**International Journal of Advance Tropical Food (IJATF)**
Vol. 3, No. 1, May 2021, pp. 35-43
E-ISSN: 2715-5889, DOI: http://dx.doi.org/10.26877/ijatf.v3i1.9349

# Review of Various Influential Factors in the Production of Robusta Coffee Effervescent Drink Tablets

**Miftahul Wahidatun Ni'mah, Diah Dwi Lestari, Ayuni Rizma Maulida, Umar Hafidz Asy'ari Hasbullah**
Study Program of Food Technology, Universitas PGRI Semarang, Jalan Sidodadi Timur No. 24 Semarang, Central Java, Indonesia 50125
e-mail: umarhafidzah@gmail.com

**Abstract**
Coffee is one of Indonesia's leading plantation commodities, which is ranked third in the world. Currently, coffee-based drinks have become a lifestyle in the millennial era. The high interest in coffee affects the economy of the community. Various efforts were made to further encourage the level of coffee consumption, especially in the form of beverages. On the other hand, it is necessary to diversify the product by highlighting the technology side, such as making effervescent which is easier, more practical, and can be enjoyed directly with cold water. Effervescent is known as a product that can cause gas bubbles as a result of the reaction of acids and bases when dissolved in water. The resulting gas bubbles are carbon dioxide which gives a sparkling effect (a taste sensation like sparkling water). The use of coffee as an effervescent raw material is related to its taste, bioactive compounds, and antioxidants. Coffee extract powder can be made from robusta and arabica coffee roasted at medium level with low-temperature crystallization, spray drying, freeze drying, and vacuum drying. Other materials that need to be added such as acid sources, bases, fillers, and binders can affect the effervescent characteristics such as tablet hardness, moisture content, hygroscopicity, and dissolution time. The recommended composition is citric acid, sodium bicarbonate, dextrin, and PVP (Polyvinilpyrrolydone).

**Keywords**: drinks, effervescent tablets, robusta coffee

***How to Cite***: Ni'mah, M. W., Lestari, D. D., Maulida, A. R., & Hasbullah, U. H. A. (2021). Review of Various Influential Factors in the Production of Robusta Coffee Effervescent Drink Tablets. *International Journal of Advance Tropical Food, 3*(1), 35-43. http://dx.doi.org/10.26877/ijatf.v3i1.9349

## INTRODUCTION

Coffee is one of the plantation commodities that have high economic value in Indonesia. The role of coffee commodities for the Indonesian economy is quite important, both as a source of income for coffee farmers, a source of foreign exchange, a producer of industrial raw materials, as well as a provider of employment through processing, marketing, and trading activities including exports and imports (Chandra et al., 2013). Indonesia's coffee production in 2012 reached 8.8% of the total world production. Indonesia is the world's third-largest coffee producer after Brazil and Colombia (Sahat et al., 2018). Most of Indonesia's coffee exports are robusta (94%), and the rest are arabica (Nurhayati, 2018). Coffee contains bioactive compounds that contribute to antioxidants and flavor. The content of coffee bioactive compounds such as caffeine, chlorogenic acid, trigonelline, and polyphenols varies depending on the type and level of roasting (Chairgulprasert & Kongsuwankeeree, 2017).

Coffee is a very popular beverage product in the world because of its distinctive taste and aroma (Zarwinda & Sartika, 2019). Generally, the coffee produced is ground coffee and instant coffee. Serving ground coffee requires a long preparation and cannot be enjoyed immediately because of the hot temperature. Instant coffee products make it easier for consumers to serve coffee (Permana et al., 2012). Diversification of coffee derivative products that are more modern and adapted to the target consumer of the millennial generation needs to be carried out by paying attention to technological aspects. The form of the product that can be produced is effervescent.

