

The Study of Effervescent Tablet Processing Using Red Roses (*Rosa damascena* Mill) Pigments Extract

Elfi Anis Saati¹, Siti Zaenab², Simon Bambang Widjanarko³ and Yunianta³

1. Department of Science & Food Technology, Faculty of Agricultural & Animal Husbandry, Muhammadiyah University of Malang, Malang 65145, Indonesia

2. Department of Biology, Faculty of Teacher Training and Science, Muhammadiyah University of Malang, Malang 65145, Indonesia

3. Department Food Technology, Faculty of Agricultural Technology, Brawijaya University, Malang 65145, Indonesia

Received: July 7, 2011 / Published: February 20, 2012.

Abstract: Rose is one of the farming products that used as an accessory plantation, which is also known to contain vitamin C and anthocyanins which can be used as an antioxidant. The purpose of this study is to identify the colour effect of flower through the quality effervescent tablet, to know the interaction between the flower colour and the sugar type through the quality effervescent rose tablet. This study was done with two steps. Step I was divided into 2 levels of examinations using simple random: Rose colouring, M1 (dark red) and M2 (pink), while step II consisted of three levels of examinations, those were G1 (sucrose), G2 (dextrose), and G3 (sorbitol). The result showed that the dark red colour has a better extract pigment quality, the level of the light color (L) was 77.3 and the redness level (b+) was 25.033. The best rose effervescent tablet was produced by the combination of M1G3 (dark red: corn sugar/sorbitol), that has 8.179% of water content; the solute velocity was 0.029 g/sec; the lightness level (L) was 84.133, the redness level (a+) was 18.3. The product of the rose effervescent drinks has a value of 6.46 pH; viscosities 342.867 cps and total of sugar 52.150%.

Key words: Red rose, anthocyanin, pigment, effervescent.

1. Introduction

Rose (*Rosa damascena* Mill) is one of the plants functioning as a decorative plant. The corolla/petal rose contains anthocyanin pigment that is classified into flavonoid [1, 2] and functions as antioxidant substances that could catch free radicals [3-5], and has possessed known pharmacological properties [6-9]. The rose's corolla/petals can be used as a medicine, that can be consumed in drink as roses essence in formula product such as effervescent tablet. The study of processing rose's petal to form an effervescent tablets is to find the merit of rose so that it can be utilized especially as a natural antioxidant due to the vitamin C and anthocyanin contained [10-12], as an effort to

diversify rose's petals products. Effervescent tablets enables the rose extract containing beneficial component to be consumed instantly. Furthermore, it can increase the economic value of rose flower. It is also to fulfill consumers' need whereby the consumers nowadays tend to consume natural substance ("back to nature"). They are now aware that they should avoid synthetic ingredients and consume safe products instead.

The main ingredients in effervescent tablets product are the red and pink local variety of rose. The reason for choosing the local rose because of good supply, affordable price and the short period of display. Furthermore, the use of *Tropicana slim* sugar aims to give a special merit to the diabetic person because it contains sorbitol sugar. Using sorbitol is non-carcinogenic (does not cause cancer) [13], on the

Corresponding author: Elfi Anis Saati, Ph.D. candidate, research fields: natural colorant and bioactive/antioxidant from pigment. E-mail: elfiumm@yahoo.co.id.

contrary it is useful for the diabetes mellitus sufferer because sorbitol has only a low level of calorie.

The objectives of the study are as follows:

(1) To identify the influence of the colour of rose on extract powders of rose pigment quality.

(2) To identify the influence of the rose colour interaction with sugar type in rose effervescent tablet quality.

2. Materials and Method

2.1 Materials

The main ingredients needed were local variety of the rose obtained from a farmers in Gunungsari village, of city Batu-East Java Indonesia. The chosen roses were the red and pink roses. The others ingredients were aquadest, maltodextrin, citrate acid, sodium bicarbonate, and three kinds of sugar: sucrose, dextrose and *Tropicana slim*.

2.1.1 Tools

The tools used were a strainer, a calibrated beaker glass, a pair of scales, a blender, a brass, a cabinet dryer, a 60-mesh sieve, a hydraulic press, a tablet mould, stainless metal ring and a chromed stainless steel-pounder with 10 cm in length and the outer diameter was 2.6 cm; whereas the analysis tools were a beaker glass, calibrated beaker, an erlenmeyer, a beaker glass, a goiter pipette, a pH meter (pH315i/SET brand: wtw), colour reader (CR-10 Konica Minolta), a hardness tester (Kiya Seisakusho, Ltd Tokyo), and an oven.

2.2 Research Method

The research was conducted in two step with three repetitions. Step I was to examine the pigment quality of red rose from two factors of rose with two colour levels of red rose, M1 (dark red) and M2 (pink) that was done using Simple Complete Random Design.

