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Research Article

PHARMACOLOGICAL SCREENING OF VARIOUS INDONESIAN HERBALS POTENTIALLY USED AS ANTIDIABETIC

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Abstract: Screening tests on Indonesian herbals as potential antidiabetic have been carried out. Herbals used were *Cajanus cajan*, *Gardenia augusta, Glycine max*, *Nephelium lappaceum*, *Fragaria ananassa, Leucaena leucocephala*, *Centella asiatica, Carica papaya, Piper bettle var. Rubrum* and *Stachytarpheta mutabilis.* The method used refers to the decrease in blood glucose in male mice (*Swiss webster*). *Phaleria macrocarpa* used as a comparison with a dose of 14 mg/kg w/w. Measurement of blood glucose levels were performed before additon of glucose and every 30 minutes for 120 minutes after a glucose solution was added by using a glucometer. The test results showed that the test plant extracts have the ability to lower blood sugar levels. Largest decrease in glucose levels occurred at minute 120. The greatest percentage decline occurred in the plant *Centella asiatica*, it could even pass through the *Phaleria macrocarpa* decreased levels and the smallest found in *Fragaria x ananassa*. Comparison between normal and negative controls gave a significance value.
Keywords: Indonesian herbals, antidiabetic, blood sugar.

1. INTRODUCTION

Diabetes mellitus is an endocrine disease that affects many people around the world. Diabetes for all age groups worldwide was estimated at 2.8% in 2000 and 4.4% in 2030. The total number of diabetics in the estimate rose from 171 million in 2000 to 366 million in 2030. Very high diabetes suffered by men than women, but women have a higher risk of contracting diabetes than men [1, 2].

Use of medication to control diabetes can use natural medicines. The use of natural medicines is supported by several favourable factors. First, the smaller side effects than synthetic drugs because of the natural ingredients work through several mechanisms which are activated by several different chemical compounds so that the total had significantly lower side effects. The second reason is more secure because it works without any harmful properties of the drug use could be as self-selected[3].

Indonesia has medicinal plants as potential anti-diabetic)[4,5,6]. Some of wich commonly used by the general public includes hiris (*Cajanus cajan* (L) Millsp), kaca piring (*Gardenia augusta* (L) Merr), strawberry (*Fragraria x ananassa* Duch), rambutan (*Nephelium lappaceum* L), petai Cina (*Leucaena leucocephala* L), soybean (*Glycine max* (L) Merr, pegagan (*Centella asiatica* (L) Urban), papaya leaves (*Carica papaya* L), sirih merah (*Piper betle* L. var. Rubrum), keji beling (*Strobilanthes crispus* Bl.

Sirih merah (*Piper betlle* L. var. rubrum) are known to grow in the cold air as red betel cannot thrive in hot regions. It is a rare ornamental plant which empirically have different efficacy as anti-cancer, anti-hypertensive, anti kidney stones, anti-hepatitis, and haemorrhoid. This plant is also known to have efficacy in the treatment of herbs that are believed to have the effect of preventing premature ejaculation, anticonvulsant, antiseptic, analgesic, anti-dandruff, anti-diabetic, liver protector, ant diarrheal, maintaining immunity and relieving swelling. A red betel leaf to overcome inflammation of the lungs, inflammation of the throat, inflammation of the gums, inflammation of the breast, bloody nose, and coughing up blood. Effect of active substances contained red betel leaves also can stimulate the central nervous and thinking. Known chemical content based on the results of research using thin layer chromatography of flavonoids, alkaloids, compounds called polyphenols, tannins, saponins, and volatile oil[7].

Soybeans (*Glycine max* (L) Merr grown in Indonesia is the kind of yellow and black. Yellow soybeans are widely used in industry tempe, tofu, and milk. While the black soy sauce used in the manufacture. Soy contains many black anthocyanins the pigment that has antioxidant activity[8]. Genistein and daidzein isoflavones contained in soy is known to have anti-cancer properties [9].

