

## NUTRACEUTICAL POTENTIAL OF ENCAPSULATED PURPLE OKRA (*Abelmoschus esculentus* L. Moench) EXTRACT

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### ABSTRACT

The accumulation of free radical production impacts on the development of degenerative diseases which are the highest cause of morbidity and mortality in the world. Biofortification of purple okra in the form of encapsulated extract has the potential as a nutraceutical through the role of antioxidants. This study aimed to analyze the potential of encapsulated purple okra extract as a nutraceutical by determining physical-chemical characteristics, microbial and heavy metals contamination, antioxidant capacity, total flavonoids, and quercetin. This was a laboratory experimental study on purple okra which was extracted using the maceration method. The results of physical-chemical characteristics showed that purple okra extract has the form of dry powder, greenish-brown color, odor characteristic of okra extract (caramel-like), and sour taste with yield of 4%, pH of 4.8, undetectable solvent residue, water content of 13.5%, total ash content of 10.4%, and disintegration time of 1.25 minutes. The results of microbial contamination showed a total plate count of  $3.1 \times 10^2$  CFU g<sup>-1</sup>, yeast and mold count, *E. coli*, *S. aureus* negative CFU g<sup>-1</sup>, and *Salmonella* spp negative CFU 10g<sup>-1</sup>. The results of heavy metal contamination showed that As, Pb, Cd, and Hg were not detected every mg Kg<sup>-1</sup>. The results of antioxidant capacity, total flavonoids, and suspected quercetin derivatives showed a value of 84.88%, 81.32 mg QE g<sup>-1</sup>, and 4.91 mg g<sup>-1</sup>. These bioactive components act as free radical scavengers in helping to prevent chain reactions. Encapsulated purple okra extract has shown its potential as a nutraceutical that helps prevent degenerative diseases.

**Keywords:** antioxidant, encapsulated, nutraceutical, purple okra extract

### INTRODUCTION

The prevalence of degenerative diseases is estimated to continue to increase and become the main cause of death globally (Ramesh & Kosalram, 2023). The accumulation of free radicals has an impact on the development of various degenerative diseases through various mechanisms (Sharifi-Rad et al., 2020). Free radicals form reactive oxygen species (ROS) which have one or more unpaired electrons. When the production of free radicals exceeds the limit of protective capabilities, it will initiate an autocatalytic reaction to induce damage to the main components of cells, namely protein, lipid, and deoxyribonucleic acid (DNA) (Burgos-Morón et al., 2019). This condition is the beginning of oxidative stress due to an imbalance between free radical production and natural radical scavengers (Salsabila et al., 2022).

Exogenous antioxidant sources from food or parts of food are needed when the production of endogenous antioxidants as natural radical

scavengers is unable to compensate for the increase in free radicals (El-Masry & Mahmoud, 2021). The availability of exogenous antioxidants can restrain the use of endogenous antioxidants, thereby synergistically increasing defense against oxidative stress (Moussa et al., 2019). Antioxidants work by giving one electron to oxidant compounds so that their activity can be inhibited (Hurrell & Hsu, 2017). Okra is starting to develop in Asia including Indonesia which has been identified as having antioxidant activity with considerable market potential (Bawa & Badrie, 2016). Biofortification of purple okra (*Abelmoschus esculentus* L. Moench) developed by the Center for Tropical Horticulture Studies, IPB University has bioactive components in the form of flavonoid and quercetin which are superior to green okra. Purple okra is the result of developing superior seeds from okra varieties (Anjani, 2018).

The bioactive components in purple okra can be utilized in the form of encapsulated extract.

The encapsulated form facilitates use, controls the release of its active substances at the right target, and protects against external factors to maintain functional stability during storage (Nining et al., 2017; Suwaris & Saputra, 2020). Purple okra is extracted using a maceration method to extract bioactive components so that it has a higher content than the fresh form of okra (Achmad, 2022). The vacuum pan evaporator technology is used to dry the extract with the consideration that reducing pressure can reduce the boiling point so that the temperature is relatively lower and the time is relatively shorter to maintain the bioactive components (Syakdani et al., 2019).

