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Color Changes of Chili (*Capsicum frutescens L.*) During Thin-Layer Drying

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ABSTRACT

This study examines the impact of hot water blanching and air velocity on the colour stability of chilli (Capsicum frutescens L.) during thin-layer drying. The objective was to determine the optimal pre-treatment and drying conditions that preserve visual quality while enhancing drying efficiency. A controlled laboratory-scale dryer was used, applying blanching at 90°C for 3 minutes and air velocities of 1.0 m/s and 1.5 m/s. Color parameters (L*, a*, b*), total color change (ΔE*), and hue angle shift (ΔH*) were measured periodically. Statistical analysis was conducted using ANOVA and Tukey HSD tests. The results show that blanching significantly improves colour retention and reduces enzymatic browning. Higher air velocity accelerated drying and enhanced uniformity, with the combination of blanching and 1.5 m/s airflow yielding the best outcomes in terms of color stability and drying time. Interaction effects between blanching and airflow were synergistic, contributing to improved product quality. These findings align with previous studies and reinforce the importance of integrated drying strategies. In conclusion, the study demonstrates that combining blanching with optimized airflow enhances drying kinetics and preserves the visual quality of chili. These insights are valuable for small-scale processors and contribute to the development of efficient postharvest technologies. Future research should explore nutrient retention, aroma profiles, and advanced modeling of drying behavior.

Contribution to Sustainable Development Goals (SDGs):
SDG2: Zero Hunger
SDG 4: Quality Educatin
SDG 9: Industry, Innovation, and Infrastucture
SDG 12: Responsible Consumption and Production

1. INTRODUCTION

1.1. *Research Background*

Chili (*Capsicum frutescens L.*) is a widely cultivated horticultural crop in tropical regions, particularly in Southeast Asia, where it plays a vital role in culinary traditions and agro-industrial applications. Its pungency, vibrant color, and nutritional value make it a valuable commodity in both fresh and processed forms. However, the high moisture content of fresh chilies often exceeding 80% (wet basis) renders them highly perishable, leading to significant postharvest losses if not properly preserved [1], [2]. Drying is one of the most effective preservation methods, reducing moisture to safe levels and extending shelf life while maintaining quality attributes such as color, flavor, and bioactive compounds [3], [4].

Modern techniques such as convective drying, microwave-assisted drying, and hybrid solar-biomass systems offer improved control over drying conditions, resulting in better retention of sensory and nutritional properties [3], [5]. Among these, thin-layer drying has gained attention for its simplicity and effectiveness in small-scale operations, particularly when combined with pretreatment methods like blanching to improve drying kinetics and product stability [6], [7].

Despite technological progress, color degradation remains a major concern during chili drying. The visual appeal of dried chilies, largely determined by carotenoid pigments such as capsanthin and capsorubin, directly influences consumer acceptance and market value [8], [9]. Color changes during drying are influenced by multiple factors, including temperature, air velocity, relative humidity, and pretreatment conditions [3], [2]. The CIELAB colour space model, using parameters L* (lightness), a* (red-green), and b* (yellow-blue), is commonly employed to quantify these changes and assess product quality [4], [1].

The primary research problem addressed in this study is the impact of hot water blanching and air velocity on the color changes of local chili during thin-layer drying. While drying is essential for preservation, it often leads to undesirable darkening and loss of vibrancy, particularly when high temperatures or prolonged exposure are involved [3], [5]. Blanching, a thermal pretreatment involving brief immersion in hot water, has been shown to inactivate enzymes responsible for oxidative browning and accelerate moisture removal [6], [10]. However, blanching may also cause pigment degradation and structural changes that affect final appearance [7], [2]. Similarly, air velocity influences drying rate and heat transfer, but its effect on color retention under high humidity conditions remains unclear [11], [12], [13]. General solutions to mitigate color degradation during drying include optimizing temperature profiles, controlling humidity, and applying pretreatments such as blanching, chemical dips, or enzymatic inhibitors [6], [8]. Studies have demonstrated that blanching can reduce microbial load, improve drying efficiency, and stabilize color by limiting enzymatic activity [5], [10]. However, the effectiveness of blanching depends on parameters such as temperature, duration, and the specific characteristics of the chili variety [7], [2]. Air velocity, while enhancing convective heat transfer, may also lead to uneven drying or increased pigment loss if not properly regulated [12], [13].

