# THE INFLUENCE OF SEA BUCKTHORN (*HIPPOPHAE RHAMNOIDES*) AND RED PEPPER (*CAPSICUM ANNUUM*) FLOUR ON THE CHEMICAL COMPOSITION OF MEAT IN ROSS 308

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***Abstract***

*The use of plant additives as natural sources of bioactive compounds represents a promising strategy for replacing synthetic pigments and improving the nutritional quality of poultry meat. This paper evaluates the influence of dietary supplementation with sea buckthorn powder (Hippophae rhamnoides) and red pepper powder (Capsicum annuum) on the chemical composition and nutritional value of muscle tissue (breast and thighs) in Ross 308 broiler chickens.*

*The results highlight significant changes in the chemical profile depending on the sources of carotenoids and the type of tissue. At the breast level, the administration of 2% red pepper powder resulted in the highest concentration of crude protein (21.88%), surpassing the control group (20.56%), along with a substantial reduction in fat (1.2% compared to 2.2%).*

*Supplementation with 2% sea buckthorn powder in the breast slightly increased the lipid fraction (2.5%). At the thigh level, both sources of carotenoids promoted a decrease in lipids, with the lowest level recorded in the 3% red pepper powder group (6.7%), and the 2% sea buckthorn powder group (6.8%), compared to the control group (7.1%). The ash content (1.01-1.18% breasts; 0.77-1.06% thighs) and moisture (75.28-76.30% breast; 72.05-74.90% thighs) remained within normal physiological limits.*

***Key words:*** *(Ross 308, Hippophae rhamnoides, Capsicum annuum, meat, chemical composition)*

## INTRODUCTION

In recent decades, the global poultry industry has increasingly turned towards identifying natural alternatives to synthetic additives used in poultry feed, driven both by consumer demands for healthier food and strict food safety regulations [1, 2]. In this context, the use of plant powders and flours rich in bioactive compounds is a promising and sustainable strategy [3]. Such phytogenic ingredients not only improve the organoleptic quality of meat, but also have the potential to optimize the chemical composition and nutritional value of muscle tissues [4].

Among the plant resources with an outstanding nutritional profile are sea buckthorn (*Hippophae rhamnoides*) and red pepper (*Capsicum annuum*). Sea buckthorn is recognized for its high content of carotenoids, vitamins (especially C and E), essential fatty acids and polyphenols with a strong antioxidant and immunomodulatory effect [5, 6]. On the other hand, red pepper constitutes an excellent source of carotenoid pigments (such as capsanthin and capsorubine) and capsaicin, compounds known to stimulate appetite, their beneficial effects on lipid metabolism and their potential to optimize protein deposits [7, 8].

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The integration of these natural additives into the diet of the meat hybrid Ross 308, known for its rapid growth rate and feed conversion efficiency, is a research direction of great interest for modern poultry farming [9]. Although the effects of natural pigments on skin and muscle coloration have traditionally been studied [10], the direct impact of sea buckthorn and red pepper powder on the chemical profile (crude protein, lipids, minerals and moisture) at the level of the main carcass parts (breast and thighs) requires a thorough evaluation The aim of this work is to evaluate the influence of supplementing the diet of broilers Ross 308 with sea buckthorn powder (*Hippophae rhamnoides*) and red pepper powder (*Capsicum annuum*) on the chemical composition and nutritional quality of the pectoral muscles and leg muscles, aiming to optimize the nutrient profile of the meat obtained.

## MATERIAL AND METHOD

The research was carried out on a herd of 150 broilers of the *ROSS 308* hybrid, monitored from the age of 1 day to the slaughter age (42 days).

Control batches, fed exclusively with the basic diet, without the addition of natural pigments. Batch 1, basic diet supplemented with 2% red pepper powder (*Capsicum annuum*); Batch 2, basic diet supplemented with 3% red pepper powder (*Capsicum annuum*); Batch 3, basic diet supplemented with 2% sea buckthorn powder (*Hippophae rhamnoides*); Batch 4, basic diet supplemented with 3% sea buckthorn powder (*Hippophae rhamnoides*); (Table 1).

