Effect of Cinnamon Powder Addition (Cinnamomum burmannii) on the Quality of Banten Banana Jam (Musa acuminata) Stored at Room Temperature

Yeni Marselina Pandiangan[a], Hotnida Sinaga[b], Linda Masniari Lubis[c]

[a] e-mail : yeni.marselina.ym@gmail.com
[a]Food Science and Technology, Faculty of Agriculture Universitas Sumatera Utara, Medan, Indonesia
[b]Food Science, Faculty of Agriculture Universitas Sumatera Utara, Medan, Indonesia

Abstract

This research was conducted to determine the effect of cinnamon powder addition to improve the quality of banten banana jam. This research was designed using a factorial Completely Randomized Design (CRD) with two factors, namely the addition of cinnamon (T): (0%, 0.3%, 0.6%, 0.9%) and storage time (P): (0 week, 1 week, 2 weeks, 3 weeks). Parameters analyzed were moisture content, ash content, crude fiber content, total soluble solids, total microbial, acidity (pH), smear test, values of color, aroma, taste, texture, and general acceptance.

The results showed that the addition of cinnamon powder had a highly significant effect on the moisturer content, ash content, crude fiber content, total microbial, acidity (pH), and smear test. In addition storage time has a highly significant effect on moisture content, crude fiber content, total soluble solids, total microbes, acidity (pH), smear test, hedonic aroma, and had a significantl effect hedonic of taste. Meanwhile interaction between the addition of cinnamon powder and storage time had a highly significant effect on the moisture content and total microbial. The best banana jam was resulted from the addition of 0,9% cinnamon stored for 2 weeks.

Keywords: Cinnamon, Storage Time, Jam, Antimicrobial, and Musa sp

1. Introduction

Jam is a food product made as a complement to bread that is practically used and liked by all people. Jam has a thick texture, processing is done by cooking it with a mixture of 40% fruit pulp, sugar, pectin and water (Liem et al., 2020). Jam is an alternative to using fruits to make products with economic value and using fruit to make other products but still has good nutritional value (Saputro et al., 2018).

Indonesia is one of the largest banana producers in the world with North Sumatra producing 121,364 tons of bananas (BPS, 2021). High banana production with short shelf life and good nutritional content. Bananas are a source of energy and contain high levels of minerals and calcium and the soft texture of bananas makes it easier for the body to digest the nutrients in bananas (Wulandari et al., 2018). Bananas can be processed into processed products that increase consumption of bananas, increase the selling value, and increase the utilization power of bananas (Qurniati et al., 2020). Banten bananas are a group of table bananas (dessert bananas) which have very low prices compared to other types of bananas and which are very rarely found in processed products. The pectin content in ripe banana fruit is less than 0.5%, so it is good for processing into processed jam products. Pectin as a thickener (gelling agent) in jam making aims to provide a good texture for jam, so jam is easier to apply to bread, pectin is in the form of powder and is white to brown in color

(Tumangger et al., 2022). There is a lot of pectin contained in fruit peels, which can be extracted to get the pectin (Sari & Arumsari, 2021).

The purpose of making Banten banana jam with the addition of cinnamon is to maximize the use of Banten bananas as a modern food product, to find out the impact of adding cinnamon powder on the quality of banana jam stored at room temperature.

2. Material and Methodology

2.1. Materials

The material of this research is banten bananas, cinnamon, pectin, sugar, citric acid and mineral water. The reagents used were distilled water, 98% H2SO4 (Merck), 0.9% NaCl, 45% NaOH, 96% ethanol, and PCA (Plate Count Agar). The equipment used during the test was an analytical balance, porcelain dish, furnace, pH meter, handrefractometer, beaker glass, Erlenmeyer, measuring cup, bulb, pipette, volume pipette, aluminum foil, cup, desiccator, funnel, oven, spatula, thermometer, test tube, micropipette, and petri dish.

2.2. Research methods

Physiologically ripe bananas are washed, separated from the skin and pulp and then blanched at 80°C for 3 minutes. Puree the fruit flesh using a blender at a ratio of bananas and water 2:1. Dried cinnamon was reduced in size and washed and then roasted for 2 minutes over medium heat, cooled, then the cinnamon seeds were crushed with a blender until smooth, then the cinnamon powder was sifted through an 80 mesh sieve. Cinnamon pulp was heated at 70°C for 3 minutes, then 50% sugar by weight of the ingredients was added, 0.5% pectin, and 0.3% citric acid were cooked and stirred until thickened for 10 minutes at 100°C, a spoon test was carried out.