1.2. Literature Review

Drying is a critical postharvest process for chilli peppers (Capsicum frutescens L.), particularly chilli peppers, which are widely cultivated in tropical regions such as Indonesia. Due to its high moisture content, often exceeding 80% on a wet basis, chilli is highly perishable and susceptible to microbial spoilage, enzymatic degradation, and pigment oxidation [4], [14], [15]. Drying not only extends shelf life but also enhances marketability and facilitates downstream processing into powder or oleoresin [5], [16].

1.2.1. Blanching

Among various drying methods, thin-layer drying has gained prominence due to its uniform heat distribution and controllable parameters. Studies have shown that drying kinetics and quality attributes are significantly influenced by drying temperature, air velocity, and pretreatment techniques such as blanching [6], [12]. Blanching, typically conducted at 80–90°C for 2–3 minutes, inactivates enzymes like polyphenol oxidase and peroxidase, thereby reducing enzymatic browning and microbial load [5], [6]. However, it may also accelerate pigment degradation and darkening, especially under high humidity conditions [4]. Based on the findings in [17], the blanching process is intended to prevent the development of undesirable odours and discolouration during drying and storage. Blanching also facilitates the release of trapped air from the tissue, allowing moisture to move freely, which in turn accelerates the drying process.

1.2.2. Color

Colour is a key quality indicator in dried chilli, significantly affecting consumer acceptance and market value. The CIELAB color model (L*, a*, b*) is widely used to quantify visual changes during drying. Parameters such as total color difference (ΔE^*) and hue shift (ΔH^*) provide insights into pigment stability and degradation pathways [14], [15]. Recent studies have reported ΔE^* values exceeding 40 and ΔH^* values above 50 in blanched samples, indicating substantial visual transformation [5], [9].

1.2.3. Air Velocity

Air velocity plays a pivotal role in drying efficiency. Higher velocities (e.g., 1.5–2.0 m/s) enhance moisture removal by increasing convective heat transfer; however, their effect on final colour quality is less pronounced [3], [12]. In some cases, increased airflow may exacerbate pigment oxidation due to greater exposure to oxygen, especially in blanched samples [6], [2]. Therefore, optimising air velocity must strike a balance between drying speed and quality retention. This was explained [18] the higher the temperature and the longer the drying time, the lower the moisture ratio in chili. Based on experiments conducted at various temperature levels, the relative humidity can be determined using a psychrometric chart.

1.3. Research Objective

This study aims to evaluate the effect of blanching pretreatment and air velocity on the color changes of chili during thin-layer drying. The primary focus is on quantifying visual transformations using the CIELAB colour model (L*, a*, b*) and derived parameters, such as total colour difference (ΔE^*) and hue shift (ΔH^*). By comparing blanched and non-blanched samples under varying airflow conditions (1.0 m/s and 1.5 m/s), the research seeks to elucidate the relationship between drying efficiency and visual quality.

2. MATERIALS AND METHODS

2.1. Research Design

This study employed an experimental approach to investigate the effects of hot water blanching and air velocity on the color changes of local chili (*Capsicum frutescens L.*) during thin-layer drying. The research design was structured to isolate and analyse the influence of two independent variables, namely blanching treatment and air velocity, on the dependent variable, which consisted of colour parameters (L*, a*, b*, ΔE*, and ΔH*).

2.2. Materials and Sample Preparation

Chillies were sourced from local farmers in Makassar, South Sulawesi. The chilies were sorted to ensure uniformity in size, maturity, and absence of physical damage. Selected samples were washed and divided into two groups: one group was blanched, and the other was non-blanched. Blanching was performed by immersing the chillies in hot water at 90°C for 3 minutes, following protocols adapted from [6] and [10].

2.3. Drying Equipment and Condition

Drying was conducted using a laboratory-scale thin-layer dryer equipped with a controlled heating system and adjustable airflow. Drying is an energy-intensive application because 10–15% of the total energy requirements of all food industries in developed countries are estimated to be consumed by this operation [19]. One of the key factors influencing the drying process of red chili peppers is their moisture content. The primary purpose of drying is to reduce the chili's water content, as lower moisture levels help inhibit the growth of spoilage organisms. The moisture content also affects the amount of water evaporated and determines the duration required to achieve the desired level of dryness [20]. The drying temperature was maintained at 47°C, based on optimal conditions reported by [21]. Two air velocity levels were applied 1.0 m/s and 1.5 m/s, as recommended by [13]. Relative humidity in the drying chamber was monitored and kept below 40%.

