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RESEARCH ARTICLE

The Effectiveness of Sea Lettuce (*Ulva Lactuca*) Water Extract from Aceh Waters as an Anti-Obesity

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Abstract

Obesity is a condition of weight excess above average weight. Obesity can happen due to calories continuing into the body without being offset by physical activity. This study aims to determine the effectiveness of the water extract of Ulva Lactuca against weight loss in obese mice. type of research used is laboratory experiments using the design posttest only control group design research. we grouped into 7 groups, namely: normal Control, Positive Control, Treatment Control, P1= the group of obese mice + extract 300 mg/kg, P2= the group of obese mice + extract 400 mg/kg, P3= the group of obese mice + extract 500 mg/kg P4=the group of obese mice + orlistat.The Aqueous Extract of Ulva Lactuca has not been able to lose obese mice for 28 days of treatment. Normal mice in treatment of the Extract did not show changes in body weight

Keywords: Ulva Lactuca; Obesity; Weight

Introduction

Obesity is a condition of weight excess above average weight. Obesity can happen due to calories continuing into the body without being offset by physical activity. The body's energy that the quantity will be stored as triglycerides in fat tissue. The measurement of Body Mass Index (BMI) can be used to determine the status of obesity by dividing weight by height squared (Kg/m2) (Hastuti, 2019). According to Hermawan, three factors occur in obesity: genetic Factors, Factors of unhealthy lifestyle factors, and technological advances that cause a person to be lazy to move (Hermawan, 2020).

Obesity-related metabolic activity of the fat and carbohydrates is disturbed. Obesity is also closely related to the oxidative stress responsible for metabolic syndrome and cardiovascular abnormalities (Susantiningsih, 2015). The relationship of diet with obesity is caused due to the habit of a person consuming foods such as meat, milk, and other dairy products and processed cereal, thereby increasing the risk of metabolic syndrome (Kandinasti, 2018). Metabolic syndrome is closely related to the circumference of the abdomen at a specific size (men > 90 cm and women > 80 cm) will have an impact on the increase in triglycerides, decrease in HDL cholesterol, and increased blood pressure. The Data obtained from RISKESDAS in 2018, the proportion of more weight with BMI ≥25.0 to s/d < 27,0 increased in 2018, with a figure of 13.6 compared to 2007 (8,6) and year 2013 (11,5), while patients with obesity also increased in 2018 by the numbers by 21.8 higher than in 2007 (10,5) and 2013 (14,8) based on indicators of IMT ≥27,0 (Kemenkes RI, 2018). Obesity will become a severe problem for the health if not treated seriously. It can lead to degenerative diseases such as heart disease, stroke, disorders of muscles and bones, and diabetes mellitus. Efforts that can be made to deal with obesity are maintaining a healthy diet, fixing the unhealthy lifestyle, and the consumption of the drug. Many people use the wealth of nature as herbal medicine as an alternative treatment. One natural material that is allegedly potentially antiobesity is sea lettuce (*Ulva Lactuca)*.

Research conducted by Belhadj (2013) showed that *Ulva Lactuca* polysaccharides could improve glucose homeostasis and lipid by delaying the process of digestion and absorption of carbohydrates. It acts as a treatment for obesity. *Ulva Lactuca* is a type of algae that can be utilized as a food such as soup, chips, and salads but has not been widely used commercially (Yunita, 2018). Sea lettuce has a content that is good for health. Water extract of sea lettuce affects weight change in mice that condition *Diabetes Mellitus* (Rinawati, 2020). In addition, *Ulva Lactuca* can play a role as an antifungal (Zulfadhli, 2018).

Research on the water extract of *Ulva Lactuca* as an antiobesity has never been done, so it refers to a study

conducted by Widya; the researchers wanted to see the effectiveness of the water extract of *Ulva Lactuca* as an antiobesity with different dosage, solvent-different animals, and different test. In the previous research that has been done by researchers (Rinawati, 2020), an Extract of *Ulva Lactuca* can help the *recovery* of β cells of the pancreas in diabetic rats, which is characterized by blood glucose levels close to or back to normal. In addition, to restore blood glucose levels to standard numbers, the water extract of *Ulva Lactuca* also helps restore the bodyweight of mice that dropped dramatically due to diabetes. This is possible because the content of metabolites in the section can help correct the disrupted body's metabolic system.

