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RESEARCH ARTICLE

COMBINATION EFFECT OF MANGO LEAF WATER EXTRACT (*Mangifera indica*L.) AND CHINESE BETEL LEAVES (*Peperomia pellucida*L. Kunth) ON BLOOD SUGAR LEVELS OF MALE WHITE RATS (*Rattus norvegicus*) DM TYPE 2

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Abstract

Background: *Diabetes mellitus (DM) is a disease caused by metabolic abnormalities that occur in the pancreatic duct. DM is characterized by an increase in blood sugar levels (KGD) and is often said to be a state of hyperglycemia, in this condition there is a total reduction in insulin by the pancreas.*

Research method: *This observation has a laboratory experimental character using a post test only controlled group design in male white mice with diabetes mellitus type 2 (T2DM).*

Results: *The p value for the initial KGD was <0.138, the p value for the KGD in the first week of HFD administration was <0.310, the p value for the KGD in the 2nd week of HFD administration was <0.378, the p value for the KGD in the 3rd week of administration HFD was <0.333, the p value for KGD in the 4th week of HFD administration was <0.241.*

Conclusion*: The combination of mango leaf water extract at a dose of 200 mg/kgBW and Chinese betel leaf at a dose of 200 mg/kgBW was more effective in reducing KGD compared to the other groups.*

Keywords: Diabetes Mellitus, Blood Sugar Levels, High Fatty Diet

1. INTRODUCTION

Diabetes mellitus (DM) is a disease caused by metabolic disturbances occurring in the pancreas. DM is characterized by elevated blood sugar levels (BGD), often referred to as hyperglycemia. This condition occurs when the pancreas produces a decrease in insulin.[1]

A person's blood glucose concentration is stable, at around 80-100 mg/dl. After consuming carbohydrates, the blood glucose concentration can increase to 120-130 mg/dl. A blood glucose level that is higher than stable is considered hyperglycemia, and a blood glucose level that is lower than stable is considered hypoglycemia. Blood glucose is influenced by both endogenous and exogenous factors.[2]

Based on *International Diabetes Federation*(IDF, 2021), the prevalence of DM is increasing generally and as a health disorder, the population of DM sufferers in the 2021 period is estimated to be around 537 million adult individuals aged 20-79 years.[3]The prevalence of DM in North Sumatra Province according to Riskesdas data for the 2018 period is ranked 10th in the region with the highest prevalence reaching a percentage of 1.9%.[4]The highest prevalence of diagnosed DM in people aged >15 years in North Sumatra province is in the Binjai area, which is around 2.04%, and the lowest prevalence is in Humbang Hasundutan, which is around 0%.[5]

2. RESEARCH MATERIALS AND METHODS

Each composition used in this observation was: 30 male white mice, mango leaf water extract, Chinese betel leaf water extract, rat husks and feed (commercial pellets), PAM water (drinking), High fatty diet (HFD) food, label paper, 0.9% NaCl solution, aquabides, permanent marker. This observation is of a laboratory experimental character using an observational design.*post test only controlled group design*In male white mice with type 2 diabetes mellitus (DMT2), there were 6 treatment groups, resulting in a total of 30 observation samples, consisting of:

1. Group 1: normal, mice were not given any treatment.
2. Group 2: negative control, rats induced with alloxan (170 mg/kgBW) + HDF (4 ml/day)
3. Group 3: positive control, rats induced with alloxan (170 mg/kgBW) + HDF (4 ml/day) and given metformin (45 mg/kgBW/day)
4. Group 4: rats were induced with alloxan (170 mg/kgBW) + HDF (4 ml/day) and given a combination of Chinese betel leaf

water extract (100 mg/kgBW) and mango leaves (100 mg/kgBW).

5. Group 5: rats induced with alloxan (170 mg/kgBW) + HDF (4 ml/day) and given a combination of Chinese betel leaf water extract (150 mg/kgBW) and mango leaves (150 mg/kgBW)
6. Group 6: rats were induced with alloxan (170 mg/kgBW) + HDF (4 ml/day) and given a combination of Chinese betel leaf water extract (200 mg/kgBW) and mango leaves (200 mg/kgBW).