2.4. Experimental Procedure

Each batch of chillies (both blanched and non-blanched) was spread in a single layer on perforated trays. Drying was performed for 8 hours, with colour measurements taken at 2-hour intervals. The drying process was repeated three times for each treatment to ensure reproducibility.

2.5. Color Measurement and Analysis

Color parameters were measured using a digital colorimeter based on the CIELAB system. The values of L* (lightness), a* (redness), and b* (yellowness) were recorded. Total color difference (ΔE*) and hue angle change (ΔH*) were calculated using standard equations [3], [2].

3. RESULT AND DISCUSSION

3.1. Effect of Blanching on Color Parameters

The blanching treatment significantly influenced the colour retention of chilli during thin-layer drying. Samples subjected to hot water blanching at 90°C for 3 minutes exhibited higher L* (lightness), a* (redness), and b* (yellowness) values compared to non-blanched samples. The blanching process inactivated polyphenol oxidase enzymes, reducing enzymatic browning and preserving visual quality [5]. The total colour difference (ΔE*) [6], [12] and hue angle change (ΔH*) were lower in the blanched samples, indicating better colour stability. In the CIELAB color system, L* denotes the lightness of a sample, ranging from 0 (absolute black) to 100 (absolute white). This metric is essential in evaluating the visual quality of chilli, where a bright red colour signifies freshness and consumer appeal, especially in processed products like chilli powder [22]—according to the analysed graph, presented in Figure 1, L* declines with both time and moisture reduction. Blanched chili shows a steeper decline than non-blanched samples. For example, chili blanched at 1.0 m/s airflow dropped from 36.5 to 14.8 after 27 hours of drying, while non-blanched samples declined from 40.5 to 27 under similar conditions. Blanching leads to cell wall disruption, making moisture release easier but also exposing pigments to oxidative damage. The reduction in L* reflects the darkening of colour due to the degradation of carotenoids, such as capsanthin and capsorubin [5], [2].

Additionally, thermal conditions may trigger Maillard reactions, especially as moisture levels approach equilibrium [2]. The correlation between L* and dry basis moisture content is negative: lower water content corresponds to lower lightness. This suggests that dehydration has a significant impact on colour brightness. The most significant changes occur within the first 21 hours of drying, after which L* stabilises, indicating that the final pr

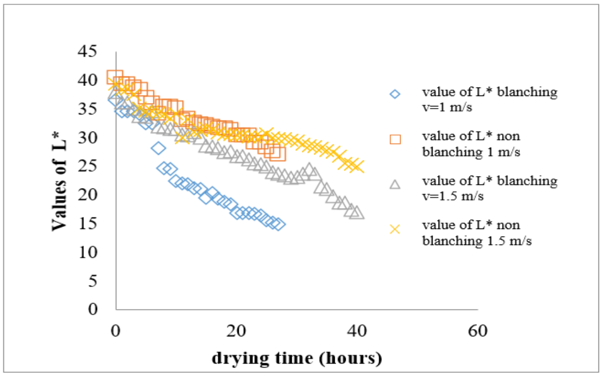

Figure 1. Changes in L* Value during Drying Process

The a* value in the CIELAB colour system represents the red–green axis, with positive values indicating a shift toward red and negative values indicating a shift toward green. For bird's eye chili, high a* values reflect strong red coloration a key indicator of freshness and product quality [5]. According to the analysed graph presented in Figure 2, data analysis shows a significant decline in a* during the drying process, especially in the blanched samples. For instance, blanched chilli at a 1.0 m/s airflow rate drops from 42.67 to 17.33 over 27 hours. Non-blanching chilli under the same conditions results in a decrease from 51.17 to 34. A similar trend is observed at an airflow of 1.5 m/s. The reduction in a* indicates carotenoid pigment degradation, particularly capsanthin and capsorubin, driven by heat and oxidation [3], [2],. Blanching accelerates this effect by increasing cell permeability and promoting exposure to oxygen, triggering browning reactions. The inverse relationship between a* and dry basis moisture content confirms that pigment loss intensifies with dehydration. Aggressive drying, especially without humidity control, may lead to significant visual quality loss, even if drying efficiency improves [21].