Methods

The type of research used is research laboratory experiments using the design posttest only control group design research. This research was conducted at the Laboratory of MIPA to extract and test bioactive compounds (phytochemicals), sea lettuce, and Laboratory YPPM Mandiri Banda Aceh. Tools that will be used in this research are as follows: Needle sonde, syringe hypodermic needle, cage, weight scales to measure the development of body weight of experimental animals before, during, and after treatment Tool checks cholesterol the brand "*easy touch*" and a Strip of cholesterol brands *easy touch*. The materials used in this study are sea lettuce (*Ulva Lactuca)*, distilled water, male rats with an average weight of food, the rats with high-fat content

Ulva Lactuca obtained from beach Ulee Lheue Banda Aceh cleaned the dirt on the sheet leaves using flowing water so that no land is left behind. After washing, *Ulva Lactuca* dried for more than one week until the sheet leaves were brittle. The next step is to destroy *Ulva Lactuca* using a blender until it becomes a powder. The extraction process uses the method of maceration using water as a solvent at room temperature for 3x24 hours. Every 24 hours, filtered, the solvent is replaced with a new one. The Extract was obtained, mixed, and concentrated by using Rotary tools evaporator. Using water as a solvent is because balance is more easily obtained, stable, non-toxic, not volatile, and non-flammable, so it is safe to use (Saada, 2015). Another reason for using water as a solvent is because this study aims to see the effectiveness of the water extract of *Ulva Lactuca* as antiobesity so eventually safe if consumed by humans as herbal tea sea lettuce. Rats acclimatized during the first seven days in a quiet room with the given drink and fed enough and sufficient air circulation. Rats were conditioned to obesity induced by fructose 66% in drinking water and given the fat feed for 21 days. The purpose of this induction is that the weights of the rats are obese with a weight of >20% of the initial weight (Patonah, 2011). 28 of the Mouse are grouped into 7 using Complete Random Design (RAL) with grouping as follows:

1. Normal control = the group of rats given only the usual feed and not given any treatment.
2. Positive control = group rats have conditioned obesity but were not given the Extract.
3. Control Treatment= the group of normal mice given the Extract,
4. P1= the group of obese mice + extract 300 mg/kg
5. P2= the group of obese mice + extract 400 mg/kg
6. P3= the group of obese mice + extract 500 mg/kg
7. P4=a group of obese mice + orlistat (as a drug comparator)

A group of normal mice is used to determine whether there is a change in the treated group. The positive control group was used as a reference to compare the weight gain during the observation. The control treatment is a group of normal mice given the Extract to see if the water extract of *Ulva Lactuca* effect on mice is standard. The administered dose is 400 mg/kg as the middle dose. Groups P1, P2, and P3 are a group of obese mice with different amounts (300, 400, and 500 mg/kg). Group P4 is a group of obese mice given the drug as a medicine comparison to see the effectiveness of the Aqueous Extract as antiobesity.

Treatment of the Extract was done for 28 days. The measurement is done in 7 days. The parameters observed in this research are the weight of the rats and the levels of blood cholesterol. The body weight of the rats was weighed using digital scales. The cholesterol level in rats using the easy tool *touch* by taking blood from the blood vessels of the peripheral part of the rats' tail as much as 0.05 ml using a small needle and sterile (Rusmini, 2019). The Data obtained will be analyzed statistically (ANOVA) using SPSS using *one-way* ANOVA with a $P< 0.05$.

