INTRODUCTION

Papaya fruit is a rich source of phytonutrients, minerals, vitamins, and other compounds such as alkaloids, saponins, tannins, and flavonoids, which have antioxidant activity and potential as an antihyperglycemic agent. A previous study revealed that 5 mg/kg BW papaya extract can significantly reduce blood glucose level in experimental mice [1]. Bay leaves, in addition to their use as a food seasoning, have traditionally been used to treat goit, high cholesterol, and diabetic diseases. The active compounds found in bay leaf such as eugenol, tannins, and flavonoids are responsible for the plant’s medicinal properties [2]. Bay leaf extract at a dose of 1.36 mg/kg showed strong antihyperglycemic activity in experimental mice [3].

Flavonoids are found abundantly in papaya and bay leaf, and these groups of compounds play an important role in the pharmacological properties of these plants. Both papaya and bay leaf extracts contain flavonoids, and the combination of these two extracts is expected to have an optimum effect as an antihyperglycemic medicine. In this study, two extracts were combined and formulated into a tablet. The tablet form was selected to formulate papaya and bay leaf extracts into a useful drug because the combination of these two extracts is expected to have an optimum effect as an antihyperglycemic medicine. In this study, two extracts were combined and formulated into a tablet. The tablet form was selected to formulate papaya and bay leaf extracts into a useful drug because the combination of these two extracts is expected to have an optimum effect as an antihyperglycemic medicine.
Institute of Sciences, Bogor Botanical Gardens. Papaya and bay leaves were cleaned and washed under running water and then dried in an oven at a temperature of 60°C. The leaves were then ground and sieved through a 40-mesh sieve to obtain powder for further study.

Characterization of plant materials

**Determination of water content**
The water content of the plant materials was calculated according to the standard method using moisture balance apparatus.

**Determination of ash content**
Ash content was determined after the plant materials were ashed in the furnace at a temperature of 600°C [8].

Extraction of papaya and bay leaves

The extracts of papaya and bay leaves were prepared by the infusion method. 1200 g of papaya leaf powder were immersed in a pot that contained 6000 ml of distilled water. 1000 g of bay leaf powder were immersed in a pot that contained 4000 ml of distilled water. Each pot was then heated and occasionally stirred for 15 minutes. The temperature was gradually increased from 15°C to 90°C. The liquid extract obtained was sieved and dried in a vacuum dryer to obtain concentrated papaya and bay leaf extracts.

Phytochemical test

**Flavonoid test**
The presence of flavonoids was detected using staining methods. The difference in the appearing color (marked in red, orange, or green) shows the variation of flavonoids in the sample.

**Alkaloid test**
The presence of flavonoids was detected using reagent Bouchardat LP. If the second trial does not precipitate, the powder does not contain alkaloids. If the LP Mayer reagent precipitates a white or yellow clot dissolved in methanol, and reagents Bouchardat LP precipitates a brown to black, then there will likely be an alkaloid [9].

**Saponin test**
The presence of saponin is characterized by the formation of foam in an aqueous solution with a height of 1-10 cm, which is stable for no <10 minutes when a drop of hydrochloric acid 2 N was added to the solution [9].

**Tannin test**
The presence of tannin was determined according to a previous method:

a. The addition of 10% gelatin solution produces white precipitate. NaCl-gelatin solution made from 1% gelatin solution in 10% NaCl ratio of 1:1

b. The addition of 3% solution iron (III) chlorides produces green-bluish to black [10].

**Determination of total flavonoids extract**

**Determination of wavelength maximum quercetin**
A total of 10 ml of a standard solution of quercetin in a methanol concentration of 10 ppm was put in a 50 ml flask. The solution added by 1 ml of AlCl3 10%, 1 ml of 1 M sodium acetate and distilled water to the limit of flask. The solution was shaken until it was homogeneous and was left to stand for 30 minutes. The absorbance at a wavelength of 390-760 nm was measured using a spectrophotometer.

**Determination of optimum incubation time**
The solution was measured at the maximum wavelength at 5, 10, 15, 20, 25, and 30 minutes to determine the optimum time.

Calibration curve of standard

Quercetin standard solution series were made 2, 4, 6, 8, and 10 ppm. Standard solution 100 ppm was pipetted 1, 2, 3, 4, and 5 ml into a 50-ml flask. Then, 1 ml of AlCl3 10% and 1 ml of 1 M sodium acetate were added and diluted with distilled water to the limit of flask. The solution was shaken until it was homogeneous, and then, allowed at the optimum incubation time. The solution was then measured at a wavelength of maximum absorbance. Curve was made between the absorbance measurements and quercetin standard solution concentration. It was produced linear regression equation \( y=bx+a \). The regression equation was used to calculate the extract concentration (ppm) by entering the extract absorbance as \( y \)-values into the equation.