Strawberry (*Fragaria x ananassa* Duch.) is found in Europe and Asia. Most of the crop is cultivated in subtropical regions and in the tropics. In the tropics was planted on a plateau. Parts of this plant are used for the treatment are the leaves, roots and fruit ripening. Fruit, especially seeds and antimutagenic, anti-carcinogenic role. Its roots can be used as a diabetes drug. Its leaves can be used to compress the outer wounds, inflamed digestive tract, respiratory tract inflammation, diarrhea, kidney disorders such as kidney stones and a diuretic, liver disease, jaundice, rheumatoid arthritis, gout, fever medication, and tense nerves[10].

Pegagan (*Centella asiatica* (L.) Urban), is a wild plant in Indonesia and tropical climatic regions, in general from the plains to a height of 2,500 meters above sea level. Centella asiatica growing in the open or slightly shaded, on damp soil and lush as in the moor, pasture, or in the field[11]. Centella works to improve blood circulation, laxative urine (diuretic),

increased neural memory, hypertension, cure wounds and ulcers, improve digestion, treat leprosy, and stimulants. In addition, gotu kola also works to increase the repair and strengthening skin cells, stimulate growth of nails, hair and connective tissue[12].

Petai china, lamtoro (*Leucaena glauca* Benth), leaves contain alkaloid, protein, myosin, saponins, flavonoids and tannins. Seeds lamtoro efficacious as anthelmintic, laxative fart, diabetes drugs, antispasmodic, antitumor, eczema. While its roots are widely used as a laxative menstruation. Besides lamtoro also be used as a contraceptive in men[13].
Hiris (*Cajanus cajan* L. Millsp)[14] leaves contain flavonoids, saponins, and polyphenols while stem contains flavonoids, saponins and tannins. Curable Disease: Jaundice (jaundice), cancer sores, cough, diarrhea, abdominal disorder, worms, cough with phlegm, cuts, bruises. Part used: Leaves, roots, and seeds.

Kaca Piring *(Gardenia augusta* L.Merr) is an annual herbaceous tribe of coffee-copy or Rubiaceae. *Gardenia augusta* and *Gardenia jasminoides* of research experts substances known to have oil evaporated compounds. Diseases that can be treated diabetes mellitus, sprue, fever, difficult defecation[15].

Rambutan (*Nephelium lappaceum* L.) The name *rambutan* is derived from the Indonesian word *rambutan*, meaning "hairy": diseases that can be treated: Rind efficacious as fever. Nutritious seeds lower blood sugar (hypoglycemic). Plant part used is the skin of the fruit, bark, leaves, seeds, and roots. Rind used to treat dysentery, fever. Bark used to treat cancer sores. Leaves are used to treat diarrhea, black hair. Roots used to treat fever. Seeds used to treat diabetes (diabetes mellitus)[16].

Keji Beling (*Strobilanthes crispus* Bl) leaves contain alkaloids, saponins, flavonoids and polyphenols[17]. Diseases that can be treated tumors, diabetes mellitus, liver (jaundice), piles (hemorrhoids), cholesterol, ulcers, can hit the snake and the black ant.
Papaya (Carica papaya L.) originally from Central America. Besides the leaves, roots and papaya latex also contains papayotin, karpain, kautsyuk, karposit and vitamins[4]. Treatable disease: kidney stones, hypertension, malaria, leucorrhoea, rheumatism, malnutrition, urinary tract disorders, excessive menstruation, abdominal pain during menstruation, dysentery, diarrhea, acne, gray hair.

This study aims to screen all ten plants traditionally known as antidiabetic drugs by the method of reduction of blood sugar in mice.

2. Materials & Methods

2.1 Materials

The materials used are simplicia of hiris (*Cajanus cajan* (L) Millsp), kaca piring (*Gardenia augusta* (L.) Merr.), strawberry (*Fragraria x ananassa* Duch), rambutan (*Nephelium lappaceum* L.), Petai Cina (*Leucaena leucocephala* Benth), soybean (Glycine max L. Merr), Pegagan (*Centella asiatica* (L) Urban), papaya leaves (*Carica papaya* L), Sirih merah (*Piper betle* L. *var. Rubrum*), Keji beling (*Strobilanthes crispus* Bl); for extraction, namely ethanol (70% & 96%); to test decrease blood sugar levels the distilled water, glucose, and the PGA; experimental animals used were white mice (Mus muculus) male, age 3-4 months, weight 20-30 grams.

