JPPIPA 11(4) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

# Evaluation of General Bioactive Phytochemicals, Antioxidant Activity, and Organoleptic Properties of *Ficus racemosa* L. as Herbal Tea

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Received: December 22, 2024
Revised: February 06, 2025
Accepted: April 25, 2025
Published: April 30, 2025

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DOI: 10.29303/jppipa.v11i5.11024



**Abstract:** *Ficus rasemosa* L. (FR), commonly known as a fig tree in Asia, is traditionally consumed in Lombok and recognized for its medicinal due to its phenolic compounds, as general bioactive compounds FR contain, have benefits such as being antidiabetic properties. Despite its ethnobotanical significance, limited studies have explored the development of FR fruits as a functional herbal tea, particularly concerning processing variables such as drying temperatures. This study evaluated the effects of three drying temperatures—50 °C ($T_1$), 60 °C ($T_2$), and 70 °C ($T_3$)—on the total flavonoid content (TFC), total phenolic content (TPC), antioxidant activity (DPPH free radical scavenging assay), and organoleptic properties of FR herbal tea. The TFC, TPC, and DPPH assay were quantified using UV-VIS spectrophotometry. The highest TFC (1.96 g QE/g) and TPC (0.36 g GAE/g) were observed at 50 °C, while the strongest antioxidant activity with the lowest $IC_{50}$ of 192.27 ppm occurred at 60 °C. Sensory evaluation showed the teas dried at 60 and 70°C were more acceptable, particularly in terms of color and overall preference. These results suggest that drying at 60 °C offers an optimal balance between phytochemical, antioxidant activity, and sensory quality, highlighting the potential of RF fruit as functional herbal tea.

**Keywords:** Antioxidant activity; Flavonoids; Organoleptics; Phenolics; Phytochemical

## Introduction

*Ficus racemosa* L. syn. *Ficus glomerata* Roxb. (Royal Botanic Gardens, 2023), known as *Gular* in India (Chaware et al., 2020) and *Elo*, *Loa*, or *Ara* in Indonesia (Verheij & Coronel, 2002), mainly grows wild and is found in Southeast Asia, Australia, and India (Keshari et al., 2016; Pahari et al., 2022). FR plants from the family Moraceae have been reported to have a multipurpose source of bioactive phytochemicals like polyphenols that have multiple diversified pharmacological include antidiarrhoeal (Nycy et al., 2023), antidiabetic (Ravichandiran et al., 2012; Ahmed et al., 2011), antioxidant (Veerapur et al., 2011); (Jain et al., 2013), anticoccidial (Khan et al., 2023a), antibacterial (Ahmed & Urooj, 2010; Pant et al., 2025), anti-inflammatory (B.N. et al., 2021), antifungal (Pingale et al., 2019), anticancer (Sivakumar et al., 2019), antiulcer (Malairajan et al., 2007).

FR has been reported to contain various polyphenolic compounds, which are bioactive compounds that are contributed to biosources studied pharmacologically. Noteworthy, FR is usually potentially utilized because of the presence of secondary metabolites such as flavonoids, tannins, and alkaloids (Dewi & Suryani, 2024; Hidayanti et al., 2023). At present, these bioactive compounds are the healthiest choice compared to consuming something that comes from synthesis. Relevant in today's world of health, the

**How to Cite:**
Suryani, N., Dewi, Y. K., & Hidayanti, B. R. (2025). Evaluation of General Bioactive Phytochemicals, Antioxidant Activity, and Organoleptic Properties of Ficus racemosa L. as Herbal Tea. *Jurnal Penelitian Pendidikan IPA*, *11*(4), 1078-1088. https://doi.org/10.29303/jppipa.v11i4.11024

use of herbal plants is of particular interest in preventing diseases, such as type 2 diabetes mellitus (DM), because of the lack of maintenance of a healthy lifestyle, psychological well-being, and smoking cessation (Dilworth et al., 2024). So, mistakes in daily lifestyle cause a greater risk of developing DM. Reactive oxygen stress (ROS), produced by the cellular mitochondria, triggers the formation of free radicals in the body. The increased number of free radicals in the body results in the body's inability to eliminate free radicals (Zamzuri et al., 2023; Govaichelvan et al., 2024), and that caused pancreatic $\beta$-cell dysfunction (Mallik et al., 2024; Dilworth et al., 2024). The body needs an intake of rich antioxidants as an alternative to FR, as an antioxidant source plant, which can be utilized as an antioxidant to neutralize free radicals that have accumulated in the body.