The potential of encapsulated purple okra extract as a nutraceutical was identified through the role of antioxidants as free radical scavengers in helping to prevent chain reactions thereby preventing further damage to cell components (Yunanto et al., 2009). Research by Elkhalifa et al. (2021) regarding the potential of okra as a nutraceutical for health applications, showed its benefits as an antioxidant, antidiabetic, antihyperlipidemic, antiproliferative, and anticancer. Nutraceuticals, a combined term between nutrition and pharmaceuticals, are food or parts of food that provide added value to improve and enhance the body's physiological functions (Siddiqui & Moghadasian, 2020). This research aims to analyze the potential of encapsulated purple okra extract as a nutraceutical by determining physical-chemical characteristics, microbial and heavy metal contamination, as well as bioactive components that help prevent and reduce the consequences of degenerative diseases.

## METHODS

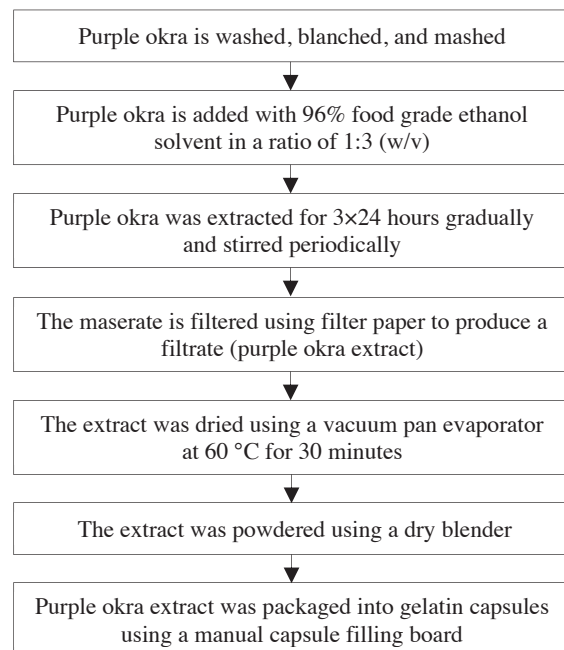
This research used a laboratory experimental design which began with the production of encapsulated purple okra extract at the Pilot Plant, Department of Food Science and Technology, IPB University. The research continued with the analysis of physical-chemical characteristics, microbial and heavy metal contamination, and bioactive components (antioxidant capacity, total flavonoids, and quercetin) at Saraswanti Indo Genetech Laboratory, Bogor and Analysis of Nutrients and Biochemistry Laboratory,

Department of Community Nutrition, IPB University.

## Encapsulated Purple Okra Extract Production

Purple okra is the result of the biofortification of okra varieties located at the Leuwikopo Experimental Garden which was developed by Prof. Dr. Muhamad Syukur, S.P., M.Sc. from the Center for Tropical Horticulture Studies, IPB University. Biofortification is carried out by including nutritional elements to produce okra varieties with superior bioactive components.

The production of encapsulated purple okra extract using a modification of research by Fan et al. (2014) and Achmad (2022) is presented in Figure 1. Fresh purple okra was blanched at 100 °C for 1 minute and mashed for 2 minutes. The extraction process was carried out using the maceration method at room temperature for 3×24 hours. Extraction results were dried using a vacuum pan evaporator at 60 °C for 30 minutes. The dry extract was powdered for 10 seconds and packed into capsules.



**Figure 1.** Production Process of Encapsulated Purple Okra Extract

## Physical-Chemical Characteristics Analysis

Analysis of the physical-chemical characteristics of purple okra extract in the form

of organoleptic observations was carried out descriptively regarding texture, taste, odor, and color (BPOM, 2019). Yield analysis was carried out by the weighing method using an analytical balance (Depkes, 2000). pH analysis was carried out by the electrometric method using a pH meter (Vernanda et al., 2019).

Solvent residual analysis was carried out by the chromatographic method using gas chromatography according to the United States Pharmacopeia (USP) (2020a). Water content analysis was carried out by gravimetric method using an oven according to SNI 01-2891-1992 5.1 (BSN, 1992a). Total ash content analysis was carried out by the gravimetric method using a furnace according to SNI 01-2891-1992 6.1 (BSN, 1992b). Disintegration time analysis was carried out using a disintegration tester on encapsulated purple okra extract according to the Indonesian Pharmacopeia VI (Kemenkes, 2020).