Effervescent products can be produced with good characteristics by taking into account several factors. These factors include the type of acid, base, filler, binder, and the method of extracting used. The use of acids and bases in the manufacture of effervescent will affect the balance of taste and the refreshing sensation of effervescent drinks (Anova et al., 2016). Fillers play a role in coating the flavor-forming flavor components, increasing the total amount of solids, accelerating the drying process, and preventing damage to the ingredients due to heat (Sembiring, 2016). In addition, the presence of fillers in the manufacture of extract powder can shorten the drying time. The binder affects holding the active ingredients and other additives in a cohesive mixture so that they are tightly bound (Hartesi et al., 2016). The extract drying method aims to produce effervescent granules as the main ingredient. The difference in the extract drying method will affect the flow properties of the granules, particle size, damage to raw materials due to thermal degradation, and the stability of the resulting dry product (Setyawan et al., 2018). Therefore, it is necessary to conduct an in-depth study of the role of each of these factors and their impact on the Robusta coffee effervescent tablet product produced. In addition, this study is also important to predict the optimal conditions of each factor so that a good Robusta coffee effervescent tablet product can be produced.

## BIOACTIVE COMPOUNDS AND ANTIOXIDANTS IN COFFEE

There are several types of coffee such as robusta, arabica, liberica and excelsa. However, the main commodities are robusta and arabica. Coffee is proven to contain bioactive compounds that are beneficial to health (Bułdak et al., 2018). The bioactive compounds in coffee include caffeine, chlorogenic acid, trigonelline, caffeic acid, quinic acid, and gallic acid. This compound has potential as an antioxidant, antiviral, hepatoprotective, anti-inflammatory, and anti-carcinogenic, (Patrice et al., 2015; Bułdak et al., 2018). Trigonelline has been shown to reduce the response of blood glucose, cholesterol levels, and triglycerides in type 2 diabetic rats (Godos et al., 2014). Gallic acid acts as an antioxidant, anti-inflammatory, and antineoplastic which helps in therapeutic activity in gastrointestinal, neuropsychological, metabolic, and cardiovascular disorders (Kahkeshani et al., 2019).

Robusta coffee contains higher bioactive compounds than Arabica. Roasting level affects the content of bioactive compounds, antioxidants, and coffee taste. Medium level roasting produces the best flavor. Medium roasting at 220°C for 12 minutes produced 12.72 g/100g robusta caffeine, higher than 8.11 g/100g arabica. This is because naturally, Robusta coffee has 40-50% higher caffeine than Arabica (Song et al., 2018). The longer it is roasted the caffeine content increases, but then the caffeine decreases due to the sublimation process (Hečimović et al., 2011). Robusta coffee chlorogenic acid is higher (6.64 g/100g) than Arabica (4.37 g/100g). Chlorogenic acid decreased when roasted at high temperatures and for a long time (Song et al., 2018). Chlorogenic acid will turn into melanoidin because it is degraded into lactans. Chlorogenic acid can be hydrolyzed into volatile caffeic and quinic acids when roasted at high roasting levels (Perrone et al., 2012). The content of chlorogenic acid in coffee is influenced by genetic aspects, the level of maturity at harvest, the roasting process, as well as weather and climate (Kitzberger et al., 2014). The content of caffeic acid and quinic acid will increase during roasting due to the decomposition of chlorogenic acid when roasted at high temperatures and for a long time (Król et al., 2020).

The content of bioactive compounds in coffee is closely related to the antioxidant activity of coffee. The greater the content of bioactive compounds, the greater the antioxidant activity (Song et al., 2018). Increasing the roasting level increased the total phenolic compounds which contributed to the increase in antioxidant activity. However, prolonged roasting will reduce the total content of phenol compounds due to polymerization and autoxidation (Somporn et al., 2011). The total content of phenolic compounds increased at the beginning of roasting due to the formation of chlorogenic lactones. The increase in temperature causes degradation of chlorogenic compounds. However, other phenolic compounds can be formed as a result of the Maillard reaction that contributes to the antioxidant activity of coffee (Song et al., 2018).