In addition, FR can be consumed from fresh or dried plant material. In the form of dry powder, it is frequently prepared as herbal tea. Compared to synthetic drugs, herbal tea as an herbal medicine choice is relatively cheaper with fewer side effects, eco-friendly, and hence readily available (Dias et al., 2024). In the preparation of herbal tea, many bioactive phytochemicals can be damaged at certain temperatures during the drying process (Mahmoudi et al., 2024). Although numerous studies have highlighted the pharmacological potential of FR, particularly due to its rich content of bioactive compounds such as flavonoids and polyphenols, there is a notable lack of research quantifying the total flavonoid and phenolic contents in the fruit when processed as an herbal tea. Moreover, comprehensive evaluations of its antioxidant properties and organoleptic characteristics, especially under different drying techniques, remain scarce. This study addresses this critical gap by assessing the total flavonoid and phenolic content, antioxidant activity, and sensory attributes of FR fruit tea, aiming to establish its potential as a functional herbal beverage for managing type 2 diabetes mellitus.

## Method

*Materials and Tools*

Ripe fruit of *Ficus racemosa* L. was collected in Langko village, Janapria, Central Lombok, West Nusa Tenggara. The organic chemicals, like methanol, potassium acetate ($CH_3COOK$), sodium carbonate ($Na_2CO_3$), and quercetin, were procured with an analytical grade from Merck, Germany. Folin-Ciocalteu reagent, aluminum chloride ($AlCl_3$), gallic acid, and free radical 1,1-diphenyl-2-picrylhydrazyl (DPPH) were purchased with an analytical grade from Sigma Aldrich. The tools used in this research are an analytical balance (KERN), a micropipette (Eppendorf), an oven (Memmert), a UV-VIS spectrophotometer (Shimadzu UV-1900i), and a digital pH (Toolman).

*Preparation of Herbal Tea*

The samples were washed and sliced thinly. Samples were dried at various temperatures 50 $^oC$ ($T_1$), and 60 $^oC$ ($T_2$) for 8 hours, then 70 $^oC$ ($T_3$) for 6 hours. All dried samples were ground and sieved with a 60 mesh size, then stored in storage and labeled. The herbal teas analyzed were steeped with 150 mL boiled water (~90 $^oC$) for 6 min (Nirmal et al., 2021).

*Screening of Phytochemicals*

Standard procedures were used to identify potential bioactive phytochemicals of fruit FR, such as tannins, by the $FeCl_3$ color test and flavonoids by the Shinoda test, as described by previous studies (Alam et al., 2025; Harborne, 1998).

*Total Flavonoid Content (TFC)*

Total flavonoid content (TFC) was determined by modifying the colorimetric ($AlCl_3$) method described by Barbouchi et al. (2024). A 1 mL of each sample was mixed with 1 mL of 10% $AlCl_3$, 1 mL of 1 M $CH_3COOK$, 1 mL of methanol, and 1 mL of distilled water to form a 5 mL reaction mixture. The mixture was homogenized and incubated for 60 minutes in the dark room, after which the absorbance was measured at 436 nm. Quantification was based on a quercetin standard curve, with the calibration equation:

$$y = 0.0073x - 0.0024 \ (R^2 = 0.9995) \quad (1)$$

Where $y$ is the absorbance and $x$ is the quercetin concentration in mg/mL. The final results were expressed as mg QE/g of dry sample and converted to g QE/g by dividing the value by 1000.

*Total Phenolic Content (TPC)*

Total phenolic content (TPC) was determined by modifying the Folin-Ciocalteu (FC) method (Belew & Gebre, 2025). A 1 mL of each sample was mixed with 2 mL of 7.5 % $Na_2CO_3$ and 2.5 mL of FC reagent in a test tube. All mixture solutions were allowed to incubate for 1 hour at room temperature in the dark. The absorbance was determined at 736 nm. Quantification was performed using a gallic acid calibration curve, with the regression equation:

$$y = 0.0585x + 0.4688 \ (R^2 = 0.993) \quad (2)$$

Where $y$ is the measured absorbance, and $x$ is the concentration of gallic acid (mg/mL). The results are expressed as mg of gallic acid equivalents (GAE)/g and converted into g GAE/g by dividing the value by 1000.