Step II used the Factorial Group Random Design, the first factor contained 2 levels of experiment (M_1 : Black Red Rose; M_2 : Pink Rose), and the second factor contained 3 levels of experiment (types of sugar: G_1 : Sucrose; G_2 : Dextrose; G_3 : sorbitol/corn sugar).

2.2.1 Research Performance

Processing the Powder of Rose's Pigment Extract

(1) Preparing the corolla/petals of dark red and pink roses;

(2) The selected corollas were measured at the rate of 45 g, add the solvent, aquadest and citrate and blend them afterwards;

(3) Kepping the blended ingresients in the refrigerator for 30 minutes and then separating the liquid from dregs;

(4) Adding 30%-40% of filler maltodextrin;

(5) Drying the ingredients in the cabinet dryer at 50 °C-60 °C;

(6) Shifting the dried ingredients at 60-mesh.

Processing Rose Effervescent Tablet

The powder of rose extract from the previous processing was made as effervescent with the following process:

Mixing 100 g of rose extract powder with 20% citrite and 30% of sodium bicarbonate using a blender;

After getting the nucleus/core granule, mixing the nucleus granule (30%) with sugar (sucrose, dextrose and sorbitol/corn sugar) in 70% rate.

The mixed ingredients were sifted at 60-mesh, condensing/pressing the shifted material into tablet and then packing them in aluminium foil.

2.2.2 Monitoring Parameter

The analyses were done both to the powder of rose extract and rose effervescent tablet covered the chemical, physical and organoleptical analysis. The analysis done consisted of water content, pH, colour intensity, whereas for the effervescent tablet, the analysis covered the water content, pH, total of solutal density, soluble rapidity, viscosity, hardness level, and colour intensity.

3. Result and Discussion

3.1 Analysing Extract Powder of Rose's Pigment

3.1.1 The Water Content and pH Analysis of Rose's Pigment Powder

There is difference in average value of water content

in the extract powder of rose pigment of red and pink rose's pigment as result of flower colour treatment. It shown that the red rose in average has a high water content with 6.652% level, while the average of water content in pink rose in lower, that is 5.953%. It is caused by the thickness of the structure of red rose's corolla, as it is thicker than the pink rose's so the water evaporation is slower. This fact is supported by Tranggono [14] who suggested that the maximum water of certain network can largely be different because of the difference in structure. It is also largely influenced by plant condition.

The pH value of rose's pigment caused by treatment is also different. The experiment shows that the dark red roses has a lower level of pH that is 2.877; while the pink rose has 2.920 of pH value. These pH levels are lower than the result of research conducted by Mustofa [15] showed that the powder of rose's pigment extract had the pH level of about 3.320. It was caused by adding the citrate, a strong organic acid [16], while extraction that influenced the condition of water solvent made it more acid due to the stable anthocyanin is in acid condition (low pH).

3.1.2 The Color Intensity Analysis of Rose's Pigment Powder

The treatment of red roses results in a lower brightness (L) level, that is 77.3; while brightness (L) level of pink rose is higher, that is 92.3. The darker the colour of flower, the lower the brightness (L) level it has. On the country, the brighter the colour of the flower, the higher the brightness level it has.

The increase of brightness (L) level is inversely proportional to the redness level (a+). The treatment of the dark red rose contributes to the higher redness level (a+) that is 25.033, while the treatment of pink rose has a lower redness level (a+) that is 6.733. The increase of the redness level (a+) shows the high contribution of red colour. It is because in the acid pH, the dominant component is cation flavium so it appears as the red colour, meaning it contains anthocyanin [17].

The redness level (a+) of rose's pigment is also

influenced by genetic factors and character of each type of flower [18]. The important characteristic of rose planted by the farmers in Batu have a pre-eminent colour such as dark red to black in the edge of petal, which had 27-40 pieces, beautiful petal, had life phase of about 7-8 days, durable, resistancy delivery for long distance, and the production each plant was about 5-6 pieces a month. It has dense, rather stiff, thick and gloddy petals. It can also planted without shelter or shade [19, 20].

In the color intensity analysis, the pink rose has the higher blueness level (b-) of 3.067, while the dark red rose has the lower blueness level (b-) of 2.833. The appearance of the blue colour causes the pigment to look red that is quite bluish/purplish (the mixing of red and a little blue).

3.2 The Analysis of Effervescent Tablet

3.2.1 The Water Content Analysis of Effervescent Tablet

In the treatment of G2 (dextrose), it has the water content that is definitely different from the treatment of G3 (sorbitol/*Tropicana slim*) and the treatment of G1 (sucrose). The highest water content, that is 16.744%, was obtained in the treatment of G2, while the lowest level treatment is obtained from the treatment of G1 (sucrose) with 4.012%. When it is compared to the water content of effervescent Calcium-D-Redoxon tablet as a control that has 0.993% level, the water content in effervescent rose tablet remains overly high. It is caused by the dextrose sugar that has more hygroscopic (has the open bond) characteristics than sucrose and *Tropicana slim* sugar, so easier to bind H₂O in the vicinity [2].