## ACID CONTENT AND ACIDITY LEVEL OF COFFEE

The acid content and acidity of coffee will contribute to the quality of coffee taste. Arabica and Robusta coffee tend to have an acidic pH. This is due to the content of organic acids (Basavaraj et al., 2014). Coffee contains several hydroxynamic acid derivatives such as caffeine, chlorogenic acid, coumatic acid, ferulic acid, synapic acid, flavonoids, and polyphenols (Chismirina et al., 2014). Chlorogenic acid is the main acid component in coffee beans. Chlorogenic acid will decompose during roasting into aliphatic acids such as acetic, citric, malic and pyruvic acids. Only this acid contributes to the sour taste of coffee (Widotomo et al., 2009; Król et al., 2020).

The amount of acid content in coffee is positively correlated with the total value of titrated acid and the level of acidity of coffee (Koskei et al., 2015). The level of acidity of steeping coffee is also related to the level of roasting where the increasing level of roasting will reduce the level of acidity of steeping coffee. This happens because of the pyrolysis decomposition during roasting (Rao et al., 2020). The acid content and acidity of coffee will affect the aroma of steeping coffee as a result of the evaporation of volatile compounds. High acidity will give better aroma quality (Widyotomo et al., 2009). The pH value of Arabica coffee (4.85–5.15) is generally lower than that of Robusta coffee (5.25–5.40.13) (Basavaraj et al., 2014). This has an impact on the taste of Arabica coffee which is more acidic than robusta (Chismirina et al., 2014).

## TYPES OF ACIDS AND BASES THAT ROLE IN MAKING EFFERVESCENT

The use of different acids can affect the characteristics of the effervescent. The types of acids commonly used in the manufacture of effervescent include fumaric acid, tartaric acid, citric acid, and malic acid. While the bases commonly used are sodium bicarbonate, sodium carbonate, potassium bicarbonate, and potassium carbonate. Research by Kartikasari et al., (2015) showed that effervescent ginger produced using citric acid, tartaric acid, sodium bicarbonate had a flow time of 4.5 seconds, the water absorption capacity of 15.1 mg/minute, friability 0.35%, hardness 5 .38 kg, dissolving time 75 seconds. Meanwhile, research by Widyaningrum et al., (2015) showed that pandan effervescent using citric acid, malic acid, sodium bicarbonate had a soluble time of 20 seconds and a foam height of 4.1 cm. The use of tartaric acid in effervescent causes lower water content compared to citric and malic acids. Citric acid is a hygroscopic acidulant. Malic acid has a smaller carboxyl group than citric acid. This causes lower hygroscopic power (Regiarti & Susanto, 2015).

Base concentration also affects the dissolution time of effervescent tablets. Oktavia et al., (2018) stated that the fastest dissolving time of probiotic effervescent tablets was obtained from the addition of 37.5% sodium bicarbonate. The addition of 38% sodium bicarbonate to cocoa effervescent resulted in the best treatment with a dissolution time of 2.8 minutes (Widiastuti et al., 2018). The more sodium bicarbonate is added, the tablets will tend to dissolve more quickly in water (Ansar, 2010). The dissolution reaction of effervescent tablets is a reaction between the acid source and carbonate which produces gas in the form of carbon dioxide which occurs spontaneously when the tablet is immersed in water (Figure 1). The mechanism of effervescent tablets is dissolving in water so that they become effervescent drinks caused by the occurrence of acid and alkaline reactions (Patel & Siddaiah, 2018). The reaction is as follows:

| | | | | | |
|---|---|---|---|---|---|
| $H_3C_6H_5O_7.H_2O$ | + 3 $NaHCO_3$ | → | $Na_3C_6H_5O_7$ | + $4H_2O$ | + 3 $CO_2$ |
| Citric acid | Na-bicarbonate | | Na-citrate | water | Carbondioxide |
| $H_2C_4H_4O_6$ | + $2NaHCO_3$ | → | $Na_2C_4H_4O_6$ | + $2H_2O$ | + $2CO_2$ |
| Tartic acid | Na- bicarbonate | | Na-tartic | water | Carbondioxide |