*DPPH Scavenging Assay*

The free radical scavenging activity of herbal tea was measured by the DPPH method as described previously (Hidayanti et al., 2023). The DPPH solution was prepared by dissolving 1 mg DPPH in 10 mL of methanol. A UV-VIS Spectrophotometer measured its absorbance at a 400 – 800 nm wavelength. Volume of samples (1 mL of brewed FR) $T_1$, $T_2$, and $T_3$ at serial concentrations 25, 125, 250, 375, and 500 ppm were mixed with 2 mL DPPH solution and adjusted to 4 mL with methanol. This mixture solution was left for 30 minutes of incubation at room temperature, then measured at 517 nm. DPPH free radical scavenging activity is determined by equation (3) (Salehi et al., 2023), then antioxidant activity was determined by $IC_{50}$ value (Zakaria et al., 2025):

$$DPPHFRSA\ (\%) = \left(1 - \frac{ABS_s}{ABS_c}\right) \times 100 \quad (3)$$

Where $ABS_s$ is the sample absorbance of the herbal tea, and $ABS_c$ is the absorbance of the control sample.

*Organoleptic Test*

The organoleptic test was performed by modifying the method (Khan et al., 2023b). Tea infusions of FR were served to 25 panelists, 150 mL of boiling water into a cup containing 3 g, and brewed for 6 min. Each panelist was asked to fill out a questionnaire regarding their preference for the tea's taste, aroma, and color. The modified range of scores from (Salehi et al., 2023) can be given: very disliked; disliked; neither liked nor disliked; liked; very liked. The results of the questionnaire filling on the questionnaire sheet were analyzed non-parametrically using SPSS.

*Statistical Analysis*

All experiments were conducted in triplicate. Organoleptic data were analyzed using the Kruskal–Wallis test in SPSS statistical software, with a $p$ value < 0.05 considered statistically significant.

## Result and Discussion

Different drying techniques affect the nutritional value. Determining appropriate drying methods for drying FR is crucial since it affects their phytochemical and antioxidant profile (Nigar et al., 2025). Tea's color, flavor, and biological effects are all impacted by the common processes of isomerization, degradation, and polymerization that occur during thermal processing (Su et al., 2024).

*Phytochemical Screening*

The previous phytochemical qualitative screening of herbal tea with all variations of temperature drying has shown the presence of flavonoids and tannins, which can be seen in Table 1 (Dewi & Suryani, 2024).

A qualitative study of FR fruit based on Table 1 contained flavonoids identified by the addition of HCl solution and magnesium (Mg) powder, giving a change in color ranging from pink to red (Maheshwaran et al., 2024). The result showed that the reduction of the benzopyrone core occurs due to the reduction of the carbonyl group atom (C=O) (Doloking et al., 2022). Then, tannin was included in the polyphenol compound group, giving a change in blue-black, greenish, or another dark color because the chemical reaction between tannin and $FeCl_3$ forms a complex Fe-tannin (Harborne, 1998). Other studies revealed that fig fruit's ethanol and methanol extracts contained positive flavonoids and tannins (Hidayanti et al., 2023; Suryani & Gustiana, 2023).

**Table 1.** The result of phytochemical screening

| Phytochemical constituent | Samples | Test performed | Result |
|---|---|---|---|
| Flavanoid | $T_1$ | Shinoda test | Positive |
| | $T_2$ | | Positive |
| | $T_3$ | | Positive |
| Tannin | $T_1$ | Ferric Chloride test | Positive |
| | $T_2$ | | Positive |
| | $T_3$ | | Positive |

*Total Flavonoid Content (TFC)*

The data presented in Table 2 highlight the impact of drying temperature on the TFC of FR fruit. As the temperature increases, the TFC decreased from 1.96 g QE/g to 1.59 g QE/g, indicating a negative correlation between thermal exposure and flavonoid retention. This decline is consistent with findings from various studies on other fruit materials. For instance, research on *Xuan-Mugua* fruit revealed a decrease in TFC from 208.50 mg LTE/g at 60 °C to 170.61 mg LTE/g at 90 °C, with the lowest flavonoid levels observed at the highest drying temperatures (Chen et al., 2022). Similarly, studies on *Leccinum scabrum* and *Hericium erinaceus* reported that drying at 70 °C resulted in significant losses of flavonoid compounds, with the greatest reductions observed at this temperature (Gąsecka et al., 2020).