2.3. Research parameters

Test the moisture content of 5 g of the material in a dry aluminum cup that has been weighed. The material to be tested is heated at 105°C, 1 hour in an oven, cooled in a desiccator and then the dry material is weighed. Heating then repeated cooling was applied until a constant weight was obtained with a final weight of 0.01g, then the %bb of water content was calculated (AOAC, 2005).

Ash content test 5 g of material is placed in a dry porcelain cup whose weight is known. The ingredients are fired over low heat then high heat until the ingredients turn into charcoal. Put the ingredients into the furnace for 1 hour at 100°C, 2 hours at 300°C, and 500°C for 3 hours until it turns ash. The material is left in the desiccator and weighed (AOAC, 2005).

The pH test was carried out using a calibrated pH meter and then dipping the pH meter electrode into the material (AOAC, 2005).

Total microbial test 1 g of sample was placed in a test tube containing 0.9% NaCl 9 ml stirred, taken 1 ml was placed in a petri dish then put in and leveled the PCA agar medium, incubated at 32°C for 24 hours (Fardiaz, 1992).

Crude fiber test 2 g of the material was placed in an Erlenmeyer flask which was then added 100 ml of H2SO4, autoclaved for 15 minutes at 105°C cooled and added 50 ml of hydrolyzed NaOH. Filter using dry Whatman No.41 paper, rinse with 10 ml of still hot distilled water, 25 ml of H2SO4, 10 ml of hot distilled water, 25 ml of ethanol. Dry in the oven at 105°C until constant. The percentage of crude fiber contained was

calculated using the last weight formula minus the weight of whatman filter paper divided by the weight of the initial material multiplied by 100% (AOAC, 2005).

Test for total soluble solids 5 g of material added to 20 ml of distilled water, the handrefractometer was standardized with distilled water. Drop the sample on the handrefractometer prism with a dropper, record the value obtained (Muchtadi & Sugiyono, 1992).

Smear test using glass with a surface area and a thickness of 20 x 5 cm x 2 mm. 3 g of sample flattened on the tip of the basting knife. Then apply it on the surface of the glass to a distance that the jam can reach. Measure with a ruler and record (Yuwono & Susanto, 1998).

Organoleptic characteristics were measured hedically on 100 panelists with a numerical scale of 1-7 (disliked very much - liked very much) (Soekarto, 1985).

2.4. Data analysis

The RAL study consisted of 2 factors, namely cinnamon powder concentration and storage time. In this test, 3 repetitions were carried out.

3. Results

The results of the analysis of Banten banana jam with cinnamon powder and storage time are shown in Tables 1 and 2.

Table 1. Effect of cinnamon powder on parameters

Test Parameters	Cinnamon Powder Addition			
	0%	0,3%	0,6%	0,9%
Moisture content (%)	$32,01^{aA}$±0,04	$1,27^{bB}$±0,07	$30,38^{cC}$±0,6	$29,48^{dD}$±0,03
Ash content (%)	$0,83^{cC}$±0,004	$0,91^{cC}$±0,01	$1,29^{bB}$±0,04	$1,61^{aA}$±0,01
Crude fiber content(%)	$1,74^{bB}$±0,01	$1,80^{bAB}$±0,01	$1,83^{abAB}$±0,007	$1,81^{aA}$±0,02
Total soluble solids (°Brix)	59,57±0,46	59,21±0,54	59,15±0,45	59,43±0,44
Total microbial (CFU/g)	$9,1x10^{2aA}$±0,13	$8,6x10^{2bB}$±0,08	$7,2x10^{2cC}$±0,15	$6,7x10^{2dD}$±0,08
Acidity (pH)	$4,18^{bB}$±0,002	$4,33^{aAB}$±0,04	$4,38^{aA}$±0,03	$4,39^{aA}$±0,04
Smear test (cm)	$12,62^{aA}$±0,05	$12,32^{bA}$±0,04	$11,93^{cB}$±0,05	$11,60^{dC}$±0,10
Values of color	6,29±0,01	6,27±0,02	6,31±0,01	6,29±0,03
Aroma	5,98±0,01	5,95±0,004	5,91±0,01	5,98±0,002
Taste	5,92±0,001	5,94±0,005	5,87±0,008	5,96±0,003
Texture	6,13±0,01	6,11±0,008	6,18±0,12	6,09±0,02
General acceptace	6,30±0,01	6,29±0,02	6,33±0,05	6,31±0,14