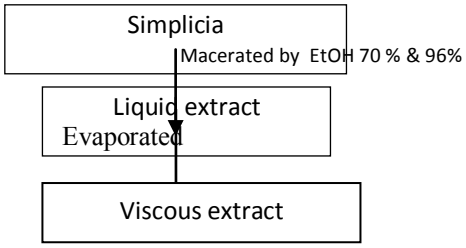
Tools

The tools used in the extraction process, namely stirred bar, glass beaker, vaporizer bowls, measuring cups, macerator, pipette drops, vacuum pumps, rotary evaporator, analytical scales; to test blood sugar levels decrease in the glucose meter and glucose test strips GlukoDr ™ Blood Test Meter, knives, restrainer, stopwatch, syringes, and scales.

2.2 Methods

The method used to obtain the extra plants by performing the extraction stage.

- Extraction



- Test of blood sugar levels drop
- Research methods to test the activity of insulin sensitivity by dividing the mice into 13 groups with each group number as many as five animals, namely:

1. Normal Control Group: PGA 2%
2. Negative (-) Control Group: PGA 2% + glucose 2.8 mg/kg w/w
3. Comparison group: Mahkota Dewa (*Phaleria macrocarpa)* + PGA 2% + 2.8 mg/kg w/w
4. Test group 1: Hiris (*Cajanus cajan* (L) Millsp + PGA 2% + glucose 2.8 mg/kg w/w
5. Test group 2: Kaca piring (*Gardenia augusta* (L.) Merr.) + PGA 2% + glucose 2.8 mg/kg w/w
6. Test group 3: Strawberry (*Fragraria x ananassa* Duch) + PGA 2% + glucose 2.8 mg/kgw/w.
7. Test group 4: Rambutan (*Nephelium lappaceum* L.) + PGA 2% + glucose 2.8 mg/kgw/w8.
8. Test group 5: Petai Cina (*Leucaena leucocephala* Benth) + PGA 2 + glucose 2.8mg/kgw/w
9. Test group 6: Keji beling (*Strobilanthes crispus* Bl) + PGA + 2% glucose + 2.8 mg/kg

10. Test group 7: Soybean (*Glycine max* L. Merr) + PGA 2% + glucose 2.8 mg/kg w/w

11. Test group 8: Pegagan (*Centella asiatica* (L) Urban) + PGA 2% + glucose 2.8 mg/kg w/w

12. Test group 9: Papaya leaves (*Carica papaya* L) + PGA 2% + glucose 2.8 mg/kg w/w

13. The test group 10: Sirih merah (*Piper betle* L. var. rubrum) + PGA 2% glucose + glucose 2.8 mg/kg w/w

Given the same treatment for all of these groups. Fasted 2 hours, blood sampling performed on all mice before administration of glucose and insulin (t = 0), and every 30 minutes to 120 minutes (minutes 0, 30, 60, 90 and 120) after being given glucose 14 mg / kg w/w.

Blood glucose measurements performed using a glucose meter and glucose test strips. The end mice cut, then the blood dripped to the end of the strip and after 20 seconds the blood glucose level will appear on the monitor glucose meter.

From the observations decrease blood sugar levels in the blood of mice, obtained data on the number average reduction in blood sugar levels for 2 hours. To prove that the blood sugar levels will decline after addition of the 10 extracts, we should know the difference of the blood sugar levels decrease between the treatment group and the control and the comparison groups. Analysis was conducted Variants (ANOVA) Statistical analysis using Student's t test on a real level of 0.05.

Newman-Keuls test performed to determine the decrease in blood sugar levels of the test plants in mice given the highest impact on blood sugar levels drop. The test is performed when the ANOVA test results obtained from the data are significantly different or significantly.