**Table 2.** The total flavonoid content

| Samples | Absorbance | | | Flavonoid content (g QE/g) |
|---|---|---|---|---|
| | I | II | III | |
| $T_1$ | 0.07 | 0.06 | 0.06 | 1.96 |
| $T_2$ | 0.06 | 0.06 | 0.07 | 1.89 |
| $T_3$ | 0.05 | 0.05 | 0.05 | 1.59 |

The decline in total flavonoid content observed at temperatures above 50 °C, as reported by Tan et al. (2014), is generally attributed to thermal degradation of

flavonoid compounds, which are known to be heat-sensitive. Nevertheless, ElGamal et al. (2023) reported that certain oxidation processes of phenolic compounds at elevated temperatures may lead to the formation of flavonoid derivatives, potentially explaining the relatively higher retention of flavonoids under specific high-temperature conditions. This suggests that the thermal behavior of flavonoids is not solely governed by degradation but may also involve transformation pathways (ElGamal et al., 2023). Therefore, optimizing drying conditions should consider the chemical nature and thermal stability of target compounds to effectively preserve bioactive constituents during processing. Flavonoids, which are polyphenolic compounds derived from plants' secondary metabolism, contain multiple hydroxyl (OH) groups and conjugated double bonds that contribute to their bioactivity (Turatbekova et al., 2023). These structural features are known to be thermolabile, making them prone to degradation under elevated temperatures. High-temperature drying can promote oxidative processes and enzymatic inactivation, such as the deactivation of polyphenol oxidase, and may further lead to breakdown of OH groups and aromatic structures within flavonoid molecules.

Nonetheless, the results from Table 2 suggest that excessive heat may accelerate flavonoid degradation in FR fruit. Therefore, drying at 50 °C appears to offer a favorable balance by reducing thermal degradation while maintaining a relatively high TFC, thus helping to preserve the functional properties of FR-based herbal tea.

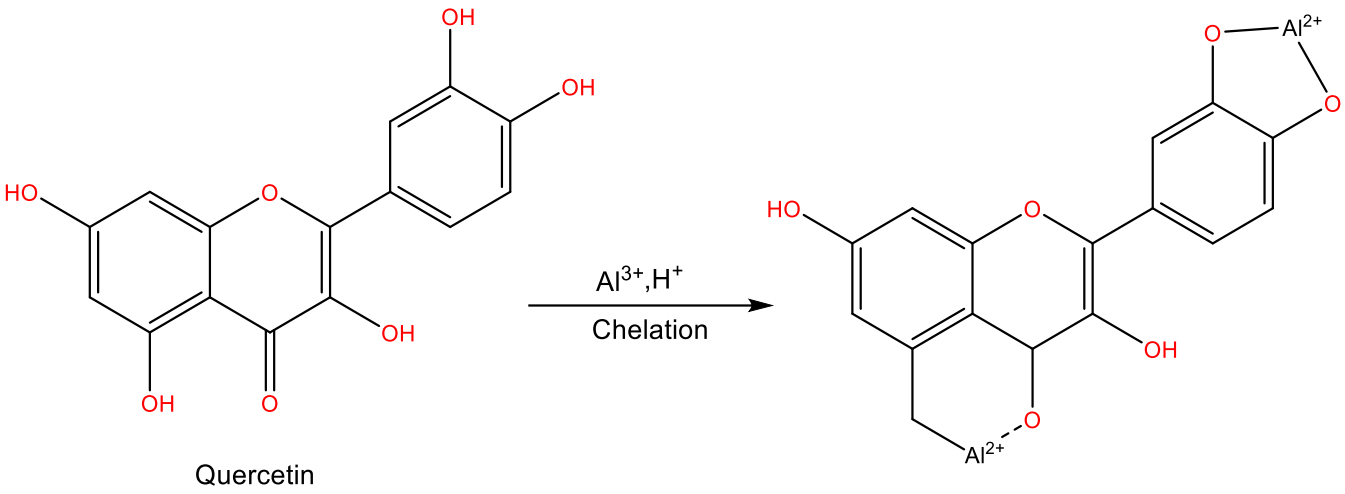


**Figure 1.** The complexation of $AlCl_3$ and quercetin (Nicolescu et al., 2025)

Based on Figure 1, quercetin, as a flavonoid compound, plays an important role as a metal chelator. The contribution of the aluminum ions reported may diminish the antioxidant efficacy of flavonoids (Cornard & Merlin, 2002). In quercetin, the complexes are initially formed at positions C-3′ and C-4′ of OH groups (Nozdrenko et al., 2015). $C_5$-OH-carbonyl interaction, even due to steric constraints, can react by binding to metals (Nicolescu et al., 2025). The other compounds, such as rutin, have chelation sites as well as the C-7 OH group, including C-3′ and C-4′ of OH groups (Nozdrenko et al., 2015).

