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# EVALUATION OF DIFFERENT COLOURANTS ON PROXIMATE COMPOSITION OF SKEWER SPATCHCOCK CHICKEN

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## ABSTRACT
This study evaluated the effect of different natural colourants on the proximate composition of skewer spatchcock chicken to promote healthier alternatives to synthetic dyes. Eighteen broiler chickens were processed and randomly assigned to six treatments: control (no colourant), turmeric, hibiscus, bell pepper, beetroot, and synthetic dye (Ja'wa). The samples were cured with the respective colourants, skewered, and roasted over open fire for 15–20 minutes. Proximate composition was determined. Results showed no significant differences in dry matter (93.33–94.00%), but crude protein was highest in hibiscus (34.06%) and bell pepper (33.20%) compared to Ja'wa (30.80%) and control (31.60%). Ether extract was lowest in bell pepper (4.28%) and beetroot (4.60%), while ash ranged from 1.26% (turmeric) to 2.60% (bell pepper). Natural colourants, especially hibiscus, bell pepper, and turmeric, improved protein retention and reduced fat content. In conclusion, natural plant-based colourants enhance both the nutritional quality and safety of processed chicken and should be used as functional alternatives to synthetic dyes in meat processing.

**Keywords:** Natural Colourants, Proximate Composition, Hibiscus, Bell Pepper, Turmeric, Spatchcock Chicken.

## DESCRIPTION OF PROBLEM
The rise in consumer demand for natural and health-promoting food additives has led to increased interest in the exploration and utilization of natural colorants [1]. Notable examples include, Bell pepper (*Capsicum annuum*), Turmeric (*Curcuma longa*), Hibiscus (*Hibiscus sabdariffa*), Beetroot (*Beta vulgaris*) among others. These plant-based colourants offer healthy, safe, and consumer-accepted alternatives to synthetic colourants, primarily due to their beneficial properties and associated health advantages. Integrating these natural colorants into food and meat products aligns with the growing consumer preference for natural and functional ingredients. This research aims to evaluate the effectiveness of natural additives as colourants derived from turmeric, bell pepper, hibiscus, and beetroot, each known for their vibrant hues and health benefits in curing meat product, such as skewer spatchcock chicken (SSC). Specifically, the study will investigate the stability, bioavailability, and sensory attributes of these colourants. This research not only aims to provide healthier alternatives to synthetic dyes for the food industry but also seeks to enhance the nutritional value and overall appeal of food products.

## MATERIALS AND METHODS
### Experimental Site
The birds were processed into skewered spatchcock chicken at Animal Products and Processing Laboratory of the Department of Animal Science, Ahmadu Bello University, Zaria, Kaduna-State. The Farm is located on latitude 11°.17"N, longitude 07°.64"E with an altitude of 671 m above sea level while the Animal products and processing laboratory is located on 11°.16"N, longitude 07°.63"E (Google map). The area is characterized with a relative humidity of 36% in dry season and 78.5% for wet season as stated by Institute for Agricultural Research Meteorological Station [2].

### Sourcing and Processing of Experimental Material
The natural colourants (turmeric, bell pepper, hibiscus and beet root) were purchased from Samaru open market in Zaria. It was rinsed with clean water, sliced into a thin layer and sundry to reduce the moisture content, it was then be

crushed into powder form using hammer mill (Model 912, Winona Attrition Mill Co, USA) with screen size of 2.36mm (14 mesh). The *Ja'wa* powder (Sudan dye), was purchased from the same market.

**Processing of Skewer Spatchcock Chicken**

A total of eighteen (18) birds were randomly selected, weighed before and after the processing. The dressed carcasses was divided into six treatment groups, the first treatment was the control (without any colourants), the second treatment was those cured with turmeric powder, the third treatment was those cured with hibiscus powder, the fourth treatment was those cured with bell pepper powder, the fifth treatment was those cured with beetroot powder; and spices at 10g/kg and the last (sixth) treatment was cured with synthetic dye (*Ja'wa* powder) at 1g/kg. Other ingredients were included as shown in Table 1. Each of the groups was replicated three times. The skewer Spatchcock Chicken (SSC) was processed by removing the offal, shank, wings and head, backbone and breastbone, so that the chicken can lie flat before processing aided with kitchen shears.