3. Results and Discussion

Simplicia Hiris deciduous plants (Cajanus *cajan* (L) Millsp), kaca piring plates (Gardenia a*ugusta*), seed Rambutan (Nephelium *lappaceum*), fruit Petai China (Leucaena *leucocephala*), Soy bean (Glycine *maxmenr*), Pegagan (Centella *asiatica (*L *) Urban*), Papaya Leaf (Carica *papaya L*), Sirih Merah *(*Piper *betle L. var. rubrum*), Keji beling (Strobilanthes *crispus Bl*) of 100 g macerated with ethanol 70% and fruits Strawberry (Fragraria *x ananassa*) of 100 g macerated with 96% ethanol with stirring a few times that aims to allow the flow of fresh solvent repeatedly came across the surface simplicia.

Table 1. Extraction rendemen results

	Simplisia									
	a	***b***	***c***	***d***	***e***	***f***	***g***	***h***	***i***	***j***
Weight (g)	**23,36**	**33,95**	**27,95**	**23,33**	**16,49**	**63,76**	**21,2**	**47,52**	**23,20**	**18.24**
Rendemen (%)	**23,36**	**33,95**	**27,95**	**23,33**	**16,49**	**63,76**	**21,2**	**47,52**	**23,20**	**18.24**

Note: (*a). C. cajans (b). G. augusta (c). F. x ananassa (d). N. lappaceum (e). L. leucocephala (f). C. asiatica (g). G. mar (h). C. papaya (i).* P. *betle (j). S. crispus*

How to calculate of blood sugar levels that make use of glucose tolerance is a pretty prevalent used today. Another common way is to use alloxan induction. For testing glucose levels elapsed areas typically use fasting blood sugar 2 hours. Graph of the average blood glucose levels of mice on the impairment testing of blood sugar levels can be seen in Figure 1. Average blood glucose levels were analyzed statistically using Student's t to see the difference in blood sugar levels decrease compared with the comparator plant *Phaleria macrocarpa.*

From below figures (see Fig. 2. To Fig. 5) along with calculation of Student's t test with a real level of 0.05, and Newman-Keuls test, it can be seen significant results in the Hiris (*Cajanus cajan* (L) Millsp group againts the negative (-) control , Rambutan (*Nephelium lappaceum*) seed, control (N) and Petai Cina (*Leucaena leucocephala*), while the Kaca piring (*Gardenia augusta* (L.) Merr.) group, Keji beling (*Strobilanthes crispus* Bl, Pegagan (*Centella asiatica* (L) Urban), Sirih merah (*Piper betle* L. var. Rubrum) and papaya addressing significant results against a Normal control and Rambutan (*Nephelium lappaceum*) seeds, besides the soybean group, Mahkota Dewa (*Phaleria macrocarpa)*, Petai Cina (*Leucaena leucocephala*) and negative (-) control yielded significant results only for the N (normal) control group.

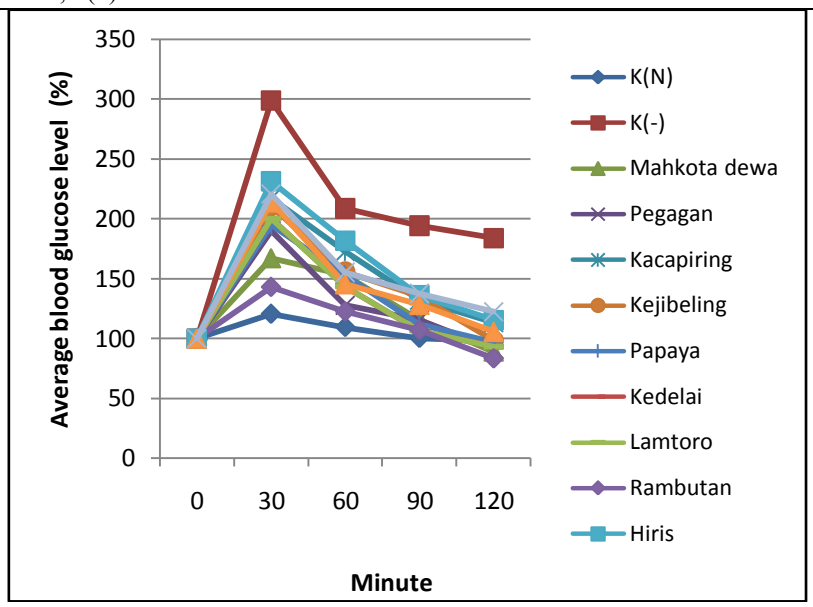


Fig.1 The average blood glucose levels (%) of mice on activity assays medicinal plant extracts