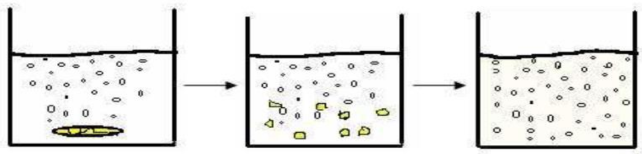

Figure 1. Mechanism of dissolution of effervescent tablets (Patel & Siddaiah, 2018)

The type and concentration of acid and base will have an impact on the effervescent flow rate. The use of citric acid can accelerate the flowability of effervescent granules because citric acid can release water crystals during melting. While tartaric acid has a low flow rate because it does not release crystal water so that the flow rate is low (Kartikasari et al., 2015).

## TYPES OF FILLING MATERIALS THAT ROLE IN MAKING EFFERVESCENT

There are several types of fillers used in the manufacture of effervescent such as maltodextrin, dextrin, glucose, lactose, and sorbitol. Maltodextrin has a higher DE (Dextrose Equivalent) value than dextrin so it is hygroscopic and has an impact on the flow time. The use of 10% maltodextrin in ant nest and rosella effervescent tablets will result in higher soluble times and hygroscopicity than 10% dextrin (Purwati et al., 2016). Fillers can also be applied in the manufacture of effervescent through combinations such as a combination of dextrin with glucose which can increase its solubility due to the level of hygroscopicity formed (Sihombing & Diana, 2016). The more hygroscopic, the higher the water absorbed so that it will form lumps. This has an impact on the longer the effervescent tablet dissolves in water due to the difficulty of breaking bonds between particles (Purwati et al., 2016). The weight uniformity of each effervescent tablet can be influenced by the type of filler. This is related to the level of hygroscopicity of each filler which triggers differences in the weight of the effervescent tablets due to the water content in the tablets. In addition, it can also affect the volume of material filling on the printing machine (Prasetyo & Winarti, 2019).

**METHOD OF MAKING POWDER EXTRACT AS EFFERVESCENT RAW MATERIAL**

The method of making extract powder in the manufacture of effervescent affects the characteristics of the effervescent product, one of which is antioxidants. Extract powder can be made using low-temperature crystallization methods such as in the manufacture of turmeric effervescent which produces high antioxidants by adding sugar and CMC to turmeric extract (Pujimulyani, 2007). Freeze drying can minimize the damage to antioxidant compounds contained in the tea extract powder compared to vacuum drying. Freeze drying will produce a lower pH of the extract powder than vacuum drying. Freeze-drying has several advantages including maintaining the stability of aroma, color, taste, and structure of materials related to shrinkage and changes in granule shape (Tahir et al., 2019). Spray drying of powdered extracts of jurai nuts will reduce antioxidant activity from 24.65% to 23.85% (Sari, 2019). The increasing drying temperature when using a spray dryer will damage the antioxidant structure so that its activity decreases. In addition, oxidation of phenolic compounds occurs at higher temperatures in the form of quinones so that the antioxidant activity becomes very low (Wiyono, 2011).

**POTENTIAL DEVELOPMENT OF COFFEE EFFERVESCENT DRINK TABLETS**

Coffee effervescent drink tablet product has the potential to be developed which can be made with robusta coffee. Other additives are needed in its manufactures such as acids and bases, fillers, binders, and extract powders. Extract powder can be prepared by various drying methods. The selection of coffee types is based on taste, the content of bioactive compounds, and antioxidant activity. Ownership of other additives is based on their effect on effervescent characteristics such as tablet hardness, dissolution time, flow properties, angle of repose, and uniformity of tablet weight. The choice of the method of making the extract powder is based on its effect on bioactive compounds and antioxidants as well as the resulting flavor. Effervescent coffee will contain bioactive compounds sourced from coffee including chlorogenic acid, trigonelline, gallic acid, caffeine, and phenol. The presence of these compounds causes effervescent coffee to be beneficial for health.