*Total Phenolic Content (TPC)*

The FC method is currently based on the fact that polyphenols react (Raposo et al., 2024). This study displayed the accumulation of phenolic content in different temperature drying methods, respectively, in Table 3. Similar to TFC, applying a variation of temperature in which phenolic content decreased at temperatures 50 to 60 °C and slightly increased at the temperature was 70 °C. This trend aligns with findings, research on *Garcinia mangostana* pericarp reported a significant reduction in TPC at 60 °C compared to 50 °C, with values decreasing from 46.11 to 33.78 mg GAE/g, respectively (Ibrahim et al., 2015). This behavior is consistent with previous findings that reported the drying *Citrus sinensis* peels at temperatures of 70 °C and above resulted in increased TPC compared to lower temperatures. Their study demonstrated a progressive rise in TPC from 70 to 100 °C, with the highest phenolic levels obtained at 100 °C (Chen et al., 2011).

**Table 3.** The total phenolic content

| Samples | Absorbance | | | Phenolic content (g GAE/g) |
|---|---|---|---|---|
| | I | II | III | |
| $T_1$ | 1.13 | 1.06 | 1.14 | 0.36 |
| $T_2$ | 0.78 | 0.97 | 0.87 | 0.23 |
| $T_3$ | 0.92 | 0.98 | 0.94 | 0.27 |

The interaction of the phenolic compound with the FC reagent, based on Figure 2, indicates the transfer of electrons from phenolic compounds to phosphomolybdic or phosphotungstic acid complexes in an alkaline solution, and then the color changes from yellow to blue.