#### **Microbial Contamination Analysis**

Analysis of microbial contamination in the form of total plate count (TPC), yeast mold count (YMC), and the specific microorganism *Escherichia coli* (*E. coli*) was carried out by the microorganism enumeration method using the pour plate technique which was counted using a colony counter according to SNI ISO 4833-1:2015 (BSN, 2015) for TPC, USP (2020b; 2020d) for YMC, and SNI ISO 16649-2:2016 (BSN, 2016) for *E. coli*. *Salmonella spp* analysis was carried out qualitatively using the inoculation method which was confirmed by biochemical test and serological test according to USP (2020b; 2020c). Analysis of *Staphylococcus aureus* (*S. aureus*) was carried out qualitatively using the inoculation method which was confirmed by the staining test and coagulation test according to USP (2020b; 2020c).

#### **Heavy Metal Contamination Analysis**

Analysis of heavy metal contamination such as arsenic (As) and lead (Pb) was carried out by the absorbance method using an inductively coupled plasma-mass spectrometer (ICP-MS) according to AOAC 2011.19 (AOAC, 2014), AOAC 2015.01 (AOAC, 2015), and Creed et al. (1994). Analysis of cadmium (Cd) and mercury (Hg) was carried

out by the absorbance method using inductively coupled plasma-optical emission spectrometry (ICP-OES) according to AOAC 2011.14 (AOAC, 2011), AOAC 2013.06 (AOAC, 2013), and Gomez et al. (2007).

#### **Antioxidant Capacity Analysis**

Antioxidant capacity analysis was carried out by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method using a microplate reader based on a modification of research by Molyneux (2004) and Khan et al. (2022). A sample of 0.01 g was dissolved with ethanol p.a in a 10 mL volumetric flask. Vitamin C standard of 0.1 g was dissolved with distilled water in a 10 mL volumetric flask. Vitamin C standard solution is diluted at a concentration of 10.000-0.001 ppm, while the sample solution is diluted at a concentration of 1000-31.25 ppm. A total of 150  $\mu$ L of each sample and the standard solution was added to 150  $\mu$ L of 0.2 mM DPPH solution and then homogenized. The solution was incubated for 30 minutes then the absorbance was measured at a wavelength of 515 nm and the antioxidant capacity was stated in %inhibition.

#### **Total Flavonoids Analysis**

Analysis of total flavonoids was carried out by the aluminum chloride ( $\text{AlCl}_3$ ) method using a microplate reader based on a modification of research by Pascal et al. (2018). A sample of 0.01 g was dissolved with ethanol p.a in a 10 mL volumetric flask. Quercetin standard of 0.01 g was dissolved with ethanol p.a in a 10 mL volumetric flask. Quercetin standard solution is diluted at a concentration of 500-15.625 ppm. A total of 500  $\mu$ L of each sample and the standard solution was added 30  $\mu$ L of 5%  $\text{NaNO}_2$  then homogenized and incubated for five minutes. A total of 30  $\mu$ L of 10%  $\text{AlCl}_3$  solution was added then homogenized and incubated for one minute. A total of 200  $\mu$ L of 5% NaOH solution and 240  $\mu$ L of distilled water were added and then homogenized. Absorbance was measured at a wavelength of 492 nm. Total flavonoids are calculated through the equation  $y = 0,0016x + 0,025$  and stated in mg quercetin equivalent (QE)  $\text{g}^{-1}$ .

## Quercetin Analysis

Quercetin analysis was carried out by a chromatographic method using high-performance liquid chromatography (HPLC) based on a modification of research by Seo et al. (2021). A sample of 0.1 g was dissolved with HPLC-grade methanol in a 10 mL volumetric flask. The sample solution was filtered using a 0.45 µm nylon syringe filter. Quercetin standard of 0.0025 g was dissolved with the same solvent in a 10 mL volumetric flask. A total of 60 µl of sample filtrate was injected into the HPLC system. A low-pressure gradient system with methanol and water as mobile phases was used at ratios of 100:0 (3 minutes), 95:5 (3 minutes), and 90:10 (3 minutes) at a wavelength of 370 nm.

