



9th INDES 2020
LIMITLESS MIND:
EMPOWERING INNOVATION THROUGH VISUALIZATION



الجامعة
UNIVERSITI
TEKNOLOGI
MARA

Cawangan Perak

PROGRAM
PROCEEDINGS
ABSTRACTS BOOK

The 9th International Innovation, Invention
& Design Competition
INDES2020

17th May – 10th October 2020

PARKA (PORANG SWEET POTATOES WITH KENIKIR LEAVES FOR ANALOG RICE TO ANTI T2DM)

Bistis Kautsarisma Istadza Kumala¹, I Wayan Wira Yuda², Yasma Aziza Ul Akrimah², Khairul Magfirah Khasanah¹ and Maulida Hikmaranti¹

¹Biology, Brawijaya University, INDONESIA

E-mail: bistiskautsarisma27@gmail.com

²Physics, Brawijaya University, INDONESIA

ABSTRACT

Type 2 Diabetes Mellitus (T2DM) is one of diseases that has clinical symptoms like insulin resistance and caused by an unhealthy lifestyle that consumes many foods with high glycemic levels. One of way to prevent hyperglycemia is to consume foods with a low glycemic index. Porang, have the lowest glycemic index values among other tubers. Considering that porang are still rarely used, an innovation, is analog rice from porang sweet potatoes fortified with kenikir leaves as an antidiabetic food for T2DM patients. Quercetin from kenikir leaves can reduce glycemic levels without eliminating carbohydrate content. Tests were carried out in vivo by mice with 6 different group treatment and in silico by docking to determine the effectiveness of this analog rice. Another test is the organoleptic test on 100 people to determine the feasibility of this rice for consumption. The results of the in vivo test showed that DMP group treatment with diabetic has decrease the glycemic index after fed by the analog rice, organoleptic test showed that the rice was acceptable for consumption by people with type 2 diabetes mellitus. In silico test show that glucomannan porang and quercetin kenikir can inhibit the type 2 diabetes by Nf-Kb pathway.

Keywords: analog rice, diabetes, glucose, porang, quercetin

1. INTRODUCTION

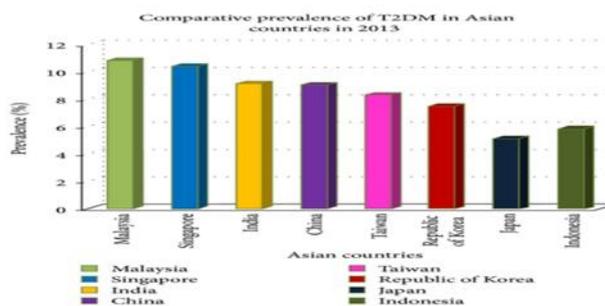


Figure 1. Comparative prevalence of T2DM in Asian countries in 2013 (Abdullah et al., 2014)

Type 2 diabetes Mellitus (T2DM) is one of diseases that has clinical symptoms like insulin resistance and caused hyperglycemia. In 2013, the *International Diabetes Federation* (IDF) estimated that Asia has prevalence 6-11% patients T2DM and become the one of epicenter [1]. One way to prevent TD2M is by eat foods with low glycemic index. One of them is porang tubers (*Amorphophallus muelleri* Blume), with high glucomannan content (41.3%) and has a glycemic index of 14. Kenikir (*Cosmos caudatus*) leaves has

high quercetin. Glucomannan and quercetin can reduce blood sugar levels [2]. So, the innovation product is analog rice from porang sweet potatoes fortified with quercetin from kenikir leaves extract as an anti TD2M.

2. MATERIAL AND METHOD

2.1 Material

Material used is porang, kenikir leaves, mice, injection tool, STZ, glucometer

2.2 In Vivo Test

There are 5 process: 1. Porang feed and Kenikir Leaves extraction, 2. Experimental animals preparation (mice) 3. Mice Treatment (Table 1) 4. Measurement of blood glucose with glucometer.

Table 1. Treatment in Mice

NormalL (NDM)	Treatment				
	DM0	DMCA/DMCF	DMP	DME	DMPE
Standard food	STZ + standard food.	STZ by acarbose (6.5 mg/kg BW/fenofibrate 26 mg/kg BW) + standard food	STZ + 5 gram/day porang	STZ + kenikir extract (420 mg/kg BW) + standard food	STZ + porang + kenikir leaves extract.

2.3 In Silico Test

Molecular docking between NF- κ B PDB ID: 3GUT with Glucomannan ID 24892726 and Quercetin ID 5280343.