The SSC was washed and partially dried with paper towels and cured with the colourants along with other seasoning. The skewer was inserted in each chicken before roasting. The SSC was roasted on an open fire using fire wood 15-20 mins. It was turned to face both front and back at every 5 minutes interval for four times, vegetable oil was sprinkled on the meat to avoid dryness and burnt while roasting.

**Determination of proximate composition**

Samples from SSC cured with different natural colourants were collected from each treatment and analysed for proximate composition (dry matter, crude protein, ether extract, and ash) according to AOAC procedure (2010) at Biochemical Laboratory, Department of Animal Science, Ahmadu Bello University, Zaria.

**Table 1: Ingredient composition of colourants use for skewer spatchcock chicken**

| Composition (g/kg) | 0 | 10T | 10H | 10BP | 10BR | *Ja'wa* |
|---|---|---|---|---|---|---|
| Chili pepper | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Salt | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Seasoning cubes | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Cooking oil | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 |
| Turmeric | 0.00 | 10.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hibiscus | 0.00 | 0.00 | 10.00 | 0.00 | 0.00 | 0.00 |
| Bell pepper | 0.00 | 0.00 | 0.00 | 10.00 | 0.00 | 0.00 |
| Beetroot | 0.00 | 0.00 | 0.00 | 0.00 | 10.00 | 0.00 |
| *Ja'wa* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Total | 90.00 | 100.00 | 100.00 | 100.00 | 100.00 | 91.00 |

10T:10g/kg Turmeric, 10H:10g/kg Hibiscus, 10BP:10g/kg Bell pepper, 10BR:10g/kg Beetroot

## RESULT AND DISCUSSION

**Effect of colourants on proximate composition of skewer spatchcock chicken**

The proximate composition of skewer spatchcock chicken processed with different colourants is presented in Table 2. Dry matter (DM) content was relatively similar across treatments (93.33–94.00 %), indicating that colourant application had no significant effect on total solids. Crude protein values, however, differed significantly ($p < 0.05$), ranging from 30.80 % in *Ja'wa*-treated meat to 34.06 % in hibiscus-treated samples. Hibiscus and bell pepper treatments recorded the highest protein contents (34.06 % and 33.20 %, respectively), while turmeric (32.71 %) also showed a moderate improvement compared to the control (31.60 %). Ether extract (fat) content varied markedly among treatments, with the highest values observed in the control (14.48 %) and *Ja'wa*-treated samples (12.61 %), whereas bell pepper (4.28 %) and beetroot (4.60 %) produced the lowest fat levels. Ash content ranged from 1.26 % in turmeric-treated meat to 2.60 % in bell pepper-treated samples,

suggesting slight variations in mineral composition. Nitrogen-free extract (NFE), representing carbohydrate content, was highest in beetroot (55.66 %) and bell pepper (53.92 %), indicating better glycogen retention in these treatments. Overall, meats cured with natural colourants particularly hibiscus, bell pepper, and turmeric had higher protein and lower fat levels compared to those treated with synthetic *Ja'wa* or the untreated control.

The results demonstrate that natural colourants significantly enhanced the nutritional quality of skewer spatchcock chicken, particularly in terms of protein enrichment and fat reduction. The increased crude protein content in hibiscus, bell pepper-, and turmeric-treated meats may be attributed to the antioxidant and polyphenolic compounds in these plants, which protect muscle proteins from oxidative denaturation during cooking [4,5]. The elevated protein retention in hibiscus-treated samples aligns with findings by Hopkins [6], who reported that anthocyanin-rich pigments can stabilize muscle proteins and reduce protein oxidation. Likewise, the lower ether extract values in bell pepper and beetroot treatments indicate that these natural additives suppress lipid accumulation, consistent with the reports of Clifford et al. [7], who found that carotenoids and betalains enhance lipid metabolism and reduce fat deposition in meat.