3. RESEARCH RESULT

Table 1. Initial KGD

Group	Mean ± SD (mg/dL)	P-value
K1	96,0 ± 7,84	<0,138
K2	96,8 ± 5,67	
K3	91,2 ± 5,93	
K4	99,8 ± 2,39	
K5	90,2 ± 8,81	
K6	91,4 ± 5,03	

The p-value for the initial KGD was <0.138, which means there was no significance, so there was no meaningful difference between the groups.

TABLE 2. KGD HFD WEEK 1

Group	Mean ± SD (mg/dL)	P-value
K1	97,2 ± 2,17	<0,310
K2	95,4 ± 3,44	
K3	99,2 ± 5,50	
K4	96,4 ± 6,19	
K5	93,6 ± 5,77	
K6	92,4 ± 5,03	

The p-value for KGD in the first week of HFD administration was <0.310, which means there was no significance, so there was no significant difference between the groups.

TABLE 3. KGD HFD WEEK 2

Group	Mean ± SD (mg/dL)	P-value
K1	93,2 ± 14,43	<0,378
K2	87,2 ± 9,58	
K3	88,4 ± 9,87	
K4	102,0 ± 13,11	
K5	96,2 ± 12,15	
K6	91,8 ± 8,67	

The p-value for KGD in the 2nd week of HFD administration was <0.378, which means there was no significance, so there was no significant difference between the groups.

Table 4. KGD HFD Week 3

Group	Mean ± SD (mg/dL)	P-value
K1	97,2 ± 2,17	<0,333
K2	99,6 ± 3,85	
K3	91,0 ± 1,58	
K4	93,4 ± 8,47	
K5	95,6 ± 9,34	
K6	90,8 ± 11,12	

The p-value for KGD in the 3rd week of HFD administration was <0.333, which means there was no significance, so there was no significant difference between the groups.

Table 5. KGD HFD Week 4

Group	Mean ± SD (mg/dL)	P-value
K1	95,8 ± 9,63	<0,241
K2	99,0 ± 8,19	
K3	86,6 ± 11,33	
K4	87,8 ± 8,84	
K5	87,2 ± 7,50	
K6	90,0 ± 11,05	

Caption: ANNOVA test
K1: normal, **K2**: negative control**K3**: positive control**K4**: the treatment group was given a

combination of 100 mg/kgBW mango leaf water extract and 100 mg/kgBW Chinese betel leaf,**K5**: the treatment group was given a combination of 150 mg/kgBW mango leaf water extract and 150 mg/kgBW Chinese betel leaf,**K6**: the treatment group was given a combination of 200 mg/kgBW mango leaf water extract and 200 mg/kgBW Chinese betel leaf.

The p-value for KGD in the 4th week of HFD administration was <0.241, which means there was no significance, so there was no significant difference between the groups.

DISCUSSION

After 15 days of administering the extract, the reduction in KGD was better in the K6 group which was given a combination of 200 mg/kgBW of mango leaf water extract and 200 mg/kgBW of betel leaf compared to the other treatment groups, namely the K4 and K5 groups.

According to research conducted by Rahayuningsih et al., 2021, mango leaf extract at a dose of 294 mg/kgBW has an antihyperglycemic effect on DM-induced rats. According to research conducted by Hanifa et al., 2023, Chinese betel leaf extract at a dose of 80 mg/kgBW can reduce blood glucose levels in DM-induced rats. Flavonoids found in mango and Chinese betel leaves increase antioxidant enzyme activity and can regenerate damaged pancreatic β cells. Flavonoids also have antidiabetic activity by inhibiting the α-glucosidase enzyme.[6,7]

4. CONCLUSIONS AND SUGGESTIONS

The combination of mango leaf water extract at a dose of 200 mg/kgBW and Chinese betel leaf at a dose of 200 mg/kgBW was more effective in reducing blood glucose compared to the other groups.

5. THANK-YOU NOTE

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