2.4 Analog Rice

Analog rice was made by the extrusion method. Porang tubers are peeled, washed, thinly sliced, soaked in a solution of 0.3% Sodium Bisulfite for 1 hour, dried at 100 ° C for 20-22 hours and ground. The results of the grinding are flour. Flour purification by mechanical (sifted) and chemical (13 ml ethanol 95%), to remove the calcium oxalate crystal content that causes itchy. Preparation quercetin treatment from kenikir leaves was made by water extraction. Analog rice process: formulations (5kg porang flour, 500 ml kenikir extract, water, lipids, binding material (6% Sodium alginate)), preconditions (temperature 80-90 ° C), extrusion (granulated analog rice) and drying) and product finished [3].

2.5 Organoleptic Test

Product was used questionnaire with 100 people and the parameter was color, form, texture and flavour.

3. RESULTS

In vivo test showed that all treatment groups had a significant decrease in blood glucose. The DMP treatment had the largest decrease in blood glucose levels from 100% down to 67.6%. Showed that combination more effective (Figure 2). Glucomannan is a low carbohydrate dietary fiber that's able to slow the process of emptying the stomach. Flavonoids on kenikir leaves are able to reduce glucose compounds in the small intestinal mucosa through inhibition of enzymes that can suppress the digestive rate of polysaccharides into monosaccharides [2]. In silico test showed that glucomannan and quercetin compounds were able to inhibit insulin resistance in type 2 diabetes mellitus patients in NF- κ B pathway through inhibition of NF- κ B translocation into cytoplasm which can activate several proinflammatory cytokines. This is proven by glucomannan binding energy with NF- κ B of -360.45 kcal / mol with 4 amino acid residues that bind to NF- κ B namely GLY352, LEU548, ARG351, ASN547, while quercetin is able to bind to NF- κ B with binding energy of -246.8 kcal / mole, and 3 amino acid residues that bind to NF- κ B namely LYS221, ARG246, GLN220 which some of them are active sites of NF- κ B, so they are capable of binding to ligands. Both ligand compounds have the ability to hypoglycemic activity and reduce blood glucose (Figure 3). Organoleptic product result that 70% people interested with colouring, form, texture and flavour of the product (Figure 4).

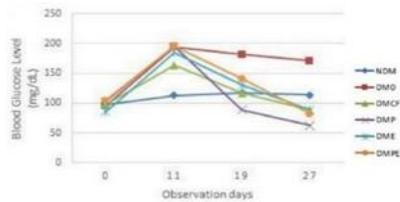


Figure 2. Result in vivo test

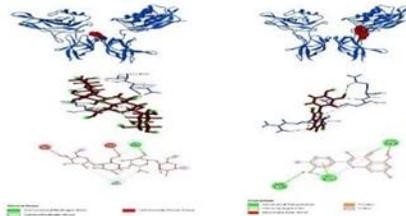


Figure 3. Result in silico pathway



Figure 4. PARKA product

REFERENCES

1. Abdullah, N., Attia, J., Oldmeadow, C., Scott, R. J., & Holliday, E. G. (2014). The architecture of risk for type 2 diabetes: understanding Asia in the context of global findings. *International journal of endocrinology*, 2014.
2. Fatchiyah. (2018). *Kajian Nutrigenomik dan Kesehatan: Nutrisi Berbasis Genomik dan Proteomik*. Ub press, Malang Indonesia.
3. Budi, F. S., Hariyadi, P., Budijanto, S., & Syah, D. (2013). Teknologi Proses Ekstrusi untuk Membuat Beras Analog (Extrusion Process Technology of Analog Rice). *Jurnal Pangan*, 22(3), 263-274.



Surat kami : 700-KPK (PRP.UP.1/20/1)
Tarikh : 30 Ogos 2022

YBhg. Profesor Ts Sr Dr Md Yusof Hamid, PMP, AMP
Rektor
Universiti Teknologi MARA
Cawangan Perak



YBhg. Profesor

**PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK
MELALUI REPOSITORY INSTITUSI UiTM (IR)**

Perkara di atas adalah dirujuk.

2. Pihak Perpustakaan ingin memohon kelulusan YBhg. Profesor untuk membuat imbasan (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.
3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna Perpustakaan terhadap semua bahan penerbitan UiTM melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak YBhg. Profesor dalam perkara ini amat dihargai.

Sekian, terima kasih.

“WAWASAN KEMAKMURAN BERSAMA 2030”

“BERKHIDMAT UNTUK NEGARA”

Yang benar