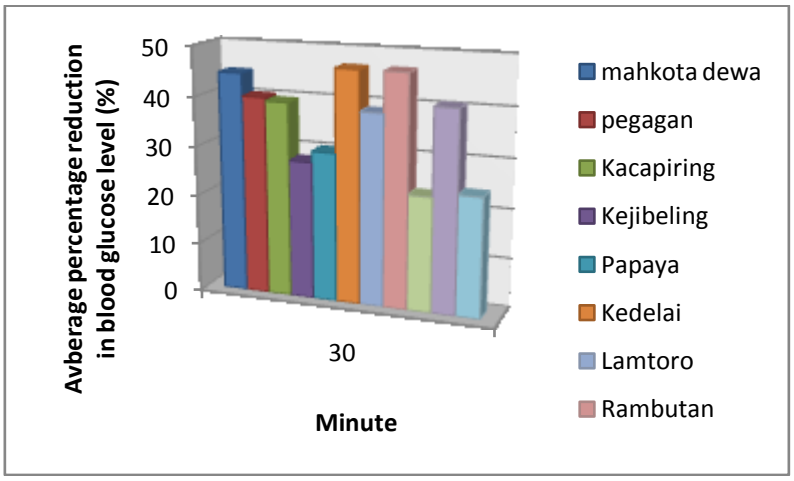


Fig. 2 The average percentage reduction in blood glucose levels (%) of mice in the 30th minutes

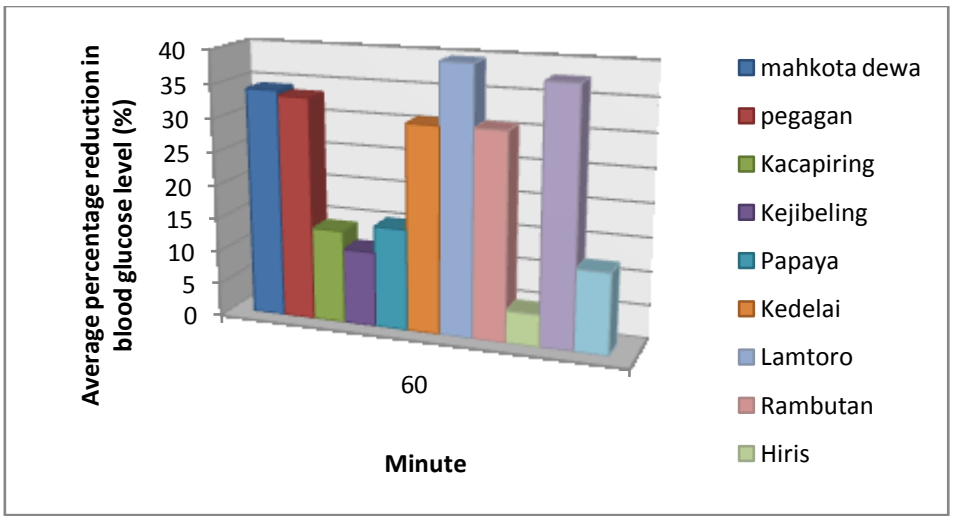


Fig 3: The average percentage reduction in blood glucose levels (%) of mice in the 60th minutes