The birds were randomly distributed into six experimental batches (n=25 chicks/batch). All batches were raised in the same hall, ensuring identical microclimatic conditions (temperature, humidity, ventilation and photoperiodic regime) according to the management guide of the ROSS 308 hybrid.

Table 1 Experience organization

| Batch | Specif. | Administration period (days) | Dose (%) |
|---|---|---|---|
| M1 | Control | 21-42 | - |
| L1 | *Capsicum annuum* | 21-42 | 2% |
| L2 | *Capsicum annuum* | 21-42 | 35 |
| M2 | Control | 21-42 | - |
| L3 | *Hippophae rhamnoides* | 21-42 | 2% |
| L4 | *Hippophae rhamnoides* | 21-42 | 3% |

Feeding was carried out *ad libitum*, using a single basic diet for all groups, the only experimental variable being the source of carotenoids and their level of inclusion in the feed recipe.

## RESULTS

The effects of supplementing the red pepper powder diet (2% and 3%) on the chemical composition of the pectoral muscles are shown in Figure 1.

The moisture content ranged from 72.05% (group 2%) to 74.93% (group 3%), compared to 73.03% recorded in the control group (Control). The addition of 3% red pepper powder favored better hydration of muscle tissue.

As for crude protein, a slight downward trend was observed with the increase in the level of supplementation, the values decreasing from 18.06% (Control) to 17.56% (group 2%) and 17.25% (group 3%). The same dynamics were reflected in the total nitrogen level: 2.99% (Control), 2.81% (2%) and 2.76% (3%). The intramuscular fat content showed the most pronounced variations. The 2% supplementation caused a considerable increase in lipids (9.51%) compared to the control (7.10%). In contrast, the level of 3% reduced the intramuscular fat to 6.70%, suggesting a lipid-lowering effect at higher doses.

The ash content (mineral substances) registered the maximum value in the control group (1.18%), dropping in both



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supplemented variants (0.77% to 2% and 0.99% to 3%).

Supplementing with 3% red pepper powder helps reduce fat storage in meat, maintaining optimal hydration, but with a slight reduction in protein and mineral fraction.

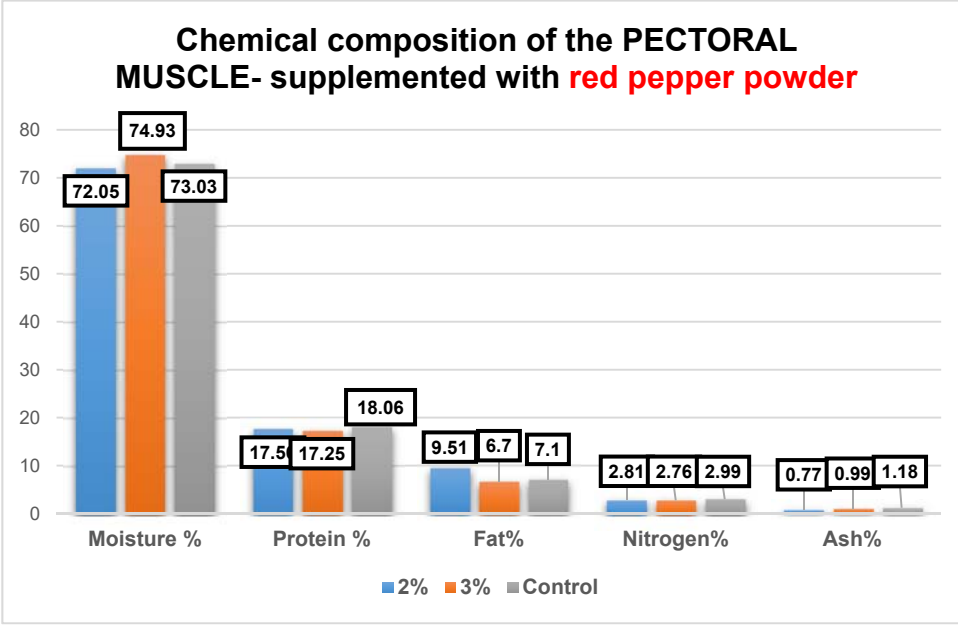



Fig. 1 Chemical composition of the pectoral muscle supplemented with red pepper powder