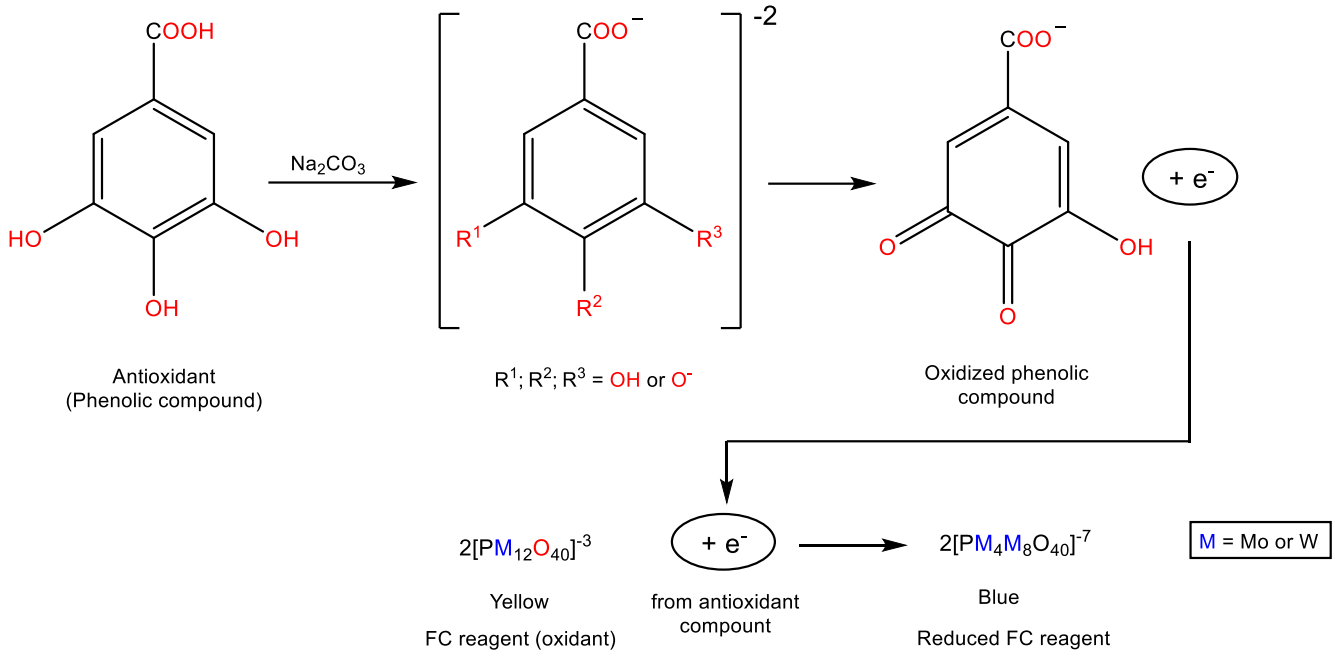


**Figure 2.** General redox reaction in FC method (Pérez et al., 2023)

Different temperature drying affected the TPC. The result indicated that the temperature drying method influenced the quantity of TPC; however, an elevation in temperature over the optimal threshold results in a reduction of phenolic content (Arslan et al., 2025). Interestingly, the trend observed in TPC values only partially aligns with TFC; the highest TFC was also recorded at a temperature of 50 °C. Moreover, although both TPC and TFC generally decreased with increasing drying temperature, suggesting that certain phenolic compounds other than flavonoids are more heat-sensitive.

The TPC represents a broader spectrum of compounds, including phenolic acids, tannins, and other non-flavonoid antioxidants, whereas TFC specifically measures flavonoid derivatives. Interestingly, phenolic degradation is expected at elevated temperatures; the observed increase at 70 °C may be attributed to the thermal breakdown of plant cell walls, which releases insoluble-bound phenolic (IBP) compounds, thereby enhancing their extractability (Shahidi & Hossain, 2023). Another study found that extractable phenolic compounds can increase during the drying process due to matrix softening and improved solvent penetration (Wojdyło et al., 2009). However, the type of plant and its conditions have an impact on the stability of the bioactive compound within it as the drying temperatures increase.

*DPPH Free Radical Scavenging Activity*

The DPPH scavenging of samples with varying temperature drying is shown in Table 4. FR fruit possesses many functional compounds, i.e., flavonoids, anthocyanins, and phenolic acids, and has gained attention due to its antioxidant, anti-filarial (Ahmed & Urooj, 2010), anti-inflammatory, and potential treatment for diabetes mellitus (Nigar et al., 2025). Variation in temperature drying in the range of 50-70 °C gives an inhibition effect on free radical scavenging as well as antioxidant activity. The result exhibited that the $T_2$ with 60 °C group presented the highest % radical scavenging activity (RSA) and $IC_{50}$ value, respectively, in Table 5 among all the samples. $IC_{50}$ value, representing a crucial indicator in pharmacological studies, means a half-maximal inhibition of a biological process by 50 %. $IC_{50}$, with the lowest value, indicates of stronger antioxidant potential. The lower $IC_{50}$ 192.27 ppm ($T_1$), then all samples likely attributable to a higher concentration of the bioactive compound (Nigar et al., 2025). Thus, these results indicated that drying under proper temperatures may avoid effective antioxidants such as flavonoids and tannins. Additionally, a more detailed analysis of specific antioxidant compounds in FR fruit extract in methanol is 65.042 ppm (Hidayanti et al., 2023).

According to Table 4, the result of this work confirms that the % of DPPHFRSA rises with each sample's concentration increase. A minimum of 50%

inhibition was observed at concentrations of 500 ppm for $T_1$, 250 ppm for $T_2$, and 375 ppm for $T_3$. This suggests that the concentration of secondary metabolites with possible antioxidant qualities remains more stable during drying at 60 °C. According to the recent antioxidant capacity classification proposed by a previous study, $IC_{50}$ values can be categorized as follows: values < 50 ppm represent very strong activity, values 50 – 100 ppm indicate strong activity, and values exceeding 100 ppm are considered to have weak antioxidant potential (Abdykerimova et al., 2020).

Considering Table 5, all samples in the present study are categorized as having weak antioxidant activity. Nevertheless, $T_2$, which recorded the lowest $IC_{50}$ value of 192.27 ppm, demonstrated relatively higher free RSA efficiency compared to $T_1$ and $T_3$. Since antioxidant efficiency is inversely related to the $IC_{50}$ value. The $T_2$ indicates it was more effective in achieving 50% inhibition of DPPH radicals at a lower concentration, highlighting its higher antioxidant potency.

Based on Figure 3, DPPH as a free radical source is widely used because it is a simple, inexpensive, and rapid method for testing antioxidant capabilities (Baliyan et al., 2022). It is worth mentioning that the overall $IC_{50}$ value given does not use selective and specific solvents because herbal tea is a traditional method of brewing with hot distilled water, with a nonstandardized method (Segoviano-León et al., 2025), and it is a kind of option for a functional diabetic drink. Besides, a specific phenolic compound with a greater number of phenolic hydroxyl groups has stronger antioxidant activity (Tang et al., 2025), but we haven't analyzed any specific phenolic compounds.

