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RESEARCH ARTICLE

Formulation and evaluation of Kirinyuh Leaf effervescent granules (*Chromolaena Odorata. L*) as an antioxidant

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Abstract

Introduction: Kirinyuh leaf is a widely grown plant in Indonesia, containing alkaloids, flavonoids, saponins, tannins, and steroids. Flavonoids are compounds that can capture free radicals or act as natural antioxidants. Effervescent granules can mask the bitter taste and simplify the dissolving process without involving manual stirring. **Aim:** The purpose of this study was to make and evaluate a formulation of effervescent granules of Kirinyuh leaf extract. **Methods:** The granule method was carried out by the wet granulation method. Granule evaluation included organoleptic test, water content test, dissolve time test, flow time test, pH test, and hedonic test. **Results:** Organoleptic test results showed similar granule size, slightly brownish colour, and characteristics of Kirinyuh leaf odour. When examining their quality, the granules produced met the requirements, with moisture content between 0.4% and 0.7%, dissolving time of 30-35 seconds, flow time test of 8-8.5 g/second, and pH of 5.6-5.8; the results of the hedonic test showed that the effervescent granule preparation was much preferred.

Introduction

In Indonesia, several plants, such as Kirinyuh, can be potentially used in traditional medicine. Despite being disturbing for other plants because of its ability to absorb water and nutrients, Kirinyuh has several benefits for human life. In addition to its use in agriculture as an organic fertiliser, biopesticide, and herbicide, it is traditionally used in medicine to treat wounds, diabetes, cough, and bleeding (Saputra *et al.*, 2017). Kirinyuh leaves are also known for their antioxidant and anticancer (against leukaemia) properties (Fitrah *et al.*, 2017).

Kirinyuh leaves contain alkaloids, flavonoids, saponins, tannins, and steroid compounds. The 2,2-diphenyl-1-picrylhydrazyl (DPPH) method used to test the antioxidant activity showed that the methanol fraction had the highest antioxidant activity, with an inhibitor concentration value (IC_{50}) of 9.57 ppm (Saputra *et al.*, 2017). Research findings revealed that the antioxidant capacity of the Kirinyuh leaf extract is 49.04% (Parnanto *et al.*, 2013). Flavonoids are compounds that can neutralise or capture free radicals (such as Reactive Oxygen Species - ROS) and act as natural antioxidants (Feronika, *et al.*,2019).

Effervescent granules are a mixture of acids and bases that, when added to water, produce foam and taste like soft drinks (Hassanbaglou *et al.*, 2012). The advantage of effervescence is that it can cover the unpleasant taste and give a fresh effect when consumed due to the carbonation process of acids and alkalis (Hayaza *et al.*, 2019).

Based on the background, this research was carried out to make and evaluate a formulation of effervescent granules of Kirinyuh leaves to be used as an antioxidant.

Material and method

The tools and materials used in this research were mortar-stampers, laboratory equipment, steam dishes, oven, analytical balance, mesh (14 and 16), pH meter, moisture analyzer, stopwatch, flow tester, Kirinyuh leaves, citric acid, sodium bicarbonate, lactose, polyvinylpyrrolidone (PVP K-30), and aerosol.

Determination

Determination was carried out at the Plant Taxonomy Laboratory of the Department of Biology, Faculty of Mathematics and Natural Sciences, Padjadjaran University.

Material preparation

The plant material used was Kirinyuh leaves obtained from Cicarulang Village, Singaparna District, Tasikmalaya Regency, which had gone through wet sorting, washing, chopping, drying, and dry sorting processes.

Making effervescent granule

The acid component consisted of the dry extract of Kirinyuh leaves, lactose, and citric acid, stirred until they were homogeneous, then added a portion of PVP K-30 that had been dissolved with 70% alcohol until the mass could be clenched. The alkaline component, namely sodium bicarbonate, was moistened with the remaining PVP K-30 solution until the mass could be clenched into a fist. Each component was sieved with a sieve number 14, then dried in an oven at 40^{o}C for 8 hours. Each dry component was sieved again with a sieve number 16. Aerosil, acid components and alkaline components were mixed until they were homogeneous. Table I provides information on the granule formulation.