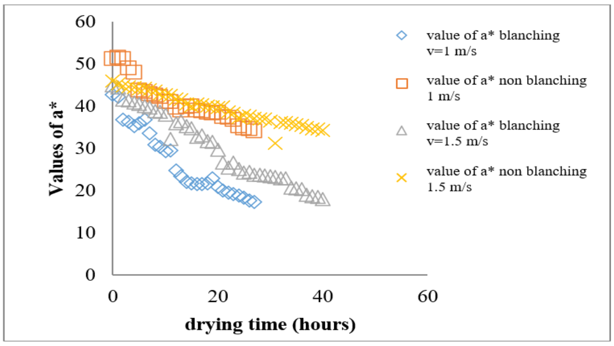

Figure 2. Changes in a* Value during Drying Process

The b* value in the CIELAB colour system measures the yellow–blue component, with positive values indicating yellow hues and negative values indicating blue hues. In chilli, yellow tones originate from carotenoid pigments such as capsorubin and capsanthin, which are susceptible to thermal degradation and oxidation [3], [21]. According to the graph analysed in Figure 3, the graph reveals a marked decline in b* during drying. Blanched chili at 1.0 m/s dropped from 34.5 to 13.17, while non blanched samples fell from 38 to 27.17. At 1.5 m/s, b* dropped from 34.17 to 12 in blanched samples, and from 35.33 to 25.5 in non blanched samples. This reduction signifies decomposition of yellow pigments under heat and oxidative stress. Blanching accelerates this process by increasing cellular permeability, thereby exposing more pigment. [3] emphasized that b* stability is closely linked to drying temperature and oxidative conditions. The inverse relationship between b* and moisture content supports the idea that drying enhances pigment breakdown. Declining b*, along with L* and a*, indicates a shift toward dull brownish tones, suggesting reduced visual quality [5].

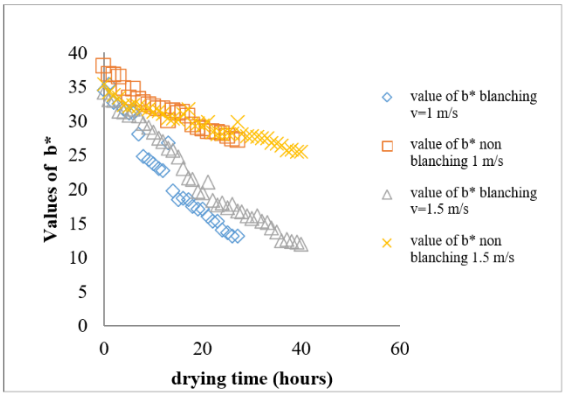

Figure 3. Changes in b* Value during Drying Process

The ΔE* value is a CIELAB metric used to assess the total colour change of a sample over time. Higher values indicate greater deviation from the original colour, suggesting a significant visual transformation. According to the analysed graph presented in Figures 4, the graph reveals a sharp increase in ΔE* from ±2 at the beginning to ±40.64 after 27 hours, especially in blanched chilli at an airflow of 1.5 m/s. Non-blanched samples registered lower final ΔE* values, around ±22.08. This confirms that drying, particularly when accompanied by blanching, causes distinct colour shifts, often from vibrant red to brownish hues. These changes result from the degradation of carotenoid pigments, triggered by oxidation and sustained heat. Blanching accelerates pigment vulnerability due to tissue disruption and enhanced oxygen penetration [3], [2]. Though blanching improves moisture loss, it may compromise visual quality. Plotting ΔE* against dry basis moisture reveals an inverse relationship: the drier the material, the higher its ΔE*. The most significant colour change occurs within the first 21 hours, matching the fastest dehydration phase, after which ΔE* stabilises [22].