**CONCLUSION**

Robusta coffee has the potential to be developed into effervescent beverage tablet products. Robusta coffee contains many bioactive compounds and antioxidants that are beneficial for health. Robusta coffee has a higher bioactive compound content than arabica. Commonly used acids are citric acid, tartaric acid, and malic acid. While the base that is often used is sodium bicarbonate. PVP is the most commonly used binder. Extract powder is generally made by drying and crystallization.

**ACKNOWLEDGEMENT**

We would like to thank the Ministry of Education and Culture Indonesia for providing grant funds for the implementation of this research.

**REFERENCES**

Anova, I. T., Hermianti, W., & Kamsina. (2016). Formulasi Perbandingan Asam Basa Serbuk *Effervescent* dari Coklat Bubuk. *Jurnal Litbang Industri*, *6*(6), 99–106.

http://dx.doi.org/10.24960/jli.v6i2.1593.99-106

Ansar. (2010). Optimalisasi Energi Mekanik Pengepresan Buah Markisa dan Formula Membentuk Sifat *Effervescent* Tablet Buah Markisa. *Jurnal Ilmu Teknologi Energi*, *1*(10), 48–57.

Anwar, K. (2010). Formulasi Sediaan Tablet *Effervescent* dari Ekstrak Kunyit (*Curcuma domestica Val.*) dengan Variasi Jumlah Asam Sitrat-Asam Tartrat sebagai Sumber Asam. *Jurnal Sains dan Terapan Kimia*, *4*(2), 168–178. http://dx.doi.org/10.20527/jstk.v4i2.2065

Atmaka, W., Nurhartadi, E., & Zainudin, A. (2013). Pengaruh Jenis dan Konsentrasi Bahan Pengikat Terhadap Karakterisitik Fisik dan Aktivitas Antioksidan Tablet *Effervescent* Ekstrak Buah Delima (*Punica granatum*). *Jurnal Teknosains Pangan*, *2*(2), 1–6.

Basavaraj, K., Gopinandhan, T. N., Ashwini, M. S., Gupta, N., & Mallikarjun Banakar. (2014). Relationship between Sensory Perceived Acidity and Instrumentally Measured Acidity in Indian Coffee Samples. *Ind J Nutr Diete*t. (51), 286. https://doi.org/10.13140/RG.2.2.29177.52328

Bułdak, R. J., Hejmo, T., Osowski, M., Bułdak, Ł., Kukla, M., Polaniak, R., & Birkner, E. (2018). The Impact of Coffee and Its Selected Bioactive Compounds on the Development and Progression of Colorectal Cancer In Vivo and In Vitro. *Molecules*, *23*(3309), 1–26. https://doi.org/10.3390/molecules23123309

Chairgulprasert, V. & Kongsuwankeeree, K. (2017). Preliminary Phytochemical Screening and Antioxidant Activity of Robusta Coffee Blossom. *Thammasat International Journal of Science and Technology*, *22*(1), 1–8. https://doi.org/10.14456/tijsat.2017.

Chandra, D., Ismono, R. H. & Kasymir, E. (2013). Prospek Perdagangan Kopi Robusta Indonesia di Pasar Internasional. *JIIA Jurnal Ilmu Ilmu Agribisnis*, *1*(1), 10–15. http://dx.doi.org/10.23960/jiia.v1i1.%25p

Chismirina, S., Andayani, R., & Ginting, R. (2014). Pengaruh Kopi Arabika (*Coffea arabica*) dan Kopi Robusta (*Coffea canephora*) terhadap Viskositas Saliva Secara in Vitro. *Cakradonya Dental Journal*, *6*(2), 678-744.