**Determination of total flavonoids extract**

200 mg of papaya leaf extract, 54.4 mg of bay leaf extract, and 254.4 mg of a mixture of papaya leaf extract and bay leaves corresponded to 5 times the dose of each formula. Each performed the assay extract manner diluted with methanol to 50 ml and was shaken for 10 minutes to extract soluble in methanol. Each solution of papaya extract, bay leaf extract, and the mixture of papaya and bay leaf extracts were pipetted into a 50-ml flask. Then, 1 ml of AlCl3 10% and 1 ml of 1 M Na acetate was added. Distilled water was added to the limit of flask. The solution was shaken until it was homogeneous and then allowed at the optimum incubation time. Absorption was then measured at the maximum wavelength the resulting absorbance was added to the regression equation of the standard curve quercetin, and the total flavonoid content was then calculated.

**Table 1**: Tablet formulation from papaya and bay leaf extracts

| Materials        | Formulation (%) |
|------------------|-----------------|
|                  | I               | II              | III              |
| Papaya leaf extract | 13.35          | 13.35           | 13.35            |
| Bay leaf extract  | 3.6            | 3.6             | 3.6              |
| PVP K-30         | 1              | 2               | 3                |
| Ac-Di-Sol        | 3              | 3               | 3                |
| Mg stearate      | 1              | 1               | 1                |
| Ac-Di-Sol        | 0.5            | 0.5             | 0.5              |
| Talk             | 2              | 2               | 2                |
| Avicel pH 102 ad. | 100            | 100             | 100              |

PVP: Polyvinylpyrrolidone

A tablet was made using the wet granulation method. All ingredients were sieved using 30 meshes. Papaya leaf extract, bay leaf extract, PVP-K30, Ac-Di-Sol, and Avicel pH 102 were weighed according to the formula. PVP K-30 as a binder solution was prepared by dissolving it in 70% ethanol. All the ingredients were stirred to obtain a homogenous mixture. The binder was stirred into the mixture to enhance the strength of the powder particles. Wettable powders were formed into granules or a moist mass to make a granulation. Moist granules or powder-sieved wet mass was pressed past an 8-mesh sieve to make granules. The granules were dried in an oven that was thermostatically controlled to record a time, temperature, and humidity constant.

**Determination of flavonoid content in the tablet**

The total flavonoid content in the tablet was determined using a method similar to that used to determine the total flavonoid content in papaya and bay leaf extracts. 20 tablets were weighed and then crushed into a fine powder. The powder weighed equivalent to the content of the amount of extract 254.4 mg. A total number of grams of the powdered tablets that had been equated were put in a 50-ml flask along with methanol to the limit. The solution was shaken for 20 minutes using a magnetic stirrer. Then, 2 ml solution was pipetted, 1 ml of AlCl3 10%, and 1 ml of sodium acetate 1 M were added. Distilled water was added...
up to the limit of the 50-ml flask. The solution was shaken until it was homogeneous and then allowed for the optimum time. Absorption was then measured at the maximum wavelength. The resulting absorbance was inserted into the regression equation of the standard curve of quercetin.

RESULTS AND DISCUSSION
Characterization of simplicial
Fresh leaves of papaya and bay plants (Figs. 1 and 2) obtained 9.43% of dry leaf powder. The papaya dry leaf powder has a bright green, a specific odor, and a very bitter taste with 4.84% of water content and 8.7% of ash content. The bay leaf powder shows a dark green, a specific aromatic odor, and a rather chelate and tart taste. The water and ash content of the bay powders were 4.78% and 4.7%, respectively.

The dry extracts of papaya and bay leaves showed slight differences compared to their powder forms, as shown in Figs. 3 and 4. The water content of papaya and bay leaf dry extracts were 4.7% and 4.46%, respectively; the ash content of papaya and bay leaf dry extracts were 9.4% and 8.2%, respectively. The results obtained were in line with the recommended quality standard in which the ash content of bay leaf extract should not be more than 10.1% [11]. The value and quality of extracts varied depending on the extract’s ash content, purity, and contaminants.

Phytochemical test
The results of phytochemical tests conducted on some classes of the main active compounds contained in the dry extracts of papaya and bay leaves showed that both extracts contained flavonoids, alkaloids, saponins, and tannins in moderate-to-high levels.

Total content of flavonoids
The maximum absorption was 430 nm. The optimum incubation time was 20 and 25 minutes with absorption of 0.151 nm. The results of the linearity of the equation y=0.0773x−0.003 with a correlation coefficient of r=0.9998, which confirms the linearity of the relationship between absorbance and concentration.