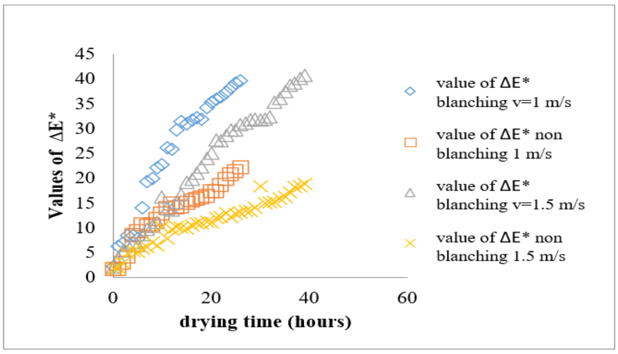

Figure 4. Changes in ΔE* Value during Drying Process

The ΔH* value is a CIELAB system that quantifies the hue angle variation, or how much the colour of chilli shifts during drying. For chili, rising ΔH* values signify a move from bright red to brownish-red, affecting both visual appeal and market acceptability. According to the graph analysed in Figure 5, ΔH* increased dramatically from 2.99 to over 55, especially in blanched samples at an airflow of 1.5 m/s. Non blanched samples showed a more moderate rise, from 2.04 to 32. These changes occurred alongside moisture loss, particularly in the first 21 hours the active drying phase. Blanching promotes pigment oxidation by rupturing cell walls, allowing oxygen to interact with carotenoids like capsanthin and capsorubin. Constant drying temperatures (47°C) and high relative humidity further trigger Maillard reactions, contributing to non enzymatic. browning [3], [5]. ΔH* negatively correlates with dry basis moisture: lower water content leads to greater hue shift. Stabilisation of ΔH* after hour 21 suggests that the final colour is fixed, with minimal change thereafter [22].

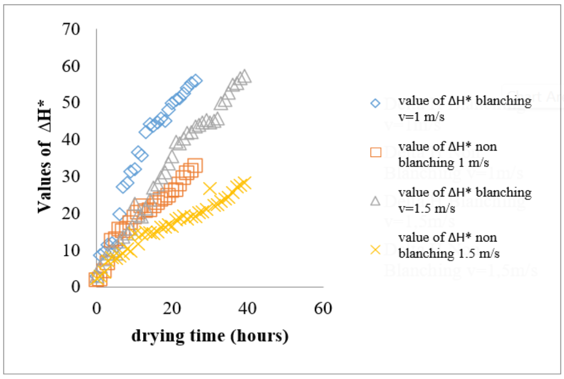

Figure 5. Changes in ΔH* Value during Drying Process

3.2. Influence of Air Velocity on Drying Kinetics

Air velocity played a critical role in moisture removal efficiency. At 1.5 m/s, drying was faster and more uniform compared to 1.0 m/s. Increased airflow enhanced convective heat and mass transfer, accelerating water evaporation from chili surfaces [5]. However, excessive velocity may cause physical damage or uneven drying. The drying curves followed a falling rate period, consistent with previous studies on chili drying behavior [23].

3.3. Interaction Between Blanching and Air Velocity

The interaction between blanching and air velocity revealed synergistic effects. Blanched samples dried at 1.5 m/s retained superior color and required shorter drying time. The pre-treatment facilitated moisture migration by disrupting cellular integrity, while higher airflow enhanced drying kinetics [21]. This combination minimized quality degradation and improved process efficiency [5].

3.4. Statistical Analysis of Color Changes

ANOVA results confirmed that both blanching and air velocity significantly affected all color parameters ($p < 0.05$). Tukey's HSD test revealed that the most distinct differences occurred between non-blanched samples at 1.0 m/s and blanched samples at 1.5 m/s. These findings align with previous research on drying optimization for chili peppers [5], [21].

3.5. Comparison with Previous Studies

The results corroborate findings from [6], [5], and [4], who reported that blanching improves drying efficiency and colour retention. Similarly, [21] and [13] emphasised the role of air velocity in enhancing drying kinetics. This study contributes to the growing body of evidence supporting the integration of pre-treatment and airflow control strategies.

3.6. Practical Implications

Implementing blanching and optimized airflow in chili drying can enhance product quality and reduce energy consumption. These findings are particularly relevant for small-scale processors in tropical regions, where maintaining colour and minimising drying time are crucial for market competitiveness [5].

3.7. Limitations and Future Research

This study focused solely on color parameters; future research should explore nutritional retention, texture, and aroma profiles. Additionally, modeling drying kinetics using advanced simulation tools could further optimize process parameters [5], [21].