3.2.2 Analysis of pH Level

The average level of pH in the solution of rose effervescent tablet as a result of flower colour treatment is relatively equal. The tablet, the result from *Tropicana slim* sugar (G3), has a higher pH level, that is 6.590, than the pH resulting from the sucrose (G1) and G2 (dextrose) which are about 6.420 to 6.470. As a

quality comparison of effervescent rose tablet, the researcher used the parameter of pH level from effervescent Calcium-D-Redoxon, that is 6.900, that has the close level.

3.2.3 The Analysis of Color Intensity and the Level of Solidity (Texture) of Rose Effervescent Tablet

The highest lightness level (L) is 95.000 that is a result from the treatment of M1G2 (dark red: Dextrose) with the lightness level of 81.633 (Table 1). It is caused by the influence of flower colour, where the rose with the red flower has a quite thick and blackish corolla. The low lightness level indicates the existence of more anthocyanin content. It can be identified from the increase of redness level (a+).

The level of redness (a+) of rose effervescent tablet using the dark red flower treatment is about 14.467 to 18.300 that is higher than the treatment of pink rose that is only about 4.100 to 5.167. The Red colour indicates the existence of anthocyanin pigment, because this pigment that in the acid pH, the dominant component is cation flavium so the colour from the solution contains the pure anthocyanin that appears to be the red colour [21].

The results of comparison examination DMRT 5% indicates that the large treatment difference is the treatment M1G1 (dark red rose: sucrose) that has the yellowness level (b+) 2.067 compared to the treatment of M2G3 treatment (pink-sorbitol/corn sugar *Tropicana slim*) that has the (-) 3.967 yellowness level. The yellowness level will increase along blueness level is rising up. It is presumed to be caused by type of anthocyanin pigment contained in rose pigment that tends to have the purplish red colour. It is compatible

with Nollet [21] argumentation that it is the colour characteristic of anthocyanin pigment. It is also supported by the statements of Stanciu et al. [22] and Lewis et al. [16] that there was presence of other compounds such as flavonoids, proteins, minerals and various sugars such as this treatment could affected the stability of anthocyanin, which was characterized with colour intensity.

The treatment of M1G2 (red: dextrose) has the lowest hardness level that is 9.167 kg/cm². While the treatment of M2G1 (pink: sucrose) is a treatment with the highest hardness level that is 21.000 kg/cm². It is lower than the effervescent of Calcium-D-Redoxon tablet that is 37 kg/cm². It is caused by the rose effervescent tablet that is produced has been absorbing the water from its surround because of its hygroscopic material, and the hardness level is lower than the controller. The high rate of density will influence the tablet soluble rapidity and viscosity of solution produced. It is in line with research results, which proposes that the insufficient harmony in a tablet can be caused by the low humidity, too dry granule so the ingredients form the capping and lamination [23, 24].

The characteristics of sugar type also influence the lightness rate of tablet. Sucrose sugar has whiter colour than dextrose sugar. Therefore, treatment using sucrose has the higher lightness level. However, *Tropicana slim* sugar which is a combination of sorbitol sugar and aspartame obtained the highest lightness. It is because the aspartame is a crystal white powder. While sorbitol is a compound which is white granulated or crystaled [25].

Table 1 The Means of color intensity and level of solidity (Texture) of rose effervescent tablets.

Treatment	Colour intensity			The Solidity level of tablet (kg/cm ²)
	Value L	Value a+	Value b	
M1G1 (Red: Sucrose)	84.067 b	14.467 b	-2.067 d	10.333 b
M1G2 (Red: Dextrose)	81.633 a	16.133 c	-2.533 c	9.167 a
M1G3 (Red: <i>Tropicana Slim</i>)	84.133 b	18.300 d	-2.733 b	11.367 b
M2G1 (Pink: Sucrose)	91.467 c	4.900 a	+2.867 b	21.000 d
M2G2 (Pink: Dextrose)	92.367 d	5.167 a	+2.933 b	11.167 b
M2G3 (Pink: <i>Tropicana Slim</i>)	95.000 e	4.100 a	+3.967 a	14.500 c

The average rate with the same letters in the same column indicates that there is significant difference with the Dunnett (DMRT) 5% examination.

