The Influence of Arabic Gum on the Quality of Instant Ginger (*Zingiber officinale* Roscoe)

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ABSTRACT

Instant ginger was traditionally made by crystallizing ginger extract and sugar. The product was easily reconstituted into ginger beverage by dissolution in warm water. The atsiries on this beverage would refresh and warming the body. Unfortunately, the atsiries are unstable during storage. The research is aimed to study the influence of arabic gum on the stability of the product.

The method being used was complete random design with two replications. The concentration of the arabic gum was 0, 0.02, 0.04, 0.06 and 0.08%. The parameter being analyzed were moisture content, ash content, total soluble solute, viscosity, and sensory (aroma, color, viscosity, solubility and taste).

The result showed that addition of Arabic gum would influence all of the parameters except solubility, color and taste. The best formula was obtained by the addition of 0.04% Arabic gum with the following criteria: ginger strong – ginger stronger aroma, yellowish brown color, slightly viscous, slightly soluble, sweet and slightly warm taste, moisture content 4.55%, ash content 3.95%, total soluble solute 49.43%and viscosity 21.70 cps. For all criteria the preferences are like moderately.

Keywords: instant ginger, arabic gum

INTRODUCTION

Ginger is one of plants that many useful in Indonesia. It uses as spices, sweets, pickles, or traditional medicine, beside as a flavoring agent in perfumed or medicine product. It can give many effects, if used in oral like feeling fresh and warm the bodies. Beside that, ginger can prevent and cure various health disorder including common cold, cough, diarrhea (Duke, 2003), anti tumor, anticancer (Craig, 1999), anti fungal, antibacterial (Sutarno, et al., 1999), and increase immunity if it is used as a beverage (Zakaria, et al., 1999). Because it contains active ingredients like gingerol, zingiberene, zingiberol, ginger oil, oleoresin and others that are atsiries oil. One of a beverage that can be made by ginger is instant ginger.

Instant ginger is traditionally made by crystallizing ginger extract and sugar. The product is easily reconstituted into ginger beverage by dissolution in warm water. The actives ingredients especially atsiries oil is a volatile compound that are unstable during storage. To hold it the researcher try to added Arabic gum in instant ginger. The research is aimed to study the influence of arabic gum on the stability of the product.

METHODOLOGY

Materials and Instruments

The materials that used in instant ginger are fresh ginger, gajah variety (Zingiber officinale, R.) and ages 10-12 month, crystal sugar (sucrose) and Arabic gum. The instruments that is used to analyzed this product are analytical balance, electric blender, thermometer, gas stoves, and others

Methods

The method being used was complete random design with two replications. The concentration of the arabic gum was 0, 0.02, 0.04, 0.06 and 0.08% respectively. The parameter being analyzed were moisture content, ash content, total soluble solute, viscosity by viscometer Stormer, and sensory (description and hedonic/preference test) for aroma, color, viscosity, solubility and taste. Especially for sensory test, before panelist analyzed the product, 20 grams instant ginger is added by 80 ml boiling water first and after cold it tried. Schema the process can be seen in Figure 1 below.

RESULT AND DISCUSSION

Moisture Content

The instant ginger moisture content is shown in Figure 2. It seems the moisture content is decline slightly from 4.69% (Arabic gum 0%) to 3.97% (Arabic gum 0.08%) dm. May be it depends on the addition of Arabic gum. Product that added Arabic gum higher has moisture content less than others.

Dried processing exactly influences moisture content. But may be there is a relation between the addition of Arabic gum and moisture content. The addition gum is predicted influenced moisture content, because gum is a powder that has a little moisture content. As higher the powder can make the soluble content higher too. It means can make the moisture content less than others. Moisture content that is standardization by SNI (1992) for instant coffee is maximal 4 percent. It means, the product is included the standard. Statistic analysis result that the addition of Arabic gum influenced the moisture content (μ=0.01). And DMRT analysis result that Arabic gum that added until 0.04 percent has the same influences and different than others. It means the addition of Arabic gum 0.06 and 0.08 % result the different influence to moisture content.