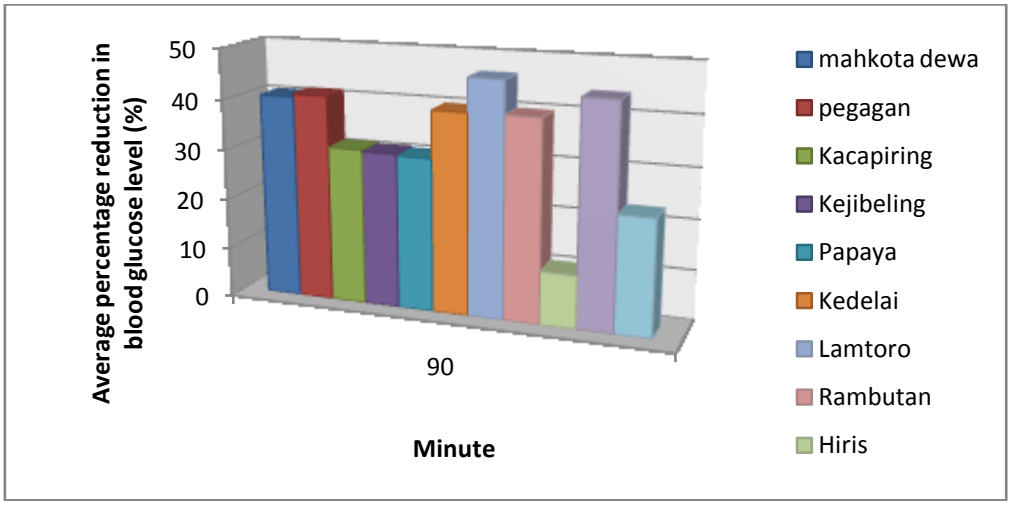


Fig 4: The average percentage reduction in blood glucose levels (%) of mice in the 90th minutes

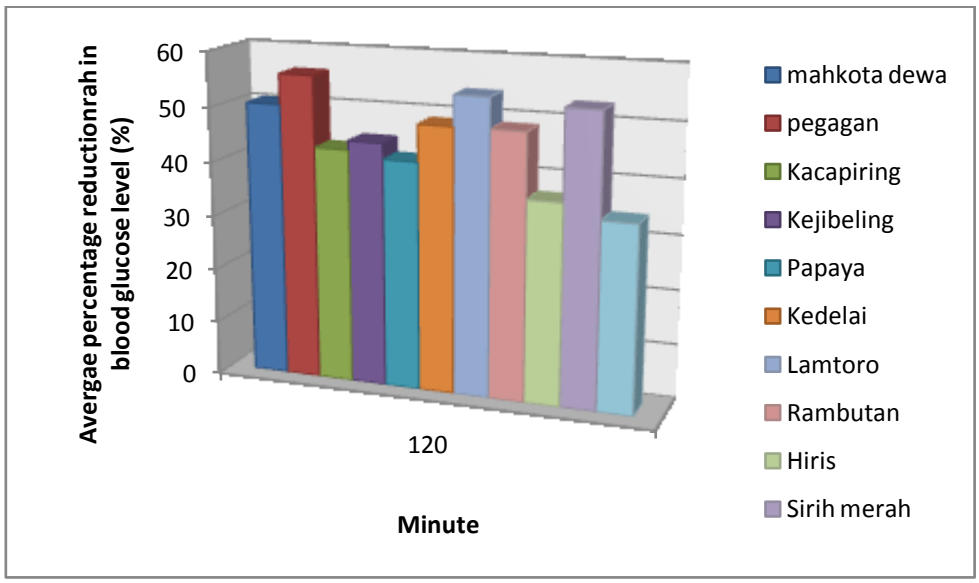


Fig 5: The average percentage reduction in blood glucose levels (%) of mice in the 120th minutes

CONCLUSION

It can be concluded that the test on the test plant extracts the largest decline in levels occurred at minute 120. Greatest percentage decline occurred in Pegagan (*Centella asiatica* (L) Urban), can even decrease over Mahkota Dewa (*Phaleria macrocarpa)* and the smallest found in strawberry plants and comparisons between positive and normal controls provide significant comparisons. This research suggests finding out further elucidated compounds from the above plants which responsible in lowering blood sugar levels to diabetes mellitus.

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