3.2.4 The Analysis of Viscosity in Rose Effervescent Solution

The lowest viscosity value is in the treatment of sucrose sugar (G1) that is 31.227 cps, where this value is remain too high comparing to viscosity value of effervescent Calcium-D-Redoxon as a control that is only 9.400 cps. The viscosity level is influenced by the density of tablet. If the viscosity level is higher, the density will be low so the tablet structure will be brittle. Consequently, the time needed to be soluble is quicker. The treatment with dextrose sugar has the highest total density compared to the other type of sugar. It caused 1 gram dextrose sugar can dissolve in 1 mL of water, and sucrose sugar can dissolve in 0.5 mL of water in room temperature [14]. It is different with *Tropicana slim* sugars which consist of sorbitol sugar and aspartame within. Sorbitol is the granulated compound or crystal which is white, sweet, and hygroscopic with melting point about 89 °C-101 °C [13]. While, aspartame is a compound that is odorless, in white crystal powder form, quite water soluble, and has sweet taste.

3.2.5 The Analysis of Total Density and the Soluble Rapidity of Rose Effervescent Tablet

Based on DMRT 5% examination, it is known that the average of total density of effervescent tablet in the treatment of flower colour with sugar type is about 0.649 to 2.105 g/mL. The treatment of M1G2 (dark red: dextrose) has the highest total density that is 2.105 g/mL (Table 2). It indicates that the red dark rose has more total density with the more existence of anthocyanin as an indicator. The rate of solutal density is supported by the total content of sugar. As

information on the results of previous studies that the total content of sugar in dark red rose is 10.1%, while the sugar content of pink rose is 8.0%-10% [5].

Based on the DMRT 5% comparison examination, it is known that the rose effervescent tablet that is resulted from the interaction of flower colour treatment with Corn sugar/*Tropicana slim* sugar type (G3) is quickest/fastest to dissolve in solvent (water) than the sucrose and dextrose sugar, which amounted 0.029 for M1G3 and 0.32 g/sec for M2G3. While the lowest rapidity soluble is the treatment which uses the sucrose (G1) that is about 0.066-0.078 g/sec, while the treatment of dextrose sugar (G2) has the soluble rapidity about 0.070-0.091 g/sec. As the quality comparison of rose effervescent tablet, the researcher uses the effervescent Calcium-D-Redoxon tablet which has the slower soluble rapidity that is 0.030 g/sec. It is caused by the low density level of the tablet so it is brittle easily and the result that the needed time to dissolve is quicker.

Furthermore, the thicker corolla's petal of red rose make the total component of soluble anthocyanin pigment in the extracting process is more than the total in pink rose. The treatment of *Tropicana slim* sugar shows the real different with the total solutal density compare to sucrose and dextrose. It is because *Tropicana slim* is consisted of sorbitol and aspartame. Sorbitol is the granulated compound or crystal which is white, sweet, and higroscopic with melting point about 89 °C-101 °C [13]. While, aspartame is a compound that is odorless, in white crystal powder form, quite water soluble, and has sweet taste. While aspartame is a compound that is composite from aspartat, fenil-alanin

Table 2 The average level of total density and soluble rapidity of rose effervescent tablet.

Treatment	The Total Density Level (g/mL)	Soluble Speed/Rapidity (g/sec)
M1G1 (Red : Sucrose)	2.027 b	0.078 c
M1G2 (Red : Dextrose)	2.105 b	0.091 c
M1G3 (Red : Corn sugar)	0.649 a	0.029 a
M2G1 (Pink : Sucrose)	0.767 a	0.066 c
M2G2 (Pink : Dextrose)	0.735 a	0.070 c
M2G3 (Pink : Corn sugar/ <i>Tropicana Slim</i>)	0.672 a	0.032 b

The average rate with the same letters in the same column shows that the experiment result is not really different with Duncan (DMRT) 5% examination.

and methanol so it has more complex interaction [26] with anthocyanin pigment which is a polifenol, so the pigment tablet that is produced is more solid and the density of component of compound is more solid) than the sucrose and dextrose sugar type. While, its soluble rapidity is caused by the characteristics of each type of sugar where *Tropicana slim* has more hydroxyl cluster and ketone cluster that is easy-water soluble.

4. Conclusions

The flower colour influence the quality of rose pigment extract powder, especially in the redness level (a+) and lightness level of rose's pigment effervescent tablet. The interactions between flower's colour and the sugar type influence the quality of rose effervescent tablet that is produced, especially on the soluble rapidity, total density, and colour intensity of rose pigment effervescent tablet. The best effervescent tablet is produced by the combination between the treatment of dark red rose with sorbitol/corn sugar type (M1G3) which has 8.179% water content, 11.5 kg/cm² of hardness level, 0.029 g/sec of soluble rapidity, 84.133 of brightness level, 18.3 redness level (a+), redness level (a+) 18, 3 2,733 of yellowness level (b), 6.46 ph value, 32,867 cps of viscosity and 0,814 g/g of total density.

Acknowledgments

The researcher thanks Research and Dedication to Society Directorate of DIKTI who had been registering the patent right of title: Effervescent tablet of Pigments Red Roses (*Rosa sp*) and this process manufacturing. Number Inventor P00200900698.

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