Godos, J., Pluchinotta, F. R., Marventano, S., Buscemi, S., & Volti, G. L. (2014). Coffee Components and Cardiovascular Risk: Beneficial and Detrimental Effects. *International Journal of Food Science and Nutrition*, *65(8),* 925-936. https://doi.org/10.3109/09637486.2014.940287

Hartesi, B., Sriwidodo, Abdassah, M., & Chaerunisaa, A. Y. (2016). Starch as Pharmaceutical Excipient. *International Journal of Pharmaceutical Sciences Review and Research*, *41*(2), 59–64.

Hečimović, I., Belščak-Cvitanović, A., Horžić, D., & Komes, D. (2011). Comparative Study of Polyphenols and Caffeine in Different Coffee Varieties Affected by the Degree of Roasting. *Food Chemistry*, *129*(3), 991–1000. https://doi.org/10.1016/j.foodchem.2011.05.059

Kahkeshani, N., Farzaei, F., Fotouhi, M., Alavi, S. S., Bahramsoltani, R., Naseri, R., Momtaz, S., Abbasabadi, Z., Rahimi, R., Farzaei, M. H., & Bishayee, A. (2019).

Pharmacological Effects of Gallic Acid in Health and Diseases : A mechanistic Review. *Iranian Journal of Basic Medical Sciences*, *22*(3), 225-237. https://doi.org/10.22038/ijbms.2019.32806.7897

Kailaku, S. I., Sumangat, J., & Hermani. (2012). Formulasi Granul Efervesen Kaya Antioksidan dari Ekstrak Daun Gambir. *Jurnal Pascapanen*, *9*(1), 27–34. https://doi.org/10.21082/jpasca.v9n1.2012.27-34

Kartikasari, S. D., Murti, Y. B., & Mufrod. (2015). Effervescent Tablets Formulation of Ginger Rhizome (*Zingiber officinale Rosc.*) with Variation of Citric Acid and Tartaric Acid Level. *Journal Traditional Medicine*, *20*(2), 119–126. https://doi.org/10.22146/tradmedj.8082

Kitzberger, C. S. G., Scholz, M. B. dos S., & Benassi, M. de T. (2014). Bioactive Compounds Content in Roasted Coffee from Traditional and Modern Coffea Arabica Cultivars Grown Under the Same Edapho-Climatic Conditions. *Food Research International*, *61*, 61–66. https://doi.org/10.1016/j.foodres.2014.04.031

Koskei, R. K., Muliro, P., & Muhoho, S. (2015). Effects of Coffee Processing Technologies on Physico-Chemical Properties and Sensory Qualities of Coffee. *African Journal of Food Science*, *9*(4), 230–236. https://doi.org/10.5897/ajfs2014.1221

Król, K., Gantner, M., Tatarak, A., & Hallmann, E. (2020). The Content of Polyphenols in Coffee Beans as Roasting, Origin and Storage Effect. *European Food Research and Technology*, *246*(1), 33–39. https://doi.org/10.1007/s00217-019-03388-9

Nariswara, Y., Hidayat, N., & Effendi, M. (2013). Pengaruh Waktu dan Gaya Tekan Terhadap Kekerasan dan Waktu Larut Tablet *Effervescent* dari Serbuk Wortel (*Daucus carota L.*). *Jurnal Industria*, *2*(1), 27–35.

Nurhayati, N. (2018). Karakteristik Sensori Kopi Celup dan Kopi Instan Varietas Robusta dan Arabika. *Jurnal Ilmiah Inovasi*, *17*(2), 80–85. https://doi.org/10.25047/jii.v17i2.547

Oktavia, D. A., Feliatra, F., & Lubis, L. L. (2018). Pengaruh Konsentrasi Penyalut terhadap Viabilitas Bakteri dan Daya Larut Tablet *Effervescent* Probiotik. *Jurnal Pascapanen dan Bioteknologi Kelautan dan Perikanan*, *13*(2), 153-163. https://doi.org/10.15578/jpbkp.v13i2.499

Patel, S. G., & Siddaiah, M. (2018). Formulation and Evaluation of Effervescent Tablets : a review. *Journal of Drug Delivery and Therapeutics*, *8*(6), 296–303. https://doi.org/10.22270/jddt.v8i6.2021

Patriche, S., Boboc, M., Leah, V., & Dinica, R. (2015). Extraction and Evaluation of Bioactive Compounds with Antioxidant Potential from Green Arabica Coffee Extract. *The Annals of the University Dunarea de Jos of Galati. Fascicle VI-Food Technology*, *39*(2), 88–95.