The chemical composition of the pectoral muscles obtained from supplementing the diet with sea buckthorn powder in doses of 2% and 3% is presented in detail in Figure 2. The analysis tracked the essential nutritional parameters: moisture, crude protein, total lipids, nitrogen and ash content.

The moisture content in the pectoral muscle registered minor variations between the experimental groups. Specifically, the values were 73.63% for the group supplemented with 2% and 72.99% for the 3% group, being close to the value of 73.35% recorded in the control group.

These results indicate that the inclusion of the sea buckthorn powder diet does not significantly affect the water retention capacity or the overall degree of hydration of muscle tissue.

As for the protein fraction, the control group recorded the highest crude protein content, respectively 18.69%. The addition of sea buckthorn powder generated minor decreases, the values being 18.25% in the 2% group and 18.05% in the 3% group. Similarly, the total nitrogen content recorded 2.94% for the 2% group, 2.91% for the 3% group and 2.69% for the control group.

Intramuscular fat levels fluctuated depending on the dose administered. The control group showed a fat content of 7.1%. Supplementation with 2% sea buckthorn powder caused a slight decrease in lipids to 6.8%, while the level of 3% led to a moderate increase in lipids to 7.5%. This dynamic suggests a moderate, dose-dependent influence of the bioactive compounds in sea buckthorn on muscle lipid metabolism.

Finally, the mineral content, reflected by the percentage of ash, remained extremely stable in all experimental variants. The values were 1.06% (group 2%), 1.05%



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(group 3%) and 1.04% (control group). This constancy demonstrates that feed supplementation with sea buckthorn powder does not disrupt the mineral balance and absorption of mineral elements in the pectoral muscle.

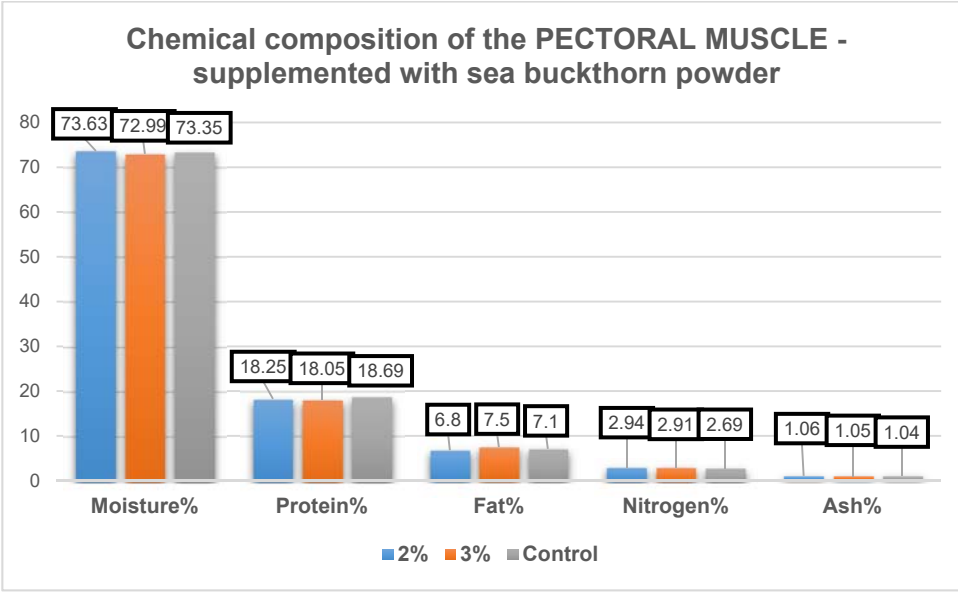



Fig. 2 Chemical composition of the pectoral muscle supplemented with sea buckthorn powder

The chemical composition of the leg muscles obtained from supplementing the diet with red pepper powder in doses of 2% and 3% is shown in Figure 3.

