerous if used by infants, children and diabetics. Based on the data obtained, sellers in NTT often mix honey with palm sugar because of its sweet taste with thick consistency and almost the same color.

![Image of three jars of honey and palm sugar](image)

**Figure 1** difference between three types a) palm sugar b) pure honey c) mixed honey

Organoleptically, there are no color differences that are not too striking from the three preparations above, although there are differences in consistency between the three. palm sugar is much thicker than pure honey.

Observation of the characteristics of honey can also be done by microscopic observation to see the presence of pollen and other microscopic particles carried by honey bees and mixed into honey (Kaspar, 2006). Pure honey used has a brighter yellow color than the color of pure palm sugar or mixed honey.

Honey has a unique smell and sweet taste, almost the same as palm sugar, so after mixing almost no difference.

**Effect Of Pure Honey, Mixed Honey And Palm Sugar On The Body Weight Of Mice**

Body weight was measured to determine the effect of body weight gain with swimming resistance that was seen from the length of time the test animal swim. Measurement of body weight was carried out on the first day and the eighth day of observation, obtained results as in the table below:

<table>
<thead>
<tr>
<th>Observation Time</th>
<th>Pure Honey Groups (gram)</th>
<th>Palm Sugar Groups (gram)</th>
<th>Mixed Honey Groups (gram)</th>
<th>Destilated Water Groups (gram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 0</td>
<td>36.66±1.52</td>
<td>31.33±0.57</td>
<td>36.66±1.52</td>
<td>29.33±4.04</td>
</tr>
<tr>
<td>Day 8</td>
<td>37.66±1.52</td>
<td>32.66±3.78</td>
<td>41±1.73</td>
<td>33±6.55</td>
</tr>
</tbody>
</table>
There was an increase in body weight in all treatment groups, this increase in body weight was not significant ($p > 0.05$) on the first day and eighth day after administration of the test substance. This data shows that body weight gain does not affect swimming activity of animals.

**Effect of pure honey, mixed honey and palm sugar on swimming time to exhaustion of mice**

Some of the substances contained in honey are fructose and glucose, which is a simple type of sugar from sucrose so that it is directly absorbed by the blood and can quickly produce energy even though the amount of calories is smaller. Honey as a source of energy and nutrients with a unique carbohydrate composition makes it an ideal nutrient before exercise.

Manifestations of fatigue in test animals can be measured through long periods of swimming (Jin, 2011). The ability to maintain energy is shown by the length of swimming time of the test animals. Anti-fatigue testing was carried out using the Weight-loaded Forced Swimming Test (WFST) method. The principle of this method is to force animals to swim with a load of 10% of the weight of the test animals placed at the base of the tail.

WFST measurements were carried out the day before the animals were treated and on the 8th day after the test animals were treated. Observation data for swimming time of test animals can be seen in table 2

<table>
<thead>
<tr>
<th>Observation Time</th>
<th>Pure Honey Groups (seconds)</th>
<th>Palm Sugar Groups (seconds)</th>
<th>Mixed Honey Groups (seconds)</th>
<th>Destilated Water Groups (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 0</td>
<td>120.66±40.67*</td>
<td>58.33±3.51</td>
<td>157±29.44</td>
<td>78.33±12.22</td>
</tr>
<tr>
<td>Day 8</td>
<td>350.66±64.42</td>
<td>177±34.59</td>
<td>126.66±33.94</td>
<td>122±58.92</td>
</tr>
</tbody>
</table>
Data shows almost an increase in the duration of swimming in each group. This occurs because generally animal muscles are able to adapt to new activities (Gossman, 1982).

Figure 2 Animal swim time (seconds) before and after administration of substances

Fatigue is a condition where muscle cells are unable to contract due to lack of ATP, neuromuscular junction is not able to continue stimulation, accompanied by accumulation of lactic acid (Herwana, 2005). Figure 2 shows an increase in swimming duration in almost all treatment groups, but there was a significant difference in swim time in the pure honey group between the days before and after administration of the preparation. Honey as one of the energy sources with the content of other compounds has succeeded in prolonging the swimming time of test animals compared to the group of palm sugar and mixed honey.

Based on statistical calculations, only pure honey groups showed significant differences (* P <0.05) between the pratest and posttest when tested using the Paired T Test so that it
can be concluded that pure honey can increase swimming activity in animals. As with the other test groups, in the mixed honey group, there was a decrease in swimming time of the test animals, although not statistically so that it could be concluded that the decrease in swimming time was not caused by the provision of test preparations as in the palm sugar and aquadest groups.

CONCLUSION
Pure honey showed significant differences in swimming resistance between pretest and posttest with a value of $p = 0.010$ ($p <0.05$) so it can be concluded that pure honey can improve swimming activity in animals better than mixed honey.

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