Note: Lowercase letters are significantly different from uppercase letters

Table 2. Pengaruh waktu simpan pada parameter

Test Parameters	Storage Time			
	0 weeks	1 weeks	2 weeks	3 weeks
Moisture content (%)	$29,36^{dD}$±0,05	$30,36^{cC}$±0,05	$31,15^{bB}$±0,04	$32,27^{aA}$±0,03
Ash content (%)	1,11±0,07	1,16±0,08	1,18±0,03	1,19±0,04
Crude fiber content (%)	$1,92^{aA}$±0,02	$1,84^{abAB}$±0,007	$1,79^{bAB}$±0,01	$1,75^{bB}$±0,01
Total soluble solids (°Brix)	$60,00^{aA}$±0,01	$59,56^{abAB}$±0,03	$59,18^{bBC}$±0,07	$58,62^{cC}$±0,07
Total microbial (CFU/g)	$5,95x10^{2dD}$±0,13	$7,40x10^{2cC}$±0,07	$8,43x10^{2bB}$±0,03	$9,89x10^{2aA}$±0,10
Acidity (pH)	$4,42^{aA}$±0,03	$4,39^{aA}$±0,01	$4,26^{bAB}$±0,04	$4,22^{bB}$±0,05
Smear test (cm)	$11,56^{dC}$±0,11	$11,98^{cB}$±0,02	$12,27^{bB}$±0,04	$12,66^{aA}$±0,04
Values of color	6,33±0,01	6,28±0,01	6,29±0,01	6,28±0,02
Aroma	$6,12^{aA}$±0,008	$5,95^{abAB}$±0,09	$5,89^{bcB}$±0,009	$5,84^{cB}$±0,007
Taste	$6,16^{a}$±0,009	$6,12^{ab}$±0,002	$6,11^{ab}$±0,006	$6,09^{a}$±0,003

Texture	6,17±0,01	6,13±0,02	6,09±0,02	6,12±0,126
General acceptace	6,32±0,03	6,26±0,05	6,33±0,5	6,32±0,12

Note: Lowercase letters are significantly different from uppercase letter

3.1. Moisture Content (%)

Cinnamon powder and storage time had a very significant effect on the water content of the jam. From Table 1 the highest water content was in the 0% treatment, namely 32.01%. This occurs because cinnamon powder has hygroscopic properties where the higher the concentration of cinnamon powder that is included in the product causes more water to be bound so that the water content decreases (Anto & Rato, 2018), stating that cinnamon powder has a hygroscopic ability, namely absorbing water to form a gel. In Table 2, the water content test for 3 weeks obtained the results of 32.27% and was the highest. This is due to the release of water from the gel due to the increasing acidity of the product as the storage time increases. According to (Desrosier, 2008), that water changes because microorganisms break down sugar resulting in the release of water molecules during storage.

The interaction between cinnamon and storage time had a significant effect on testing the water content of Banten banana jam. Increasing the concentration of cinnamon powder causes a decrease in water content. This decrease is caused by the increased ability to bind water by cinnamon powder, thereby reducing the water content (Karyantina et al., 2021). Storage time increases the water content of Banten banana jam. This is because the process of transpiration and the breakdown of complex compounds becomes simpler (Marwita et al., 2021).

3.2. Ash Cotent (%)

Cinnamon has a very significant effect on testing the ash content of Banten banana jam. Table 1 shows that the highest k.ash was obtained at 0.9% treatment, namely 1.61% due to the mineral content in cinnamon powder. The ash content of cinnamon is 2.4%, the ash content is a mineral in food (Kristiandi et al., 2021).