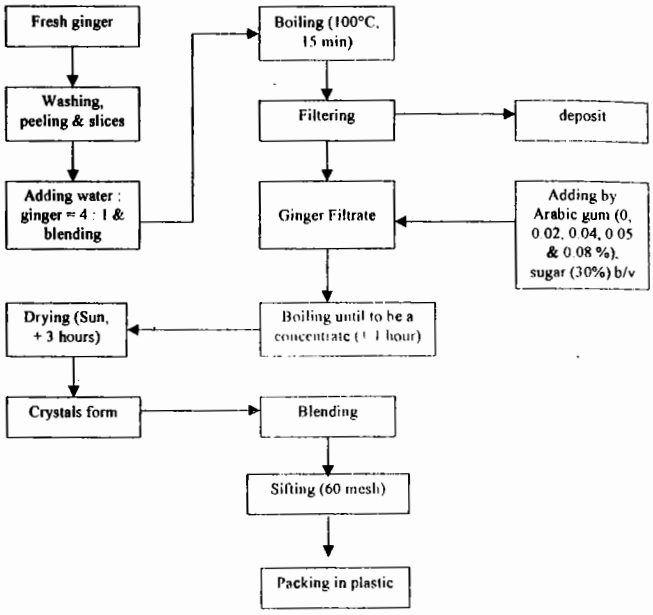

Figure 1. Schema the processing of instant ginger (Zingiber officinale, R.) by adding Arabic gum

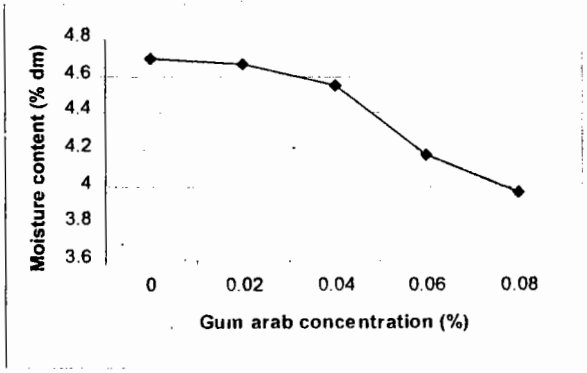

Figure 2. The moisture content of instant ginger (Zingiber officinale, R.) by adding Arabic gum

Ash Content

Ash refers to the inorganic residue remaining after either ignition or complete oxidation of organic matter in a foodstuff. The organic substances will be burned in furnace process and an inorganic substance like minerals are converted to oxides (Nielsen, 1998). It is still remaining as ash content. The addition of Arabic gum result the ash content decline slightly from 4.55% (Arabic gum 0%) to 3.09% (Arabic gum 0.08%) dm (Fig.3).

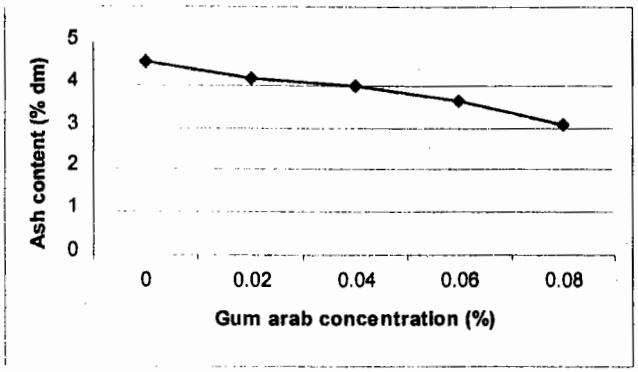

Figure 3. The ash content of instant ginger (Zingiber officinale, R.) by adding Arabic gum

It is related with the contain of inorganic residue, in Arabic gum less 4% (Codex in Bakri & Hermanuadi, 1995) than ginger (8%) (English standard, BS 4593 in Bakri & Hermanuadi, 1995) so the higher of the addition Arabic gum will increase the organic residue, but decrease the ash content. Statistic analysis result that the addition of Arabic gum influenced the ash content (μ=0.01). And DMRT analysis result that the addition of Arabic gums with different concentration indicates the different influences one each other (0% different with 0.02%, 0.04%, 0.06% and 0.08%). It means the addition of Arabic until 0.08 % resulted the different influence to ash content.

Total Soluble Solid

The instant ginger soluble solid is shown in Figure 4. It seems the soluble solid is increase slightly with the higher of Arabic gum addition from 46.57% (Arabic gum 0%) to 48.20% (Arabic gum 0.08%). May be total soluble solid is influenced by the addition of Arabic gum. Product that added Arabic gum higher has total soluble solid higher than others. The addition of Arabic gum makes the concentration of product higher. It reduces the moisture content. It means increasing total soluble solid, but decreasing ash content. Because Arabic gum contains inorganic residue less than ginger, so the higher of the addition Arabic gum will increase the organic residue (total soluble solid), but decrease the ash content.