## RESULTS AND DISCUSSION

### Physical-Chemical Characteristics

The results of the physical-chemical characteristics analysis of encapsulated purple okra extract based on BPOM standard (2019) in encapsulated powder form, Depkes standard (2008), and Depkes standard (2000) in powder extract form are presented in Table 1. Organoleptic observation aims to provide a simple objective introduction by the researchers which is described in the form of dry powder, greenish-brown color, odor characteristic of okra extract (caramel-like), and sour taste. The results of the yield analysis of 4.0% show a different value compared to the standard yield according to Depkes (2000) of  $\geq 7.2\%$ . The yield provides an estimate of the bioactive components that can be extracted from the extraction process.

The results of the pH analysis show a value of 4.8. This is different from okra flour which is dried using a cabinet dryer which has a pH value of 6.35 (Fauza et al., 2019). The extraction process can lower the pH and lower pH values contain higher antioxidant activity (Rifkowitz & Wardanu, 2016). At low pH, the density of hydrogen increases which suppresses the release of hydrogen to scavenge free radicals (Fathinatullabibah et al., 2014). The residual solvent content after evaporation can be determined through residual solvent analysis to ensure the safety of the extract for consumption. The results show that solvent

**Table 1.** Physical-Chemical Characteristics of Encapsulated Purple Okra Extract

Parameter	Unit	Purple Okra Extract	Standard
Organoleptic			
Texture		dry powder	-
Color		greenish-brown	-
Odor		okra extract	-
Taste		sour	-
Yield	%	4.0	$\geq 7.2^1$
pH		4.8	-
Solvent residue	ppm	not detected	Max. 10.000 <sup>2</sup>
Water content	%	13.5	$\leq 10^2$
Total ash content	%	10.4	$\leq 16.6^3$
Disintegration time	minute	1.25	$\leq 30^2$

Source: <sup>1</sup>Depkes (2000). <sup>2</sup>BPOM (2019). <sup>3</sup>Depkes (2008).

residue is not detected according to BPOM (2019). The vacuum pan evaporator technology is used to dry the extract which can evaporate the solvent at low pressure so that the temperature is relatively lower and the time is relatively shorter to maintain the bioactive components (Syakdani et al., 2019).

Furthermore, the results show a water content of 13.5% which is different from the standard water content according to BPOM (2019) of  $\leq 10\%$ . The presence of water content because the purple okra extract is hygroscopic which is able to absorb air humidity or water at normal temperature and normal pressure. Total ash content analysis provides an overview of the inorganic or mineral compounds remaining after the ashing process (Hidayati et al., 2018). The results show a total ash content of 10.4% which is different from the standard total ash content according to BPOM (2019) of  $\leq 16.6\%$ . The lower ash content indicates an optimal extraction process due to the low mineral residue (Khirzin et al., 2019). This is related to the use of solvents that attract more organic compounds than inorganic compounds.

The encapsulated form has an effect if it is first broken down into smaller particles so that it can be absorbed into the digestive tract. Encapsulated purple okra extract requires a disintegration time of 1 minute 15 seconds which shows a value in accordance with BPOM (2019), namely  $\leq 30$  minutes. The harder the capsule material, the

smaller the porosity, so it becomes more difficult to penetrate and absorb water into the capsule, which affects disintegration time (Sugiyanto et al., 2017).

### Microbial and Heavy Metal Contamination

The results of microbial and heavy metal contamination analysis of encapsulated purple okra extract based on BPOM (2019) standards in encapsulated powder form are presented in Table 2. Microbial contamination analysis can provide assurance that microbial contamination does not exceed the specified limits to ensure the safety of the extract for consumption. The presence of microbes can affect the stability during storage and the safety of the extract. The result of TPC analysis shows a value of  $3.1 \times 10^2$  colony-forming units (CFU)  $g^{-1}$  according to BPOM (2019) of  $\leq 2 \times 10^4$  CFU  $g^{-1}$ . In addition, YMC analysis as well as specific microorganisms such as *E. coli*, *Salmonella spp*, and *S. aureus* showed negative results. These results are in accordance with BPOM (2019), namely  $\leq 2 \times 10^2$  CFU  $g^{-1}$  for YMC, negative  $g^{-1}$  for *E. coli* and *S. aureus*, and negative  $10g^{-1}$  for *Salmonella spp*. Research on the potential of okra as a nutraceutical shows its benefit as an antimicrobial that can inhibit bacterial growth (Syukri et al., 2020; Elkhalfa et al., 2021).