3.3. Crude Fiber Content (%)

The interaction of the two factors of Banten banana jam gave results ($p < 0.01$) in the product of Banten banana jam. Table 1 shows the 0.9% treatment, which is 1.81%, is the highest fiber content. The cause of this occurrence is because the fiber content of cinnamon is 33.0% and cinnamon powder has a significant effect on products with the addition of cinnamon (Habi et al., 2021). Storage time reduced the crude fiber content of Banten banana jam where in the 0 week treatment the fiber content was 1.92%. This decrease occurred because the increase in product storage time caused an increase in water content and the crude fiber content of a product would decrease (Marwita et al., 2021).

3.4. Total Soluble Solids (°Brix)

Storage time has a very significant effect with the highest TSS value found in the 0 week test, namely 60.00°Brix. During storage, a fermentation process occurs which reduces the total dissolved solids content in the jam. (Ningsih et al., 2019), the decrease in TSS during storage time is due to the transformation of simple sugars into alcohols and acids so that the dissolved content in the samples decreases during testing with a longer shelf life.

3.5. Total Microbial (CFU/g)

The addition of cinnamon powder (Table 1) and storage time had a very significant effect. The interaction between cinnamon powder and storage time has a very significant effect. Increasing the concentration of cinnamom causes the total microbial value to decrease because cinnamon has cinnamaldehyde and eugenol as anti-microbials which will inhibit the growth of the microbes themselves (Marliana et al., 2021). Storage time causes an increase in total microbes in Banten banana jam. This happens because storage is carried out at room temperature, where at room temperature microorganisms are ideal for growing. In addition, the increase in water content during storage increases microbial growth., (Azara & Saidi, 2020), states that microbial growth in storage is affected by temperature and moisture content.

3.6. Acidity (pH)

The interaction of these two factors significantly affects the pH of the product. The highest treatment was the addition of 0.9% cinnamon, namely 4.39. This happens because cinnamon powder has alkaline properties, cinnamon is included in the alkaline group with a pH of 8.5 (Wardatun et al., 2020). Storage time will decrease the pH value of banana jam where the 0-week treatment is the highest, namely 4.42. This occurs due to increased microbial activity at room temperature storage (Harianja et al., 2019).

3.7. Smear Test (cm)

The interaction of the two factors gave results ($p < 0.01$) to the Banten banana jam test. The addition of cinnamon powder will reduce the spreadability of Banten banana jam where the highest treatment of 0.9% addition of cinnamon powder is to produce 12.62 cm. This is because cinnamon can bind water, where the higher the concentration of cinnamon that is included in the composition will increase the ability to bind water so that it will form a paste texture (Nurminabari et al., 2019). Storage time increases the spreadability of the jam where the highest treatment is 3 weeks, namely 12.66 cm. This was due to an increase in the water content of the jam during storage. According to (Abdillah et al., 2021), the water content of the jam is too high or low will affect the texture and spreadability of the jam.

3.8. Organoleptic

The storage time (Table 2) of Banten banana jam has a very significant effect on the hedonic aroma. Increasing the storage time decreases the organoleptic value. This decrease occurs due to the decomposition of the ingredients contained in the jam into acids and alcohol. (Arini, 2017), states that during normal storage fermentation occurs which produces acids that affect the aroma. Storage time (Table 2) has a significant effect on the organo taste. The increase in the length of storage time decreases the value of organo taste. The decrease in the organoleptic value of taste is due to the overhaul of simple sugar compounds into acids in the jam which affects the taste. (Putri et al., 2021), stated that the length of storage of food products and the interactions between components during storage will affect taste. The effects of cinnamon and storage time on organoleptic values of color, texture, and general acceptance had no significant effect on the tested Banten banana jam.

4. Results

Cinnamon powder had a very significant effect on testing for water content, pH, crude fiber value, total microbes, ash percentage and spreadability test. Storage time gave very significant results on water, crude fiber, TSS, total microbes, pH, spreadability, aroma organoleptic, and significantly on organo taste. Based on the study of Banten banana jam, the best treatment was obtained with 0.9% cinnamon powder and a curing time of 2 weeks at room temperature based on the parameters of the total microbial test, water content, taste hedonic test, and aroma hedonic test.