Permana, A. W., Widayanti, S. M., Prabwati, S., & Setyabudi, D. A. (2012). Sifat Antioksidan Bubuk Kulit Buah Manggis (*Garcinia mangostana L.*) Instan dan Aplikasinya untuk Minuman Fungsional Berkarbonasi. *Jurnal Pascapanen*, *9*(2), 88–95. http://dx.doi.org/10.21082/jpasca.v9n2.2012.88-95

Perrone, D., Farah, A., & Donangelo, C. M. (2012). Influence of Coffee Roasting on the

Incorporation of Phenolic Compounds Into Melanoidins and Their Relationship with Antioxidant Activity of The Brew. *Journal of Agricultural and Food Chemistry*, *60*(17), 4265–4275. https://doi.org/10.1021/jf205388x

Prasetyo, A., & Winarti, S. (2019). Karakteristik *Effervescent* Prebiotik Galaktomanan dari Ampas Kelapa. *Jurnal Teknologi Pangan*, *13*(2), 68–76. https://doi.org/10.33005/jtp.v13i2.1707

Pujimulyani, D. (2007). Sifat Fisik dan Aktivitas Antioksidan Tablet *Effervescent* Kunyit (*Curcuma domestika Val.*). *Agritech*, *27*(2), 70–74. https://doi.org/10.22146/agritech.9495

Purwati, I., Yuwanti, S., & Sari, P. (2016). Karakterisasi Tablet *Effervescent* Sarang Semut (*Myrmecodia tuberosa*) – Rosella (*Hibiscus sabdarisffa L.*) Berbahan Pengisi Maltodekstrin dan Dekstrin. *Jurnal Agroteknologi*, *10*(01), 63-72.

Putra, D. J., Antari, N. W., Putri, N. P. R., Arisanti, C. I., & Samirana, P. (2019). Penggunaan Polivinill Pirolidon (PVP) sebagai Bahan Pengikat pada Formulasi Tablet Ekstrak Daun Sirih (*Piper betle L.*). *Jurnal Farmasi Udayana*, *8*(1), 14–21. https://doi.org/doi.org/10.24843/JFU.2019.v08.i01.p03

Rao, N., Fuller, M., & Grim, M. (2020). Physiochemical Characteristics of Hot and Cold Brew Coffee Chemistry: The Effects of Roast Level and Brewing Temperature on Compound Extraction. *Foods*, *9*(7), 902. https://doi.org/10.3390/foods9070902

Regiarti, U., & Susanto, W. H. (2015). Pengaruh Konsentrasi Asam Malat dan Suhu terhadap Karakteristik Fisik Kimia dan Organoleptik *Effervescent* Ekstrak Daun Mengkudu (*Morinda citrifolia L.*). *Jurnal Pangan Dan Agroindustri*, *3*(2), 638–649.

Sahat, S. F., Nuryartono, N., & Hutagaol, M. P. (2018). Analisis Pengembangan Ekspor Kopi di Indonesia. *Jurnal Ekonomi dan Kebijakan Pembangunan*, *5*(1), 63–89. https://doi.org/10.29244/jekp.5.1.63-89

Sari, D. N. (2019). Pembuatan Minuman Fungsional Tablet *Effervescent* dari Bubuk Ekstrak Daun Kacang Tujuh Jurai (*Phaseolus lunatus, L.*). *Jurnal Litbang Industri*, *9*(1), 23–31. https://doi.org/10.24960