**Table 4.** The result of DPPH free radical scavenging activity

| Sample | Concentration (ppm) | Absorbance ± SD | DPPHFRSA (%) |
|---|---|---|---|
| $T_1$ | Control | 0.753 | |
| | 25 | 0.60 ± 0.05 | 20.06 |
| | 125 | 0.53 ± 0.05 | 28.96 |
| | 250 | 0.43 ± 0.04 | 35.78 |
| | 375 | 0.40 ± 0.06 | 46.45 |
| | 500 | 0.33 ± 0.06 | 55.66 |
| $T_2$ | Control | 0.63 | |
| | 25 | 0.47 ± 0.02 | 24.86 |
| | 125 | 0.37 ± 0.02 | 41.25 |
| | 250 | 0.26 ± 0.03 | 59.21 |
| | 375 | 0.14 ± 0.02 | 77.64 |
| | 500 | 0.05 ± 0.00 | 90.94 |
| $T_3$ | Control | 0.89 | |
| | 25 | 0.67 ± 0.00 | 23.79 |
| | 125 | 0.60 ± 0.00 | 32.62 |
| | 250 | 0.47 ± 0.01 | 47.28 |
| | 375 | 0.36 ± 0.02 | 59.37 |
| | 500 | 0.25 ± 0.00 | 70.96 |

**Table 5.** The result of $IC_{50}$

| Samples | Linear Regression Equations | $IC_{50}$ (ppm) |
|---|---|---|
| $T_1$ | y = 0.0739x + 18.551 | 425.56 |
| $T_2$ | y = 0.1402x + 23.043 | 192.27 |
| $T_3$ | y = 0.1010x + 21.066 | 286.47 |

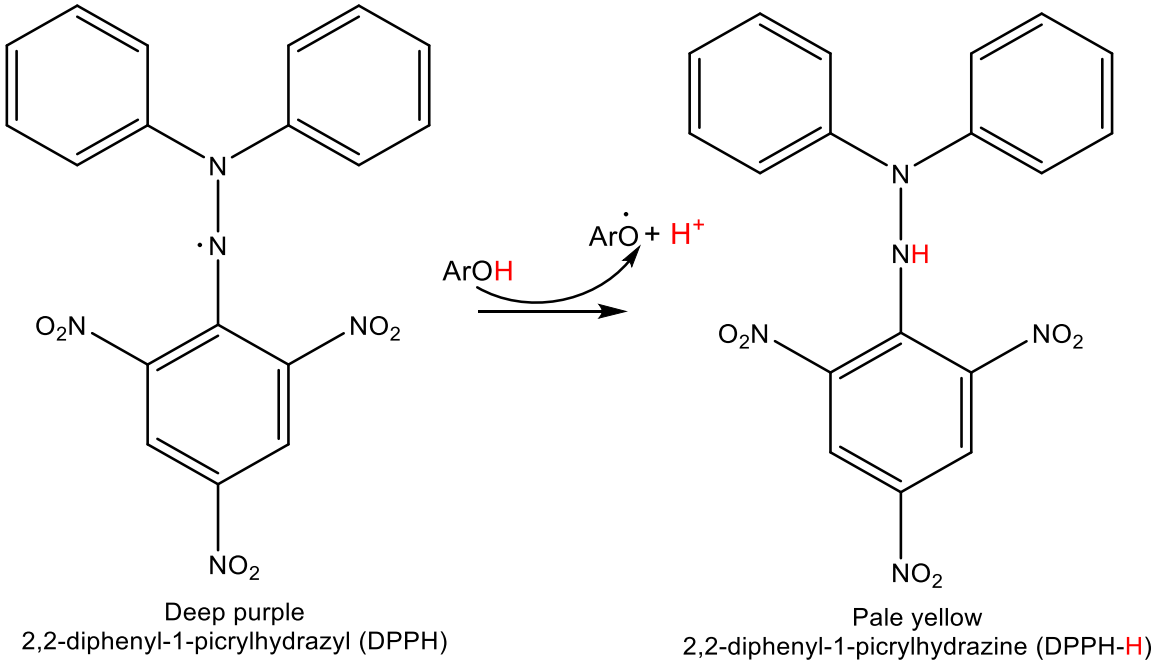


**Figure 3.** Mechanism of DPPH free radical scavenging activity (Hidayanti et al., 2023)

*Organoleptic Test*

Table 6 demonstrates the organoleptic test of FR fruit as an herbal tea. In terms of organoleptic test evaluation, $T_3$ has a higher score for color, with a significant value of 0.047 < 0.05, the difference in the panelists' preference scores for variation in temperature drying. The color of tea is generally influenced by the drying temperature and time. The longer and higher the drying temperature used, the more reddish-brown or yellowish the tea will be. In addition, there are thearubigin compounds obtained from the degradation of tannins, which give a reddish-brown color, and theaflavin compound, which gives a yellowish color to the tea brew, on other research findings state that the color of tea depending on the amount of natural pigment extracted from the fruit after brewing that caused by the browning reaction (Salehi et al., 2023).