**Table 2.** Microbial and Heavy Metal Contamination of Encapsulated Purple Okra Extract

Parameter	Unit	Purple Okra Extract	Standard <sup>1</sup>
<b>Microbial contamination</b>			
TPC	CFU $g^{-1}$	$3.1 \times 10^2$	$\leq 2 \times 10^4$
YMC	CFU $g^{-1}$	negative	$\leq 2 \times 10^2$
<i>E. coli</i>	CFU $g^{-1}$	negative	negative
<i>Salmonella spp</i>	CFU $10g^{-1}$	negative	negative
<i>S. aureus</i>	CFU $g^{-1}$	negative	negative
<b>Heavy metal contamination</b>			
Arsenic	mg $Kg^{-1}$	not detected	$\leq 5$
Lead	mg $Kg^{-1}$	not detected	10
Cadmium	mg $Kg^{-1}$	not detected	$\leq 0.3$
Mercury	mg $Kg^{-1}$	not detected	$\leq 0.5$

Source: <sup>1</sup>BPOM (2019)

Heavy metal contamination analysis can provide assurance that heavy metal contamination does not exceed the specified limits that cause toxicity (Depkes 2000). The results show that heavy metal contamination such as As, Pb, Cd, and Hg are not detected according to BPOM (2019) in units of mg  $Kg^{-1}$ , namely  $\leq 5$  for As, 10 for Pb,  $\leq 0.3$  for Cd, and  $\leq 0.5$  for Hg. Heavy metal contamination can occur during the production of purple okra extract. In addition, industrial waste or agricultural activities such as the geological condition of the land where cultivation is carried out and the fertilizer used also affect contamination (Wijianto et al., 2022). Heavy metal contamination provides negative effects which are mostly mediated through increased production of excess ROS causing oxidative damage to various body's physiological systems (Awoke et al., 2020).

### Antioxidant Capacity

The ability of antioxidant compounds in okra extract to inhibit free radicals is known as antioxidant capacity (%inhibition). The results of antioxidant capacity analysis showed that the %inhibition of purple okra extract was 84.88% (Table 3). The results of this study are different from the results of research by Zainuddin et al. (2022) on the ethanol extract of green okra which has an inhibition of 81.9%. The difference occurs because purple okra is the result of biofortification which has superior bioactive components compared to green okra (Anjani et al., 2018). Furthermore, the difference can also occur because the previous study used dry okra which was extracted and concentrated using a rotary evaporator at  $<50$  °C to obtain a thick extract. In contrast to this study, which used fresh okra before the extraction process and vacuum pan evaporator technology to dry the extract. This technology works at a pressure of 65 cmHg so that the boiling point of the solvent can be lowered and the time required is relatively shorter (Syakdani et al., 2019). Heat treatment and light exposure for a certain time affect antioxidant compound that has thermolabile properties by triggering pre-oxidation (Rifkowitz & Wardanu, 2016).

**Table 3.** Antioxidant Capacity, Total Flavonoids, and Quercetin of Encapsulated Purple Okra Extract

Parameter	Unit	Purple Okra Extract
Antioxidant capacity	%	84.88
Total flavonoids	mg QE g <sup>-1</sup>	81.32
Quercetin	mg g <sup>-1</sup>	4.91

This is different from research by Anjani (2018) on green okra and purple okra in extract form which has an inhibition of 19.28% and 23.34%. Apart from being caused by differences in varieties and forms of dried okra before extraction, the difference in inhibition was also caused by the solvents used. In the previous study, okra was extracted using methanol, while in this study okra was extracted using ethanol. Research shows that the use of ethanol as a solvent shows higher amounts of bioactive components (Padmawati et al., 2020). Antioxidant compounds such as phenol are polar so using ethanol as a solvent is appropriate. Another study showed a different inhibition of 76.28% in okra fruit extract compared to okra leaf extract of 62.12% (Faisal & Handayani, 2019). This is because the fruit contains seeds and mucilages which are known to contain more antioxidant compounds, especially quercetin derivatives in the form of isoquercitrin (Chaemsawang et al., 2019).