Sembiring, B. B. (2016). Pengaruh Konsentrasi Bahan Pengisi dan Cara Pengeringan Terhadap Mutu Ekstrak Kering Sambiloto. *Buletin Penelitian Tanaman Rempah dan Obat*, *20*(2), 173–181. https://dx.doi.org/10.21082/bullittro.v20n2.2009.%25p

Setyawan, I. A., Syukri, Y., & Anshory, H. (2018). Sifat Fisik dan Aktivitas Antioksidan Tablet Ekstrak Buah Mahkota Dewa (*Phaleria macrocarpa B.*). *Journal of Science and Applicative Technology*, *2*(1), 34–39. https://doi.org/10.35472/281428

Sihombing & Diana. (2016). Formulasi Sediaan Serbuk *Effervescent* Sari Buah Jambu Biji ( *Psidium guajava* ). *Jurnal Dunia Farmasi*, *1*(1), 7-14.

Somporn, C., Kamtuo, A., Theerakulpisut, P., & Siriamornpun, S. (2011). Effects of Roasting Degree on Radical Scavenging Activity, Phenolics and Volatile Compounds of Arabica Coffee Beans (*Coffea arabica L. cv. Catimor*). *International Journal of Food Science and Technology*, *46*(11), 2287-2296. https://doi.org/10.1111/j.1365-2621.2011.02748.x

Song, L., Asare, T., Kang, M., & Lee, C. S. (2018). Changes in Bioactive Compounds and

Antioxidant Capacity of Coffee under Different Roasting Conditions. *Koraen Journal of Plant Resources*, *36*(6), 704-713. https://doi.org/10.7732/kjpr.2018.31.6.704

Tahir, M. M., Langkong, J., Tawali, A. B., & Abdullah, N. (2019). Kajian Pengaruh Jenis Pengering dan Konsentrasi Maltodekstrin Terhadap Produk Minuman Teh Secang *Effervescent*. *Canrea Jurnal: Food Technology, Nutritions, and Culinary Journal*, *2*(1), 51-61. https://doi.org/10.20956/canrea.v2i1.192

Widiastuti, R. A., Tamrin, & Asyik, N. (2018). Pengaruh Variasi Konsentrasi Asam Sitrat, Asam Tartrat, dan Natrium Bikarbonat Terhadap Sifat Fisik, Kimia, dan Organoleptik Produk Minuman Instan *Effervescent* Bubuk Kakao *(Theobroma cacao L.)*. *Jurnal Sains dan Teknologi Pangan. 3*(3), 1341-1355. http://dx.doi.org/10.33772/jstp.v3i3.4440

Widyaningrum, A., Lutfi, M., & Argo, B. D. (2015). Karakterisasi Serbuk *Effervescent* Dari Daun Pandan (*Pandanus amaryllifolius Roxb*) dengan Variasi Komposisi Jenis Asam. *Jurnal Bioproses Komoditas Tropis*, *3*(2), 1-8.

Widyotomo, S., Mulato, S., Purwadaria, H. K., & Syarief, A. M. (2009). Decaffeination Process Characteristic of Robusta Coffee in Single Column Reactor Using Ethyl Acetate Solvent. *Pelita Perkebunan*. 25(2), 101-125. https://doi.org/10.22302/iccri.jur.pelitaperkebunan.v25i2.133

Wiyono, R. (2011). Studi Pembuatan Serbuk *Effervescent* Temulawak (*Curcuma xanthorrhiza roxb*) Kajian Suhu Pengering, Konsentrasi Dekstrin, Konsentrasi Asam Sitrat dan Na-Bikarbonat. *Jurnal Teknologi Pangan*, *1*(1), 56-85. https://doi.org/10.35891/tp.v1i1.477

Zarwinda, I., & Sartika, D. (2019). Pengaruh Suhu dan Waktu Ekstraksi Terhadap Kafein dalam Kopi. *Lantanida Journal*, *6*(2), 180-191. https://doi.org/10.22373/lj.v6i2.3811