Results

Table 1. Test Results of The Phytochemical Extracts of Water Sea Lettuce (*Ulva Lactuca*)

The content of Metabolites	Reagent	Results	Results of the Observations
Alkaloids	Mayer	-	Not Formed a White Precipitate
	Wagner	-	Not Formed a Brown Precipitate

	Dragendorff	-	is Not Formed Precipitate Red
Steroids	Test Liebermann-Burchard	+	Formed Green Color
Terpenoids	Test Liebermann-Burchard	-	is Not Formed Red
Saponins	Distilled water	+	Foaming
Flavonoids	Hcl and Metal Mg	-	Not Formed a Reddish Color
Phenols/Tannins	FeCl3	+	Formed Green Color

Source: *Primary Data, 2021*

Table 2. The Average Weight of The Rats Before and After Obesity

Group	The Average Weight of the Rats	
	Before obesity	After Obesity
KN	199±2 [a]	197,3±1,5[a]
K+	199,7±0,57 [a]	284,0±1,00[b]
K-	199±1,00 [a]	188±1,00[a]
P1	198,7±1,15 [a]	289,3±1,15[c]
P2	198,7±0,57 [a]	290,0±1,00 [c]
P3	198,7 ±0,52[a]	289,7±0,57 [c]
P4	199,7±0,57 [a]	291,7±4,7[c]

Source: *Primary Data, 2021*

Table 3. The mean Weight of Mice after Obesity and Given Preferential Treatment

Group	**The Average Weight of the Rats**				
	Obesity	**H7**	**H14**	**H21**	**H28**
KN	197,3 of±1.5[a]	199±1[b]	203±2,6[b]	202,0±2,6[b]	205±1[b]
K+	284,0±1,00[b]	of 285.0±1[c]	286,0±0[d]	288,0±1[e]	290,0±1[f]
K-	188±1,00[a]	195,3±0,57[a]	195,0±1[a]	194,7±1,15[c]	194,0±1[a]
P1	289,3±1,15[c]	288,7±2,30[d]	288,7±1,15[e]	286,7±0,57[e]	286,3±0,57[e]
P2	290,0±1,00 [c]	288,7±1,52[d]	287,3±0,57 [e]	286,3±0,57[e]	284,7±1,52 [e]
P3	289,7±0,57 [c]	286,3±1,52[c,d]	284,7±0,57[c]	282,7±0,57[d]	280,7±0,57 [d]
P4	291,7±4,7[c]	288,3±1,52[d]	283,7±0,52[c]	276,3±1,52[c]	263,3±1,52[c]

Source: *Primary Data, 2021*

The process of Extraction and Phytochemical Content of Lettuce Sea

Sea lettuce has a structure such as a thin sheet of resemble colored plastic green transparent. In making the Extract, sea lettuce should be cleaned from dirt and then dried for a couple of days. After the drying process, sea lettuce is crushed into powder using a blender and ready to be extracted. The extraction process on the lettuce sea was carried out by maceration using water as a solvent.

Ulva Lactuca is a type of algae that contains chlorophyll. It can absorb the free radicals with antioxidant activity (Ulaan, 2019) and significantly use herbal medicine as a raw material. Based on the above table, the content of phytochemical extracts water lettuce sea is not all detected, from 6 range of metabolites in checking only three positive (contained), namely steroids, saponins, and phenols/tannins. In contrast, alkaloids, terpenoids, and flavonoids were not detected. The results of the phytochemical screening are not much different from the previous (Zulfadhli, 2018), using ethanol as a solvent and seen as a compound of alkaloids, steroids, and tannins. Alkaloids, terpenoids, and flavonoids were not detected in the extraction results can be due to the nature of the polar Extract and just a little bit contained in the section so that it is pulled hard by solvent water and ethanol. *Water* is a polar solvent that can extract other components that are nonpolar or semi-polar. Steroids are a class of soluble compounds In the nonpolar solvent (Saada, H, and Nurhasanawati, 2015) so that the steroid is detected in the water extract of *Ulva Lactuca*. Properties of the phenols tend to be easy to dissolve in water because, generally, phenol binds with sugar as glycosides are usually stored in the cell's vacuole. The role of phenol as the material forming the cell wall, defense, and antioxidants (Henry, 2015).