4. CONCLUSION

This study confirms that hot water blanching at 90°C for 3 minutes, combined with an air velocity of 1.5 m/s, significantly improves the drying performance and colour stability of bird's eye chilli during thin-layer drying. Blanching effectively inactivates polyphenol oxidase enzymes, thereby reducing enzymatic browning and preserving the product's visual appeal. The increased airflow enhances convective heat and mass transfer, accelerating moisture removal and shortening drying time. The interaction between blanching and airflow demonstrates a synergistic effect, where pre-treatment facilitates internal moisture migration and airflow supports external evaporation. Statistical analysis validates the significance of these factors, with the best results observed in blanched samples dried at 1.5 m/s. These findings are consistent with recent literature and contribute to the growing body of knowledge on chili drying optimization. As a contribution to postharvest technology, this study provides evidence-based recommendations for chili drying practices. Future research should expand its scope to include nutritional retention, aroma preservation, and advanced modelling techniques, such as computational fluid dynamics or machine learning-based prediction. Exploring hybrid drying systems and alternative pre-treatments, such as cold plasma or ultrasound, may further enhance product quality and sustainability.

REFERENCE

[1] D. C. P. Ambrose, R. Naik, and H. Patil, "Studies on the drying behaviour of red chilli and it's effect on quality," *J. Appl. Hortic.*, vol. 26, no. 2, pp. 182–185, 2024, doi: 10.37855/jah.2024.v26i02.34.

[2] M. Liu *et al.*, "Effects of different hot-air drying methods on the dynamic changes in color, nutrient and aroma quality of three chili pepper (Capsicum annuum L.) varieties," *Food Chem. X*, vol. 22, no. November 2023, p. 101262, 2024, doi: 10.1016/j.fochx.2024.101262.

[3] A. Krzykowski *et al.*, "Drying of Red Chili Pepper (Capsicum annuum L.): Process Kinetics, Color Changes, Carotenoid Content and Phenolic Profile," *Molecules*, vol. 29, no. 21, pp. 1–19, 2024, doi: 10.3390/molecules29215164.

[4] D. P. García-Moreira *et al.*, "Evaluation of Various Drying Methods for Mexican Yahualica chili: Drying Characteristics and Quality Assessment," *Processes*, vol. 12, no. 9, pp. 1–15, 2024, doi: 10.3390/pr12091969.

[5] N. D. M. Romauli, H. V. Sihombing, K. N. Sinamo, H. Ambarita, and H. Manurung, "Effect of blanching treatment on drying time and the quality of hybrid system solar dried red chilli," *J. Phys. Conf. Ser.*, vol. 2421, no. 1, 2023, doi: 10.1088/1742-6596/2421/1/012040.

[6] T. Marwati, Y. P. Wanita, T. F. Djaafar, R. U. Hatmi, E. Apriyati, and S. D. Indrasari, "Effect of Blanching and Drying Process on Physicochemical and

Microbiological Characteristics of Dried Chili," *Int. J. Adv. Sci. Eng. Inf. Technol.*, vol. 11, no. 3, pp. 1001–1006, 2021, doi: 10.18517/ijaseit.11.3.12132.

[7] K. Reddy, N. Harish, B. Tejashiwini, B. Amala, and R. Swamy, "Effect of different drying techniques on quality of Teja red chilli (MHCP-310) powder," *Pharma Innov. J.*, vol. 12, no. 3, pp. 2031–2035, 2031, [Online]. Available: www.thepharmajournal.com

[8] R. Rachmat, H. Harris, A. Ma'ruf, and A. Ginantaka, "Quality Evaluation of Dried Red Chili (Capsicum annuum L) with Convection and Radiation Drying Methods," *J. Agroindustri Halal*, vol. 9, no. 2, pp. 167–174, 2023, doi: 10.30997/jah.v9i2.8493.

[9] M. Castillo-Téllez, D. Mex-Álvarez, C. Llanes-Chiquini, L. Hernández-Cruz, J. Cano-Carrillo, and B. Castillo-Téllez, "Efectos del secado solar sobre el cambio de color en chile pimiento (Capsicum annuum)," *593 Digit. Publ. CEIT*, vol. 10, no. 3, pp. 768–777, May 2025, doi: 10.33386/593dp.2025.3.2800.

[10] T. D. K. Vo, B. Pham, T. Đ. Tran, and T. L. Nguyen, "The Effect of Blanching and Drying Process to the Quality of Capsicum Frutescens L," *Am. J. Eng. Res.*, vol. 10, no. 1, pp. 192–196, 2021, [Online]. Available: www.ajer.org

[11] Theresya Narotama, Anggraeni Sutrisni, and Edy Susanto, "Produktivitas Dryhydrator Alat Pengeringan Bahan Cabai Bubuk," *J. Mesin Mater. Manufaktur dan Energi*, vol. 2, no. 2, pp. 12–19, 2021.