More so, the higher fat content in the control and *Ja'wa*-treated samples implies poor oxidative stability and limited nutrient preservation. This trend agrees with Muzolf-Panek et al. [8], who observed that synthetic *Ja'wa* (Sudan dye) tends to increase fat retention due to lack of antioxidant protection, predisposing the meat to rancidity and inferior quality. The relatively higher ash content in bell pepper and beetroot treatments suggests a greater mineral contribution from these natural sources, which aligns with their known calcium, potassium, and magnesium composition [9]. In general, the superior proximate profile of naturally coloured meats underscores the functional advantage of plant-based pigments, which not only enhance appearance but also improve the nutritional quality and health value of broiler meat compared to synthetic dyes.

**Table 2: Effect of colourants on proximate composition of skewer spatchcock chicken**

| Treatments | DM | Crude protein | Ether extract | Ash (%) | NFE |
|---|---|---|---|---|---|
| Control | 93.69 | $31.60^{c}$ | $14.48^{a}$ | 1.61 | 46.01 |
| Turmeric | 93.48 | $32.71^{bc}$ | $7.09^{b}$ | 1.26 | 52.43 |
| Hibiscus | 93.90 | $34.06^{a}$ | $6.24^{bc}$ | 1.33 | 52.27 |
| Bell pepper | 94.00 | $33.20^{ab}$ | $4.28^{d}$ | 2.60 | 53.92 |
| Beetroot | 93.60 | $31.22^{c}$ | $4.60^{cd}$ | 2.12 | 55.66 |
| Jaw'a | 93.33 | $30.80^{c}$ | $12.61^{a}$ | 1.85 | 48.08 |
| SEM | 0.37 | 0.62 | 0.97 | 0.74 | 5.06 |

$^{abcd}$Means with different superscripts along the same column are significantly different ($P<0.05$), SEM: standard error of means.

## CONCLUSION AND APPLICATION

Skewer spatchcock chicken cured with hibiscus and bell pepper had higher crude protein followed by turmeric and beetroot while the control group and those cured with Ja'wa had lower. Hence, these natural additives can be used as colourants by meat processors for improved quality.

## REFERENCES

1. Talabi, A. E., Zahraddeen, D., Abdu, S. B., Jibir, M., Salihu, E. A., Moses, E. E., Yaqoob, R., Aliyu, Z. I., Joseph, S., Kpachi, V. A., & Ibidiran, O. E. (2025). Influence of colourants (turmeric and ja'wa powder) on the proximate composition of broiler meat. *Nigerian Journal of Animal Production*, 1747–1750. Retrieved from https://njap.org.ng/index.php/njap/article/view/8709.
2. Institute for Agricultural Research Metrological Station, IARMS (2024). Metrological Data from IAR metrological

station, Ahmadu Bello University, Samaru, Zaria, Nigeria.
3. AOAC, (2010). Association of analytical chemists. *Official methods of analysis*.17th Edition, Washington DC, USA.
4. Gao, M., Li, Y., and Hettiarachchy, N. S. (2020). Current applications of natural colorants in food. *Food Chemistry*, 299, 125036.
5. Wang, Y., Chen, H., & Zhang, H. (2021). *Curcumin supplementation improves oxidative stability and meat quality in broilers.* Animals, 11(8), 2241.
6. Hopkins, A. L. (2019). The role of hibiscus anthocyanins in health and disease prevention. In C. G. Fraga (Ed.), *Plant phenolics and human health: Biochemistry, nutrition, and pharmacology* (pp. 341-361). John Wiley and Sons.
7. Clifford, T., Howatson, G., West, D. J., and Stevenson, E. J. (2015). The potential benefits of red beetroot supplementation in health and disease. *Nutrients*, 7(4), 2801-2822.
8. Muzolf-Panek, M., Zaworska-Zakrzewska, A., Czech, A., Lisiak, D., & Kasprowicz-Potocka, M. (2024). Antioxidative Status and Meat Quality Traits as Affected by Dietary Supplementation of Finishing Pigs with Natural Phenolics. *Antioxidants (Basel, Switzerland)*, *13*(11), 1362.
9. Njoku, C. N., Okoli, C. I., & Udeh, F. N. (2023). *Mineral and phytochemical composition of turmeric (Curcuma longa) rhizome cultivated in Nigeria. Nigerian Journal of Animal Production*, 50(4), 1123–1132.