Weight Rat

The results of weighing (BB) are performed before conditioned obesity, after obesity, and day-to-7,14,21 after administration of the Extract. Based on table 2. the rats were conditioned to be obese by feeding a high-fat weight gain while the standard and control groups with negative weight are still in the

normal category. The above data indicate the presence of a significant rise between the group of normal mice and mice that were conditioned to obesity. The increase in BB in the group conditioned obesity was caused due to the effect of feeding with high fat. High fat intake can increase the weight of the rats. Excess fat will be metabolized into triglycerides in the body and stored in the adipose tissue resulting in increased body weight (Hardiningsih, 2006). In the negative control group (K-), a minor experience weight loss. This is due to physiological factors in rodents, such as stress. Table 3 shows the difference in body weight in rats in each group. Weight group KN each normal from day 7 to day 28, although it tends to rise not significant. Significance in the group of rats K+ remains in the condition of obesity, and it is because the rats still got the intake foods high-fat content. A group of normal mice that gave the extract treatment did not change body weight, proving that the aqueous Extract of *Ulva Lactuca* in normal mice did not affect the body weight of rats.

Group P1 during the days 7, 14, 21, and 28 days experienced no significant change in body weight, even remaining. Such circumstances could be caused because the dose is low, so we have not been able to provide tangible effects for changes in the bodyweight of rats. Administration of the Extract in groups P2 and P3 affects weight loss more than in group P1. It is seen that the importance of the rats by decreasing from day 14 to day 28. Weight loss in groups P1, P2, and P3 could not reach the standard weight compared to the control group.

Weight loss in obese mice is caused due to the activity of the active compounds in the water extract of *Ulva Lactuca.* Table 1 above has already mentioned that the water extract of *Ulva Lactuca* contains compounds steroids, saponins, and phenols/tannins. Darusman (2001) stated that the two groups of compounds that are thought to play a role in addressing obesity are flavonoids and tannins. Saponins are trusted as a compound suspected to have a role in antiobesity with a mechanism through inhibition of the activity of the enzyme lipase, which hydrolyzes fats into monoglycerides and fatty acids (Ruiz. et al. 2005). Tannin can precipitate the proteins on the surface of the small intestine because it is easy to bind with proteins that reduce the absorption of food. Thus, the process of fatness can be inhibited (Widyati. 2012). Tannins also have an essential role in lowering lipids, inhibiting the enzyme lipase so that the lipid is a bit absorbed by the body (the Princess). Orlistat is an agent that inhibits gastrointestinal lipases. The lower enzyme activity that is produced intestinal reduces about one-third of the amount of fat absorbed from food (Moyers 2005).

Although the highest dose is capable of weight loss but does not yet rival the effectiveness of or silat used as a comparison, the mechanism of orlistat inhibiting the stomach and pancreas lipases is reversible. Lipase has an essential role in the digestion of dietary fat. Lipase works to break down triglycerides into free fatty acids and monoglycerides, which can be absorbed. Orlistat covalently binding residues serine of the active site of the lipase and disable it. Inactivation of lipase prevents the hydrolysis of triglycerides so that free fatty acids are not absorbed. The majority (over 99%) of the drug is bound to plasma proteins (lipoproteins and albumin is a protein binder main) (Bansal, 2020). The results of this study are similar to that conducted by the Widiyaningsih (2015), namely, the administration of ethanol extract of *Ulva Lactuca* with a dose of 50, 100, and 200 mg/kg body weight have not been able to lose the weight that is given a high-fat diet.

Conclusion

Water extract of *Ulva Lactuca* containing compounds steroids, saponins, and phenols/tannins. The Aqueous Extract of *Ulva Lactuca* does not affect the body weight groups of normal mice but affects the weight of obese mice, although not significant. Treatment water extract of *Ulva Lactuca* for 28 days has not been able to lose weight significantly and returned to average compared with the group of P4 and the standard control group.

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Author Contributions and Competing Interest

The author has carried out all research activities. All research members played an important role in this research. We also use the services of a translator for this article

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