The total flavonoid content in the dry papaya and bay leaf extracts was 1.562% while the total flavonoid content of the mixture of papaya and bay leaf extract was 4.675%. This data showed that the total flavonoid content of the mixture of dry papaya and bay leaf extracts were higher than level of total flavonoid content from those single extracts. Based on this data, papaya and bay leaf extracts were mixed to obtain higher levels of flavonoid content.

Evaluation of granule characteristics
The characteristics of the granules of dry papaya and bay leaf extracts were determined by measuring the water content, flow rate, friability, and compressibility of the granules, as shown in Table 2.

Evaluation of tablet characteristics
The uniformity in the weight of the papaya and bay leaf tablets was tested by weighing each tablet, and the results were presented as percentages of deviation. The results showed that the uniformity in the weight of the papaya and bay leaves tablets met the quality requirement.
in which the deviation value tablets ranged from 5% to 10% for the tablets that weighed 300 mg or more [12]. The thickness and diameter of the tablets can be seen in Table 3 and Fig. 5. All formulas meet the requirement. Diameter of the tablets was not >3 times their thickness and not smaller than 1.5 times their thickness [12].

The hardness of the tablets that resulted from the third formula is comparable to that of the tablets that resulted from the first and second formulas according to literature and as shown in Table 4, where the hardness of tablets range between 4 and 8 kp [13]. The tablets that resulted from Formula II had the highest hardness compared to the tablets that resulted from Formula I and Formula III. This result could be associated with the high pressure used in the printing process of the tablets yields a high hardness level.

The results of a friability test (Table 5) show that all of the tablet formulas were eligible according to literature, as the average friability ranged between 0.8% and 1% [14]. The highest friability was found in the tablets with Formula III while the lowest friability was found in the tablets with Formula II. The discrepancy in the friability of the tablets may be related to the difference in the moisture content of Formulas I, II, and III.

The disintegration time of the tablets, as shown in Table 6, indicated that all tablet formulas were eligible according to the standard of pharmacopeia, which determined that the disintegration time of a good tablet should be <15 minutes [15]. The disintegration of the tablets was influenced by the concentration of the binder. Formula III has the longest disintegration time. The tablets’ disintegration time was possibly influenced by the tablets’ level of super disintegrants and fillers in the tablets’ formulation. The super disintegrant Ac-Di-Sol used in the tablets has an intense mechanism of destruction although it can be compared to other types of disintegrants at low concentrations. The use of avicel as the filler in the tablet formulas also affected the disintegration time of tablets. According to the literature, the substance that can improve the flow of powder will accelerate the dissolution of the tablet obtained, and hydrophilic derivative compounds such as avicel are not soluble in water; thus, avicel can absorb water into the tablet and facilitate the release and dissolution of the tablet and its content [16].

Table 2: Characteristics of the granules from dry papaya and bay leaf extracts

| Granule evaluation | Formula | I | II | III |
|--------------------|---------|---|----|-----|
| Water content (%)  | 3.30    | 3.53 | 4.16 |
| Flow test (g/s)    | 12.16   | 11.06 | 10.80 |
| Angle of repose (°) | 28.24   | 22.11 | 26.00 |
| Compressibility (%) | 11.76   | 13.32 | 13.47 |

Table 3: The thickness and diameter of the tablets

| Results | Average measurement (cm) |
|---------|--------------------------|
|         | Thickness | Diameter | 1 1/3 | 3  |
| Formula I | 0.393 | 0.957 | 0.524 | 1.179 |
| Formula II | 0.392 | 0.957 | 0.523 | 1.176 |
| Formula III | 0.391 | 0.957 | 0.521 | 1.173 |

Table 4: Average hardness of papaya and bay leaf tablets

| Results | Average hardness (kp) | Hardness range (kp) |
|---------|-----------------------|---------------------|
| Formula I | 5.465 | 4.5-6.5 |
| Formula II | 6.945 | 5.6-8.2 |
| Formula III | 5.810 | 4.7-6.8 |

Table 5: Average of tablets’ friability

| Results | Average friability (%) |
|---------|------------------------|
| Formula I | 0.34 |
| Formula II | 0.27 |
| Formula III | 0.53 |

Table 6: Average of tablets’ disintegration time

| Results | Disintegration time |
|---------|---------------------|
| Formula I | 6 minutes 8 seconds |
| Formula II | 11 minutes 35 seconds |
| Formula III | 13 minutes 97 seconds |

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Fig. 5: Tablets formed from the combination of dry papaya and bay leaf extracts
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