The moisture content of the pulp muscle increased in the experimental groups compared to the control group. Specifically, the values were 75.29% for the 2% group and 75.92% for the 3% group, compared to 73.03% recorded in the control group. This indicates that the inclusion of red pepper powder improves the water retention capacity of the thigh muscle tissue.

In terms of protein fraction, supplementation with red pepper powder generated a significant increase in crude protein content. The control group recorded 18.60%, while the additional batches reached higher values: 21.88% (group 2%) and 21.51% (group 3%). In accordance with these data, the total nitrogen content was also higher in the treated batches (3.53% for 2% and 3.42% for 3%) compared to the control (3.27%).

In contrast, intramuscular fat content recorded a substantial reduction in the groups that received red pepper powder. While the control group showed 2.21% fat, the values visibly decreased to 1.23% in the 2% group and 1.11% in the 3% group. This pronounced decrease suggests that supplementing the diet with red pepper powder exerts a strong lipid-limiting effect in the thigh muscle.

Finally, the ash content (mineral substances) remained relatively stable in all variants, with minor variations: 1.11% for the 2% group, 1.09% for the 3% group and 1.18% for the control group, demonstrating that the overall mineral profile was not significantly affected by the treatment.



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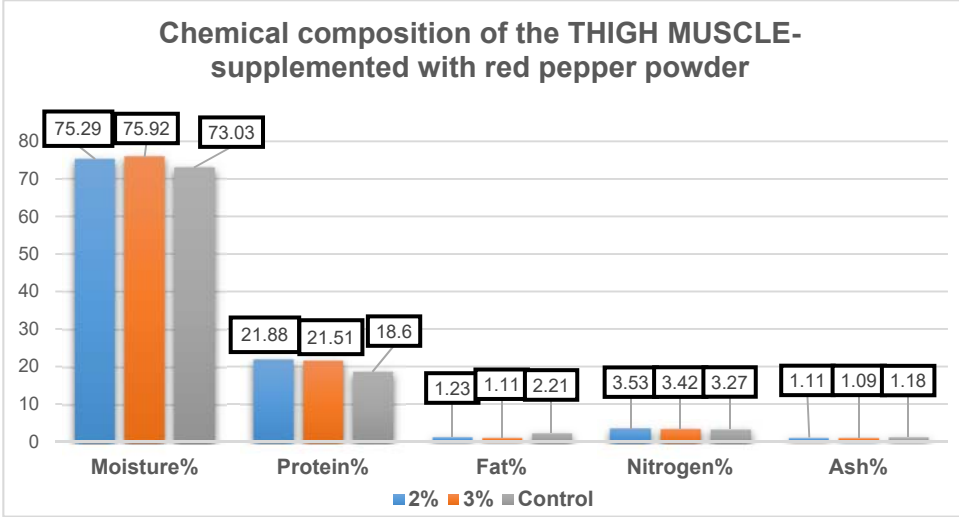



Fig. 3 Chemical composition of the thigh muscle supplemented with red pepper powder

The chemical composition of the leg muscles obtained from supplementing the diet with sea buckthorn powder in proportions of 2% and 3% is illustrated in Figure 4.

The moisture content of the thigh muscle registered moderate variations between the experimental groups. The measured values were 73.83% for the 2% group and 76.31% for the 3% group, compared to 75.06% recorded in the control group. These data suggest that a higher proportion of sea buckthorn powder in the feed (3%) favors a slight improvement in the water retention capacity in the muscle tissue.