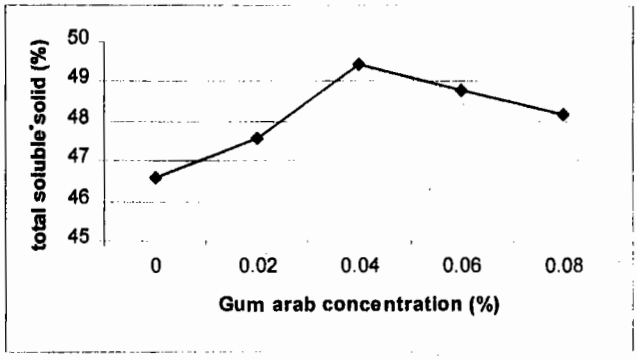

Figure 4. The total soluble solid of instant ginger (Zingiber officinale, R.) by adding Arabic gum

Statistic analysis result that the addition of Arabic gum influenced the soluble solid (μ=0.05). And DMRT analysis result that the addition of Arabic gums with different concentration indicates the different influences too. The addition Arabic gum 0, 0.02, 0.06 and 0.08 % result the same influence. It result the different influence with 0.04 %.

Viscosity

The instant ginger viscosity is shown in Figure 5. The viscosity increases slightly with the higher of Arabic gum addition from 19.70 cps (Arabic gum 0%) to 23.70 cps (Arabic gum 0.08%). Arabic gum is one of hydrocolloid that contains carbohydrate polymer with long chain and high molecule weight. It easy dissolves

in water, especially hot water (Fennema, 2000). It will increase viscosity. And it means the addition of Arabic gum with different concentration will influence viscosity. Product that added Arabic gum higher has viscosity higher than others.

Statistic analysis result that the addition of Arabic gum influenced the viscosity (α=0.01). And DMRT analysis result that the addition of Arabic gums with different concentration indicates the different influences too. The addition Arabic gum 0% result the different influence with other concentration. Arabic gum with 0.02 and 0.04 % has the same influence and different with 0.06 %.

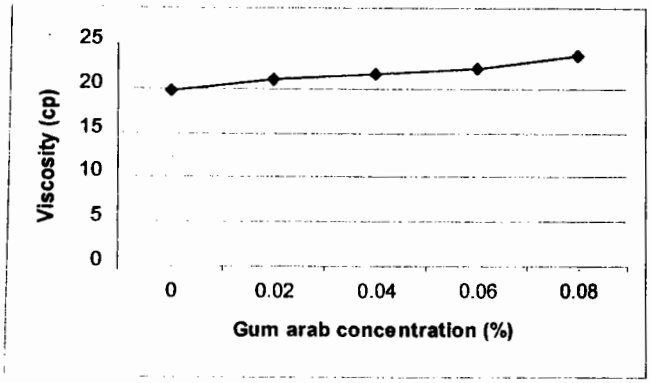

Figure 5. The viscosity of instant ginger (Zingiber officinale, R.) by adding Arabic gum

Sensory analysis

Sensory analysis are used is to know the quality and preference the product by people. Panelists are used to give the descriptions and preferences of product. There are 25 panelists from food technology students in Sahid University. The characteristics that analyzed are aroma, color, viscosity, solubility and taste.

1. Aroma

Aroma is an important factor that influences the preferences of product. The condition of aroma instant ginger is shown in Fig. 6.

Intensities of aroma is especially effected by the atsiries oil especially zingiberen and zingiberol. Atsiries oil is a volatile component. The description of aroma instant ginger is stronger (ginger strong – ginger stronger) with the addition of Arabic gum. It is suspected influenced by the addition of Arabic gum. Because Arabic gum can bind the volatile component and make the aroma stronger (Fennema, 2000). So the addition of gum can increase the aroma.

The preferences of aroma are increasing too (like moderately - like very much). It assumed that the preferences of aroma are influenced by the description. Statistic analysis result that the addition of Arabic gum influenced (μ=0.01) not only the description of the aroma but also the preferences too. And DMRT analysis result that the addition of Arabic gums with different concentration indicates the different influences too. The highest score is the addition Arabic gum 0.08%. But this value is the same influenced with 0.04% and 0.06%. It means the addition of Arabic gum 0.04% is enough.