[12] H. Hayati, N. Nurahmi, and Y. R, "Pengaruh Lama Blansir Dan Suhu Pengeringan Terhadap Kualitas Bubuk Cabai Merah (Capsicum annuum L.)," *J. Agrium*, vol. 20, no. 3, p. 258, 2023, doi: 10.29103/agrium.v20i3.13024.

[13] S. S. Rahayu, A. A. P. Susastriawan, F. Surahmanto, M. R. Firmansyah, and G. Kurniawan, "Energy Efficiency of a Biomass Powered Dryer: An Analysis of Flue Gas Velocity Effects During Chili Drying," *Int. J. Heat Technol.*, vol. 41, no. 5, pp. 1365–1373, 2023, doi: 10.18280/ijht.410528.

[14] Hunter Laboratories, "Measuring Color using Hunter L, a, b versus CIE 1976 L*a*b*," *Hunt. Lab*, p. 4, 2012, doi: 10.1128/AEM.02997-13.

[15] K. L. Yam and S. E. Papadakis, "A simple digital imaging method for measuring and analyzing color of food surfaces," *J. Food Eng.*, vol. 61, no. 1, pp. 137–142, Jan. 2004, doi: 10.1016/S0260-8774(03)00195-X

[16] H. Fadhilatunnur, Subarna, Z. Murtadho, and T. Muhandri, "Pengeringan Cabai Merah (Capsicum annuum L.) dengan Kombinasi Oven Microwave dan Kipas Angin," *J. Mutu Pangan Indones. J. Food Qual.*, vol. 9, no. 1, pp. 26–35, 2022, doi: 10.29244/jmpi.2022.9.1.26.

[17] N. Khaerunnisya and E. Rahmawati, "Pengaruh Metode Blanching pada Proses Pengeringan Cabai," *J. Food Culin.*, vol. 2, no. 1, p. 27, 2019, doi: 10.12928/jfc.v2i1.1569.

[18] U. F. Arifin, M. Djaeni, and F. D. Utari, "Effect of blanching-brine-calcium pretreatment on red chili pepper drying," *MATEC Web Conf.*, vol. 159, p. 02072, Apr. 2018, doi: 10.1051/matecconf/201815902072.

[19] S. Buzrul, "Reassessment of Thin-Layer Drying Models for Foods: A Critical Short Communication," *Processes*, vol. 10, no. 1, p. 118, Jan. 2022, doi: 10.3390/pr10010118.

[20] H. Ramdani, R. A. Wicaksono, and M. A. Fachruddin, "Penambahan Natrium Metabisulfit (Na2S2O5) terhadap Vitamin C dan Warna pada Proses Pengeringan Cabai Merah (Capsicum annuum L.) dengan Tunnel Dehydrator," *J. AGRONIDA*, vol. 4, no. 2, Jan. 2019, doi: 10.30997/jag.v4i2.1572.

[21] A. M. Irfan, N. Lestari, A. Arimansyah, and A. R. Rasyid, "Kinetika Pengeringan Cabai dengan Perlakuan Blansing Suhu Rendah-Waktu Lama," *AGRITEKNO J. Teknol. Pertan.*, vol. 10, no. 1, pp. 24–35, Apr. 2021, doi: 10.30598/jagritekno.2021.10.1.24.

[22] F. Ajuebor, O. A. Aworanti, O. O. Agbede, S. E. Agarry, T. J. Afolabi, and O. O. Ogunleye, "Drying Process Optimization and Modelling the Drying Kinetics and Quality Attributes of Dried Chili Pepper (Capsicum frutescens L.)," *Trends Sci.*, vol. 19, no. 17, p. 5752, Aug. 2022, doi: 10.48048/tis.2022.5752.

[23] Rustam, Salengke, and Junaedi, "Karakteristik pengeringan dan perubahan warna cabai Katokkon (capsicum annuum L. Var. Sinensis)," vol. 4, no. 59, p. 8743, 2016, [Online]. Available: Jurnal AgriTechno (Vol. 9, No. 2, Oktober 2016)

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