**Table 6.** Organoleptic test

| Category | Score Samples | | |
|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ |
| Color | 3.16[a] | 3.32[ab] | 3.64[b] |
| Aroma | 3.16 | 3.44 | 3.30 |
| Taste | 2.60 | 2.88 | 2.92 |
| Overall | 2.92[a] | 3.28[b] | 3.28[b] |

Note: Values with different letters in the same column were significantly different ($p < 0.05$) from each.

In aroma evaluation, $T_2$ has a higher score than others, with a significant value of 0.586 > 0.05; there was no significant difference in the panelists' preference score. The score of the taste category has a significant value of 0.384 > 0.05; there was no significant difference in the panelists' preferences either. Besides that, the key aroma compounds that are responsible for FR fruit aroma are not yet specifically known.

Based on Table 6, the score for the taste test, which is shown as an average score below 3 for all samples, indicates the panelists' disapproval of the tea's flavor. The result explains that slightly bitter tea is disliked by most people. The literature explains that the formula tea with a bitter taste is least accepted by panelists (Pratiwi et al., 2024). Naturally, FR methanol extract containing alkaloid compounds (Hidayanti et al., 2023) may cause a bitter taste in FR herbal tea, which presents alkaloids imparting a bitter taste to the tea (Ye et al., 2022). Although it gives unexpected bitterness in food, most secondary metabolites with bitter taste contribute a unique flavor and health effect potential (Luo et al., 2025).

The result for the overall sensory evaluation, including color, aroma, and taste, showed a significant difference among treatments, with the Kruskal-Wallis test yielding a *p*-value of 0.041 (< 0.05). This indicates that the differences in sensory attributes among the samples were statistically significant. The $T_2$ and $T_3$ received the highest overall score from the panelists, suggesting a generally favorable perception. The panelists' responses for these two treatments indicated a neutral to slightly positive preference. In contrast, $T_1$ consistently received lower scores, implying it was the least preferred among the three formulations.

## Conclusion

This study demonstrated that drying temperature significantly influences the phytochemical content, antioxidant activity, and sensory acceptability of FR fruit herbal tea. The highest total flavonoid content (1.92 g QE/g) and total phenolic content (0.36 g QE/g) were observed at 50 °C ($T_1$), while both decreased with increasing temperature. Interestingly, the antioxidant capacity, expressed as $IC_{50,}$ improved at 60 °C ($T_2$) with 192.27 ppm compared to 50 °C ($T_1$) with 425.56 ppm, and 70 °C ($T_3$) with 286.47 ppm, suggesting that moderate thermal processing may enhance the availability or activity of antioxidant compounds. In terms of sensory attributes, tea samples dried at 60 °C ($T_2$) and 70 °C ($T_3$) received significantly higher overall acceptance scores (3.28) than the sample dried at 50 °C ($T_1$, 2.92). Among the attributes, color and taste were notably more preferred in $T_3$, while $T_2$ offered a favorable balance between antioxidant performance and sensory quality. Therefore, drying at 60 °C can be considered the most optimal condition for producing FR fruit tea, as it maintains acceptable levels of bioactive compounds, enhances antioxidant activity, and provides favorable sensory attributes.

**Acknowledgments**

The author extends their appreciation to Lembaga Penelitian dan Pengabdian Kepada Masyarakat Universitas Islam Negeri Mataram, grant number 773/2024.

**Author Contributions**

N.S.: Writing – original draft, writing – review & editing, investigation, conceptualization; Y.K.D.: Supervision, writing – review & editing, validation, visualization; B.R.H.: Investigation and project administration.

**Funding**

This research was funded by Lembaga Penelitian dan Pengabdian Kepada Masyarakat Universitas Islam Negeri Mataram, grant number 773/2024.

**Conflicts of Interest**

The authors declare no conflict of interest.

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