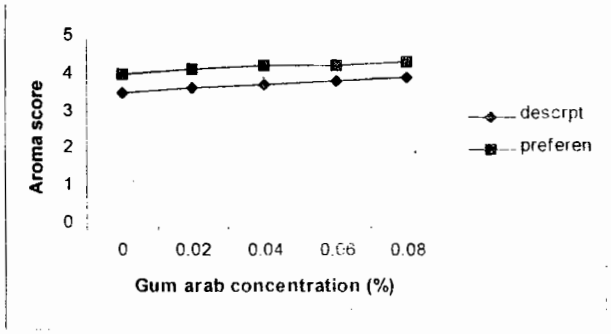

Figure 6. The description and preference of aroma of instant ginger (Zingiber officinale, R.) by adding Arabic gum (Note: **description** (1) ginger weak; (2) ginger moderately; (3) ginger strong; (4) ginger stronger; (5) ginger very strong; **preferences** (1) dislike very much; (2) dislike moderately; (3) neutral; (4) like moderately; (5) like very much)

2. Color

The color of instant ginger is shown in Figure 7 below. Color is influenced by processing, especially heat

process. There are 2 conditions in processing that make the product contact with heat, e.g. boiling and drying. At this time can cause browning reaction that can influence the product color. The addition of Arabic gum result the color yellowish brown. The different concentration seemed did not influenced the color significant.

The preferences are like moderately and not change with the different concentration. Statistic analysis result that the addition of Arabic gum did not influenced (μ=0.05) not only the description of the color but also the preferences. It means the addition of Arabic gum until 0.08% result the same color and preferences.

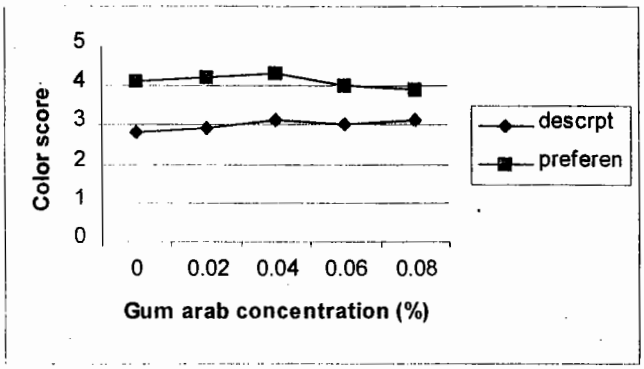

Figure 7. The description and preference of color of instant ginger (Zingiber officinale, R.) by adding Arabic gum (Note: **description** (1) black brown; (2) brown; (3) yellowish brown; (4) yellow; (5) yellowish white; **preferences** (1) dislike very much; (2) dislike moderately; (3) neutral; (4) like moderately; (5) like very much)

3. *Viscosity*

The instant ginger viscosity is shown in Figure 8. The viscosity increases slightly (slightly viscous – viscous) with the higher of Arabic gum addition. But it makes the preferences slightly decline (like moderately - neutral). Arabic gum is easy dissolves in water, especially hot water (Fennema, 2000) and will increase the viscosity because it binds water with hydrogen binding (Potter, 1973).

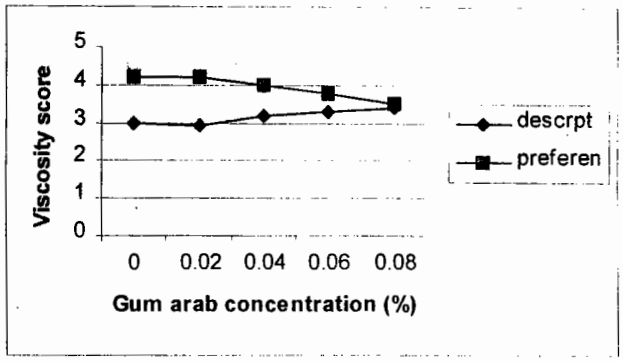

Figure 8. The description and preference of viscosity of instant ginger (Zingiber officinale, R.) by adding Arabic gum (Note: **description** (1) very liquid; (2) liquid; (3) slightly viscous; (4) viscous; (5) very viscous; **preferences** (1) dislike very much; (2) dislike moderately; (3) neutral; (4) like moderately; (5) like very much)

Statistic analysis result that the addition of Arabic gum influenced the viscosity (μ=0.01) not only for the description but also the preferences. And DMRT analysis result that the addition of Arabic gums with different concentration indicates the different influences too. The addition Arabic gum 0.04% result the same influence with 0%, 0.06% and 0.08% and different influence with other concentration for description parameter. And this concentration has the same influence with 0, 0.02, 0.06% and different influence with 0.08% for preference parameter. Instant ginger that addition by Arabic gum with 0.04 % has the highest preferences

4. *Solubility*

Solubility is a capability of instant ginger to dissolve as soon as possible after adding warm water. The condition is shown in Figure 9 below. The addition of Arabic gum seems resulting the same solubility (slightly soluble – soluble). The preferences slightly decline from like moderately to neutral. Arabic gum in hot or cold water will be a bigger molecule because a fine particle in the outer will be gelation that will inhibit the penetration of water to be the inner (Glicksman, et.al. 1973).