Encapsulated purple okra extract with antioxidant content has the potential as a nutraceutical that can increase the capacity to withstand oxidative stress. Antioxidants can prevent, inhibit, eliminate, or repair oxidative damage to target molecules that occur as a result of chemical reactions involving free radicals (Banjarnahor & Artanti, 2014). Several mechanisms of antioxidant action include inhibition of enzymes involving the formation of ROS, termination of radical chain reactions, stabilization of initiator radicals, and enhancement of endogenous antioxidants (Sachdeva et al., 2014).

In addition, several studies show the health benefits of bioactive components of purple okra, namely increasing antioxidant status, improving oxidative stress conditions, hypoglycemia effects

(Anjani et al., 2018; Nabila et al., 2018), improving lipid profiles (Nabila et al., 2018), improving kidney functions (Wahyuningsih et al., 2021a), improving liver functions (Wahyuningsih et al., 2021b), anticancer effects (Achmad, 2022), and reducing inflammation (Pramudya et al., 2022).

### Total Flavonoids

The bioactive component of flavonoids in purple okra extract acts as an antioxidant to repair damage caused by radical compounds (Nabila et al., 2018). The results of the total flavonoids analysis showed a value of 81.32 mg QE g<sup>-1</sup> (Table 3). In contrast to research on green okra extract by Chandra et al. (2022) with total flavonoids of 3.19 mg QE g<sup>-1</sup>. Apart from being caused by differences in okra varieties, the previous study required maceration for 5 days, while this study required 24 hours only. Maceration time of 24 hours has higher bioactive components compared to 12, 36, 48, 60, and 72 hours (Widodo et al., 2021). The longer the maceration time tends to reduce the total flavonoids due to oxidation which damages the flavonoid compounds after the optimum time has passed. The total flavonoids were also different compared to the research by Syam et al. (2020) in extracts from green okra and red okra of 2.57 mg QE g<sup>-1</sup> and 2.84 mg QE g<sup>-1</sup>. Apart from being caused by differences in okra varieties, previous study used a different solvent concentration, namely 70%, while this research used 96%. Solvent concentration can result in changes in solvent polarity, thereby affecting the solubility of bioactive compounds (Suhendra et al., 2019).

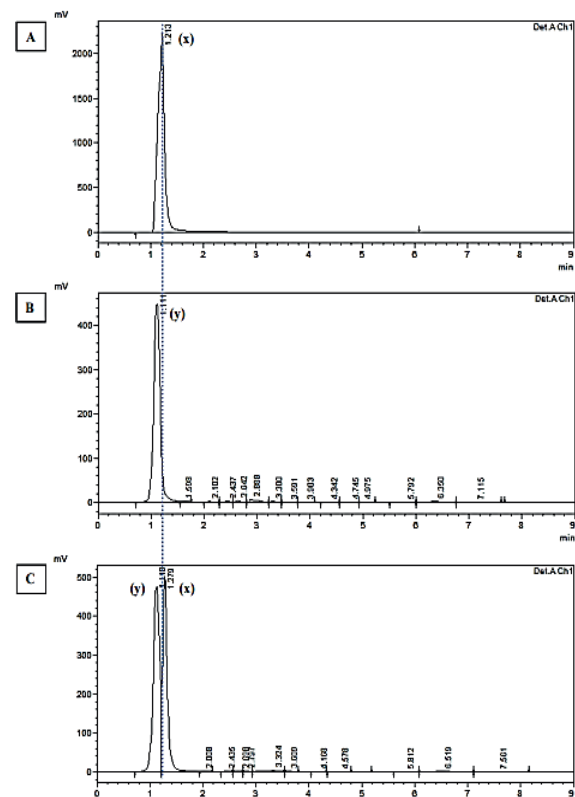
Encapsulated purple okra extract has the potential as a nutraceutical with flavonoid content which plays a role not only in improving health status but helps prevent and reduce the consequences of degenerative diseases (Balentine et al., 2015). Flavonoid prevent damage by activating the main antioxidant defense enzymes, activating metal chelators, and inhibiting the activity of enzymes that produce free radicals (Banjarnahor & Artanti, 2014; Panche et al., 2016). According to Procházková et al. (2011), flavonoids easily donate hydrogen atoms to radical compounds resulting in the reduction of highly oxidized radicals. Flavonoid phenoxyl radical can change into aroxyl radical which is capable

of carrying out secondary radical scavenging activities by transferring spare electrons and obtaining a stable structure.