In terms of protein fraction, the crude protein content remained extremely stable in all groups. The control group recorded 20.56%, while the variants supplemented with 2% and 3% showed values of 20.50% and 20.75%, respectively. Similarly, the total nitrogen content was very close: 3.28% (group 2%), 3.33% (group 3%) and 3.27% (control group).

Intramuscular fat levels showed notable differences depending on dietary treatment. While the control group showed a fat content of 2.21%, the 2% supplemented group saw an increase to 2.51%. In contrast, the higher supplementation level of 3% resulted in a marked reduction in lipid content, which dropped to 1.51%, indicating a limiting effect on fat deposition at the higher dose.

Finally, the ash content (mineral substances) showed minor variations, being 1.00% in the 2% group, 1.10% in the 3% group, and 1.18% in the control group, demonstrating that the overall mineral profile of the thigh muscle was not significantly affected by the supplement administration.



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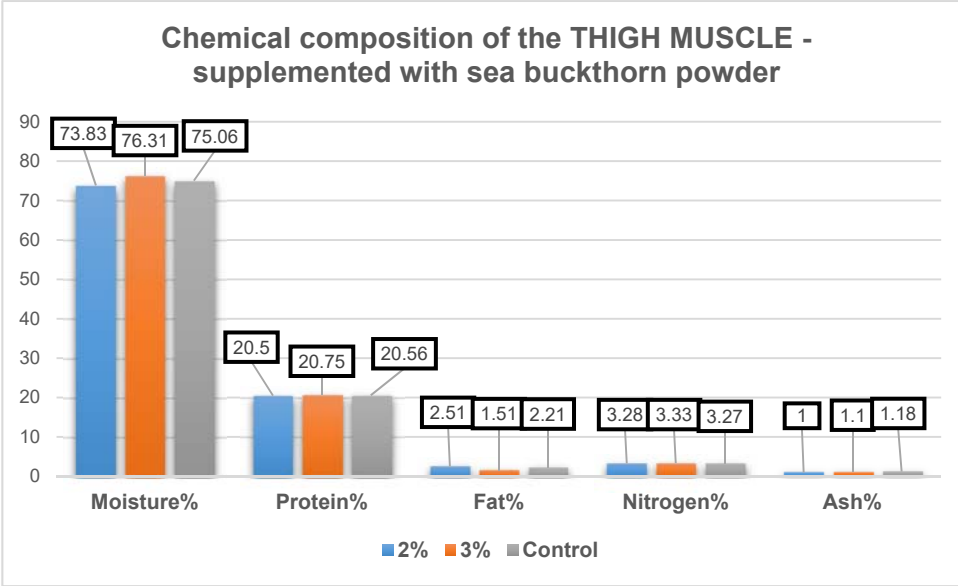



Fig. 4 Chemical composition of the thigh muscle supplemented with sea buckthorn powder

## CONCLUSIONS

Both natural sources of carotenoids demonstrated lipid-modulating properties. The 3% red pepper powder level was found to be the most effective in reducing intramuscular fat, both in the pectoral muscle (6.70% vs. 7.10% in the control) and in the thighs (1.11% vs. 2.21% in the control). Sea buckthorn powder at a dose of 3% also significantly reduced fat deposition in the pectoral muscles (1.51% vs. 2.21%), while the 2% dose slightly increased lipid levels.

Supplementation with red pepper powder significantly stimulated the increase of crude protein in the leg muscles (21.88% at the 2% dose and 21.51% at the 3% dose, compared to 18.60% at the control). In contrast, in the pectoral muscles, the protein content remained stable or registered slight decreases in the supplemented variants. The degree of hydration of the tissues remained optimal or increased slightly at the 3% dose.

The ash (mineral) content remained very stable, especially in the batches with sea buckthorn, proving that none of the supplements negatively affect the mineral accumulation in the meat.

In conclusion, supplementing your diet with 3% red pepper powder or 3% sea buckthorn powder is an effective nutritional strategy for obtaining leaner poultry meat (with a low fat content), while maintaining a high protein quality and good hydration of muscle tissue.

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