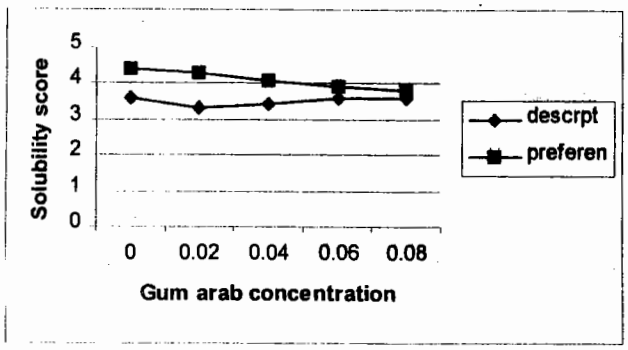

Figure 9. The description and preference of solubility of instant ginger (Zingiber officinale, R.) by adding Arabic gum (Note: **description** (1) extremely insoluble; (2) insoluble; (3) slightly soluble; (4) soluble; (5) extremely soluble; **preferences** (1) dislike very much; (2) dislike moderately; (3) neutral; (4) like moderately; (5) like very much)

Statistic analysis result that the addition of Arabic gum not influenced the description of solubility but influenced the preferences (μ=0.01). And DMRT analysis result that the addition of Arabic gums with different concentration indicates the different influences too. The addition Arabic gum 0% result the same influence with 0.02%, and different influence with other concentration. The addition 0.04% Arabic gum has the different influence with others. And 0.06% Arabic gum has the same influence with 0.08%, and different with others. Instant ginger that addition by Arabic gum with 0.04 % has the optimum preferences (like moderately)

5. Taste

Taste is an important factor that influences the preferences of product. The condition of taste instant ginger is shown in Fig. 10. It shown that the additions of Arabic gum decline slightly the description of product from slightly sweet & warm to sweet & slightly warm. The preferences seem relative stable (like moderately). Statistic analysis result that the addition of Arabic gum not influenced significantly (μ=0.05) to both of the description and preferences of taste. It means Arabic gum can add to instant ginger until 0.08 % without result the different of taste significantly

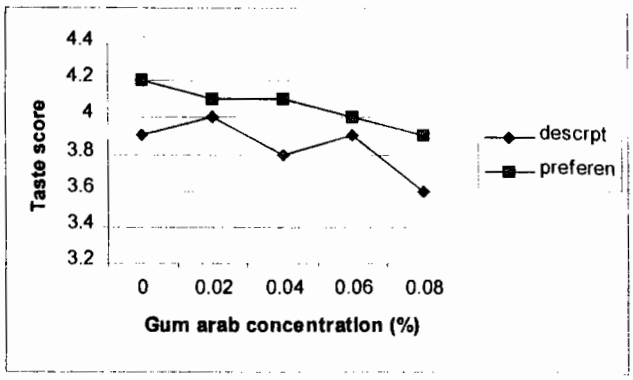

Figure 10. The description and preference of taste of instant ginger (Zingiber officinale, R.) by adding Arabic gum (Note: **description** (1) bitter & warm; (2) slightly bitter & warm; (3) slightly sweet & warm; (4) sweet & slightly warm; (5) very sweet & warm; **preferences** (1) dislike very much; (2) dislike moderately; (3) neutral; (4) like moderately; (5) like very much)

CONCLUSION

The result showed that addition of Arabic gum would influence all of the parameters except solubility, color and taste. The best formula was obtained by the addition of 0.04% Arabic gum, especially based on preferences of aroma, viscosity and solubility. This concentration has higher score in aroma than 0% and 0.02%, and the same influenced with 0.06% and 0.08% Arabic gum. Beside that, this concentration has higher score in viscosity and solubility than 0.06% and 0.08%, and the same influenced with 0% and 0.02%. The following criteria for the best formulation is: ginger strong – ginger stronger aroma, yellowish brown color, slightly viscous, slightly soluble, sweet and slightly warm, moisture content 4.55%, ash content 3.95%, total soluble solute 49.43% and viscosity 21.70 cps. For all criteria the preferences are like moderately.

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