### Quercetin

Quercetin is one of the main flavonols from the class of flavonoids which has a hydroxyl group on the benzo-dihydropyran ring which makes quercetin have strong antioxidant activity (Yang et al., 2020). Quercetin can express a higher antioxidant capacity than other flavonoid derivatives (Banjarnahor & Artanti, 2014). The results of the analysis of suspected quercetin derivatives in the encapsulated purple okra extract showed a value of  $4.91 \text{ mg g}^{-1}$  (Table 3). The results of the chromatogram using HPLC are shown in Figure 2. The retention time that appeared with the largest area on standard quercetin was 1.213 minutes, while for purple okra extract was 1.111 minutes. Spike results using a quercetin standard on purple okra extract (1:4) showed a new peak that was visible at the retention time of the quercetin standard. Based on the results of identifying quercetin derivatives, it can be assumed that the compound seen in purple okra extract is a quercetin derivative, namely quercetin-3'-O-sulphate (Yang et al., 2018) or quercetin rhamnoside-(feruloyl-hexoside) (Acquavia et al., 2021) with a retention time adjacent to the retention time of quercetin.

The presence of quercetin in okra is qualitatively known but has not been analyzed quantitatively. Green okra is known to contain quercetin of  $0.018 \text{ mg g}^{-1}$  (Utami, 2018). The quercetin content was different compared to the green okra extract form in the same study, which was  $2.47 \text{ mg g}^{-1}$ . The extract form can attract bioactive components so that it has a higher quercetin content. When compared to green okra, purple okra has a different quercetin content of  $0.039 \text{ mg g}^{-1}$  in fresh form (Utami, 2018) and  $0.45 \text{ mg g}^{-1}$  in extract form (Anjani, 2018). Biofortification of purple okra produces varieties with superior bioactive components (Anjani, 2018).



**Figure 2.** Quercetin Analysis Chromatogram. (A) Quercetin Standard, (B) Purple Okra Extract, (C) Spike of Quercetin Standard and Purple Okra Extract, (x) Quercetin Standard Peak, (y) Suspected Quercetin Derivative Peak

Encapsulated purple okra extract has potential as a nutraceutical with quercetin content which can improve oxidative stress conditions. According to Xu et al. (2019) and Yang et al. (2020), quercetin has effects on signal transduction pathways such as activating, inhibiting, increasing, and downregulating conditions related to oxidative stress. The antioxidant activity of quercetin has been identified primarily through its effect on regulating glutathione peroxidase levels and increasing the expression levels of endogenous antioxidant enzymes. Quercetin also works with its ability to scavenge free radicals including superoxide anions, hydroxyl radicals, and peroxy radicals as well as better inhibition of ROS formation compared to other classes of flavonoids (Demirci, 2017; Elkhalfi et al., 2021).

## CONCLUSION

Encapsulated purple okra extract shows its potential as a nutraceutical which has a dry powder form, greenish-brown color, odor characteristic of okra extract (caramel-like), and sour taste with yield of 4%, pH of 4.8, undetectable solvent residue, water content of 13.5%, total ash content of 10.4%, and disintegration time of 1.25 minutes. Microbial contamination showed TPC of  $3.1 \times 10^2$  CFU g<sup>-1</sup>, YMC, *E. coli*, and *S. aureus* negative CFU g<sup>-1</sup>, and *Salmonella spp* negative CFU 10g<sup>-1</sup>. Heavy metal contamination showed As, Pb, Cd, and Hg contamination not detected per mg Kg<sup>-1</sup>. Bioactive components such as antioxidant capacity, total flavonoids, and suspected quercetin derivatives showed values of 84.88%, 81.32 mg QE g<sup>-1</sup>, and 4.91 mg g<sup>-1</sup>. These bioactive components act as free radical scavengers in helping prevent and reduce the consequences of degenerative diseases. Further research can prove in vivo the potential of encapsulated purple okra extract as a nutraceutical.

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