References

Abdillah, S., Kristiastuti, D., Bahar, A., & Sutiadiningsih, A. (2021). Selai lembaran belimbing wuluh dan pepaya. Jurnal Tata Boga, 10(1), 185–193. https://ejournal.unesa.ac.id/index.php/jurnal-tata-boga/article/view/38278/33756

Anto, & Rato, R. (2018). Pengaruh penambahan bubuk kayu manis (Cinnamomum burmannii) terhadap sifat kimia dan total mikroba pada nugget ayam. Jurnal Agropolitan, 5(1), 1–11. https://media.neliti.com/media/publications/259194-pengaruh-penambahan-bubuk-kayu-manis-cin-082eaf2b.pdf

AOAC. (2005). Official Methods of Analysis. Association of Analytical Chemists.

Arini, L. D. D. (2017). Faktor-faktor penyebab dan karakteristik makanan kadaluarsa yang berdampak buruk pada kesehatan masyarakat. Jurnal Teknologi Dan Industri Pangan, 2(1), 15–24. https://ejurnal.unisri.ac.id/index.php/jtpr/article/download/1531/1349/5420

Azara, R., & Saidi, I. A. (2020). Mikrobiologi Pangan. Buku Ajar Muhammadiyah. Buku Ajar Muhammadiyah Sidoarjo.

BPS. (2021). Produksi pisang Menurut Provinsi. https://www.bps.go.id/indicator/55/62/1/produksi-tanaman-buah-buahan.html

Desrosier, N. W. (2008). Teknologi Pengawetan Pangan (T. M. Muljoharjo (ed.)). UI-Press.

Fardiaz, S. (1992). Petunjuk Laboratorium Mikrobiologi Pengolahan Pangan. IPB-Press.

Habi, U. T., Limonu, M., & Tahir, M. (2021). Uji kimia serbuk herbal rambut jagung yang diformulasi dengan serbuk kayu manis (Cinnamomum burmannii). Jambura Journal of Food Technology (JJFT), 3(2), 50–61. https://ejurnal.ung.ac.id/index.php/jjft/article/view/7547/3295

Harianja, J. J. ., Ginting, S., & Suhaidi, I. (2019). Pengaruh penambahan ekstrak kulit kayu manis (Cinnamomum burmanii Blume) sebagai baha pengawet alami untuk meningkatkan umur simpan minuman kopi. Jurnal Rekayasa Pangan Dan Pertanian, 7(3). https://jurnal.usu.ac.id/index.php/jrpp/article/view/Yosua J.R. Harianja/0

Karyantina, M., Suhartatik, N., & Prastomo, F. E. (2021). Potensi ekstrak kayu manis (Cinnamomum burmannii) sebagai senyawa antimikrobia pada edible film pati sukun (Artocarpus communis). Jurnal Teknologi Hasil Pertanian, 14(2), 75–83. https://jurnal.uns.ac.id/ilmupangan/article/download/48363/32613

Kristiandi, K., Rozana, R., Junardi, J., & Maryam, A. (2021). Analisis kadar air, abu, serat dan lemak pada minuman sirop jeruk siam (Citrus nobilis var. microcarpa). Jurnal Keteknikan Pertanian Tropis Dan Biosistem, 9(2), 165–171. https://doi.org/10.21776/ub.jkptb.2021.009.02.07

Liem, J. L., Sugiarti, S., Faisalma, M. W., Handoko, Y. A., Pertanian, F., Kristen, U., & Wacana, S. (2020). Karakteristik dan uji organoleptik selai labu kuning. Jurnal Pertanian Agros, 22(1), 22–29. https://e-journal.janabadra.ac.id/index.php/JA/article/view/1110

Marliana, Hafsan, Masriany, & Nur, F. (2021). Aplikasi ekstrak kayu manis (Cinnamomum burmanii) sebagai anti kontaminan pada kultur stevia (S . rebaudiana) secara in vitro. Prosiding Biologi Achieving the Sustainable Developmrnt Goals with Biodiversity in Confronting Climate Change (Pp. 396-401), 396–401.