Table I: Kirinyuh Leaf extract effervescent granule formulation

Material	Formula 1 (g)	Formula 2 (g)	Formula 3 (g)
Kirinyuh Leaf	0.1	0.1	0.1
Sodium Bicarbonate	3	3	3
Citrate Acid	2.1	2.1	2.1
Aerosil	0.05	0.05	0.05
PVP K-30	0.2	0.3	0.4
Lactose	Add 10	Add 10	Add 10

Evaluation of effervescent granules

Organoleptic test

The organoleptic test process was carried out to see the physical appearance of the preparations by observing the colour, odour, and taste.

Water content test

A total of 10 g of granules were put into the moisture balance tool. First, granules were flattened, then the tool was turned on, then the data on the moisture contained in the granules were generated. Effervescent granules that met the moisture content requirements were granules with moisture content between 0.4% and 0.7%.

Flow rate test

A flow rate check was carried out by inserting some granules into the funnel, closed at the bottom, to produce good quality granules. The funnel was then opened slowly until all the granules came out and formed a heap on the graph paper. Granule flow was good if the time required to flow was 100 g/10 s (Anshory *et al*., 2007).

Point of quit test

The point of quit test was obtained by measuring the height and diameter of the granule pile.

Dissolve time test

The granule solubility test was done by putting the weighted sample in 200 ml of water. The time taken to dissolve the entire sample was calculated using a stopwatch. The good dissolving time of effervescent granules was less than five minutes.

pH test

The sample was dissolved in 50 mL of aqua dest in a beaker, then 200 mL of aqua dest were added, then stirred until evenly distributed. The pH of the solution was measured with a pH meter that had been calibrated.

Table II shows the quality inspection results of each formula.

Table II: Effervescent granule quality inspection results

Physical Properties	Formula 1 (g)	Formula 2 (g)	Formula 3 (g)
Water content (%)	0.45±0.02	0.47±0.01	0.48±0.03
Flow Rate Test (g/s)	8.27±0.01	8.31±0.01	8.32±0.01
Point of quit test α (°)	26.67±0.58	27±1.00	28±1.00
pH	5.8±0.10	5.6±0.17	5.7±0.10
Dissolve time test (second)	31.09±0.51	33.30±0.13	35.23±0.03

Hedonic test

Observations were made on colour, smell, homogeneity, and dispersibility by 35 respondents; they observed colour, smell, and taste changes in granule effervescent preparations.

Results

Organoleptic test

The organoleptic examination of all formulas was visible, and the colour of the preparation obtained was light green.

All formulations had a homogeneous appearance seen from the colour and size of the granules. The taste and smell of the preparation were typical of Kirinyuh leaves. Solubility test results met the requirements, dissolving in less than five minutes.

Hedonic test

After several evaluations of the preparation, a final evaluation consisted of the preference test. First, the organoleptic examination was done to find out which effervescent granule products the respondents preferred. Next, each respondent completed a questionnaire assessing the smell, colour, and taste of the preparation. The data obtained were analyzed using SPSS. The results of the Hedonic test showed that the granules produced were liked by many respondents. The formula respondents liked most was Formula 2.

Discussion

Inspection of the water content of the granules was carried out to determine the moisture or water content in the granules after drying, which would affect their flow properties.

The moisture content of the granules was measured with the Moisture Analyzer and met the requirement of 0.4%-0.7% determined by Anshory and authors (2007).

This test was carried out by flowing 100 g of granules through a funnel with three repetitions. A flow time of 100 g of granules ≤ of 10 seconds suggests the granules had a good flow rate, as shown by the flow velocity test in this study.

The flow rate was influenced by the point-of-quit; the smaller the point of quit, the better the flow rate (Lachman *et al.*, 2008). The results of the point-of-quit examination showed that all formulas met the requirements because they had an angle of rest between 25^{o} and 30° (Lachman, 1994).

The pH test results obtained from the effervescent granules ranged from 5.5 to 5.9. Therefore, based on the data obtained, the pH value of the three formulas had a good pH effervescence value.

Conclusion

The evaluation shows that the Kirinyuh leaf extract can be made into effervescent granules and has good results. Furthermore, the hedonic test findings showed that the effervescent granule extract was agreeable to respondents.

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