Marwita, Efendi, R., & Rossi, E. (2021). Konsentrasi kayu manis terhadap mutu manisan empulur buah nanas (Ananas comosus L. Merr) selama penyimpanan. SAGU Journal – Agri. Sci. Tech, 20(2), 49–59. https://sagu.ejournal.unri.ac.id/index.php/JSG/article/download/7925/6799

Muchtadi, T. R., & Sugiyono. (1992). Ilmu Pengetahuan Bahan Pangan. Departemen Pendidikan dan Kebudayaan Direktorat Jenderal Pendidikan Tinggi. Pusat Antar Universitas Intitut Pertanian Bogor.

Ningsih, R., Rizqiat, H., & Nurwantoro. (2019). Total padatan terlarut, viskositas, total asam, kadar alkohol, dan mutu hedonik ater KefirSemangka Dengan Lama Fermentasi Yang Berbeda. Jurnal Teknologi Pangan, 3(2), 352–331. https://ejournal3.undip.ac.id/index.php/tekpangan/article/view/24151

Nurminabari, I. S., Windiantara, T., & Irana, W. (2019). Pengaruh perbandingan serbuk kayu manis (Cinnamomum burmannii) dengan cengkeh (Syzgium aromaticum L.) dan konsentrasi gula stevia (Stevia rebaudiana B.) terhadap karakteristik teh celup daun mengkudu (Morinda citrifolia L.). Pasundan Food Technology Journal, 6(1), 18–22. http://repository.unpas.ac.id/40398/

Putri, S. N. Y., Syaharani, W. F., Utami, C. V. B., Safitri, D. R., Arum, Z. N., Prihastari, Z. S., & Sari, A. R. (2021). Pengaruh mikroorganisme, bahan baku, dan waktu inkubasi pada karakter nata: review. Jurnal Teknologi Hasil Pertanian, 14(1), 62–74. https://jurnal.uns.ac.id/ilmupangan/article/download/47654/30040

Qurniati, R., Duryat, Prasetia, H., & Hartati, F. (2020). Olahan pisang sebagai penunjang ekonomi masyarakat di sekitar gunung Rajabasa

Lampung. J-ABDIPAMAS Jurnal Pengabdian Kepada Masyarakat, 4(2), 177–124. https://ejurnal.ikippgribojonegoro.ac.id/index.php/J-ABDIPAMAS/article/view/1217

Saputro, T. A., Permana, I. D. G. M., & Yusasrini, N. L. ari. (2018). Pengaruh perbandingan nanas (Ananas comosus L. Merr.) dan sawi hijau (Brassica juncea L) terhadap karakteristik selai. Jurnal ITEPA, 7(1), 52–60. https://ojs.unud.ac.id/index.php/itepa/article/view/36949

Sari, N. N., & Arumsari, A. (2021). Studi literatur metode ekstraksi pektin dari beberapa sumber limbah kulit buah. Jurnal Riset Farmasi, 1(1), 55–63. https://doi.org/10.29313/jrf.v1i1.186

Soekarto, S. T. (1985). Penilaian Organoleptik (untuk Industri Pangan dan Hasil Pertanian). Bharata Karya Aksara.

Tumangger, R. S. S., Muhammad, ZA, N., Jalaluddin, Nurlaila, R., & Ginting, Z. (2022). Pengaruh asam (HNO3) sebagai pelarut pada ektraksi pektin dari orka (Abelmoschus esculentus). Jurnal Teknologi Kimia Unimal, 11(1), 91–101. https://ojs.unimal.ac.id/jtk/article/view/7252

Wardatun, S., Rustiani, E., & Damahyanti, O. (2020). Pengembangan mikrogranul mukoadhesif ekstrak kayu manis dengan kombinasi polimer karbopol dan gelatin. Jurnal Fitofarmaka Indonesia, 7(1), 9–15. https://doi.org/10.33096/jffi.v7i1.477

Wulandari, R. T., Widyastuti, N., & Ardiaria, M. (2018). Perbedaan pemberian pisang raja dan pisang ambon terhadap VO2max pada remaja di sekolah sepak bola. Journal of Nutrition College, 7(1), 8–14. https://ejournal3.undip.ac.id/index.php/jnc/article/view/20773

Yuwono, S. S., & Susanto, T. (1998). Pengujian Fisik Pangan. Jurusan Teknologi Hasil Pertanian. Fakultas Teknologi Pertanian. Universitas Brawijaya.