Comparison of the effects of *Moringa oleifera* leaf meal with probiotic and organic acid feed additives for improved meat quality of broiler chickens

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Antibiotic growth promoters (AGP) have been used in the poultry industry, having benefits that include increasing prime cuts yield and decreasing the deposition of intramuscular fat, resulting in lean cuts that satisfy consumer demands. However, the same consumers are rejecting the use of synthetic chemicals because of their association with human health risks. Research studies have reported feed residues in chicken meat products and the development of bacterial resistance to antibiotics used both in human medicine and poultry production. Due to the concerns on the use of AGP in poultry nutrition, avenues for the use of natural phytogenic feed additives have been opened. Studies were conducted where the inclusion of organic acids (Hassan, 2014) and probiotics (Contreras-Castillo *et al.*, 2008) in poultry diets were suggestible as alternatives of antibiotics, but consistent results on their effects on meat quality have not been reported. The aim of the current study was to compare the potential of *Moringa oleifera* leaf meal (MOLM) with a probiotic and organic acid, in improving meat quality characteristics when included in broiler diets as alternatives to AGP.

Day-old Cobb-500 unsexed broiler chicks (n = 600) were divided into 5 experimental treatments, each group consisting of 6 replicates with 20 chicks per replicate in a completely randomized design. Experimental diets were as follows: T1, positive control, antibiotic growth promoters (AGP) (300 g/ton Zinc bacitracin and 500 g/ton Salinomycin); T2, 1000 g/ton MOLM; T3, probiotic (500 g/ton); T4, organic acid (1000 g/ton); and T5, 0% additives (negative control). Breast pH was recorded at 45 minutes (pH_{45}) and 24 hours (pH_{24}) *post-mortem*.; then pH, colour (L* = lightness, a* = redness, and b* = yellowness) and drip loss were measured in triplicate. Data was analysed using the general linear model (GLM) procedure of SAS/STAT® software 9.4. The least significant difference method was used to separate the means and differences were considered significant at $P<0.05$.

Differences were observed in meat redness (a*), chroma (C*) and hue angle (HA) values, where birds in T2 had a significantly higher a* and C* values as compared to the birds in T3. Subsequently, the HA values were lower ($P<0.05$) in T2 birds and the highest value was shown in T3 birds. The birds in T3 had lower ($P<0.05$) drip loss % and the highest WHC values, where the opposite was observed in T2 birds.

Attributes	**Dietary treatments**				
(*n* = 60)	**T1**	**T2**	**T3**	**T4**	**T5**
pH_{45min}	6.01 ± 0.085	5.88 ± 0.085	6.09 ± 0.085	5.96 ± 0.085	5.96 ± 0.085
pH_{24}	5.86 ± 0.051	5.93 ± 0.051	5.88 ± 0.051	5.91 ± 0.051	5.99 ± 0.051
L*	47.89 ± 0.599	48.87 ± 0.599	48.29 ± 0.599	48.47 ± 0.599	48.80 ± 0.599
a*	0.97^{ab} ± 0.203	1.43^{a} ± 0.203	0.73^{b} ± 0.203	1.19^{ab} ± 0.203	0.80^{b} ± 0.203
b*	6.77 ± 0.405	7.52 ± 0.405	6.39 ± 0.405	6.63 ± 0.405	6.57 ± 0.405
C*	6.89^{ab} ± 0.410	7.69^{a} ± 0.410	6.51^{b} ± 0.410	6.79^{ab} ± 0.410	6.65^{ab}± 0.410
H*	82.53^{ab} ± 1.828	79.61^{b} ± 1.828	84.76^{a} ± 1.828	79.89^{ab} ± 1.828	83.05^{ab} ± 1.828
Drip loss %	1.98^{ab} ± 0.225	2.31^{a} ± 0.225	1.52^{b} ± 0.225	2.06^{ab} ± 0.225	1.54^{b} ± 0.225
WHC	0.36^{c} ± 0.011	0.38^{abc} ± 0.011	0.41^{a} ± 0.011	0.40^{ab} ± 0.011	0.37^{bc} ± 0.011

Table 1. Least square means (± standard errors) of physico-chemical meat quality attributes of broiler chickens

Results achieved in this study point to the viability of including MOLM in broiler diets as natural feed additive without deteriorating meat quality. The study revealed that the dietary inclusion of MOLM improved meat redness, without causing a DFD condition and adversely affecting other physico-chemical quality attributes. With recent consumers growing health consciousness, the inclusion of MOLM as a feed additive in poultry diets can be a promising solution to addressing public health concerns regarding the safety and quality of meat.

References

Contreras-Castillo CJ, Brossi C, Previero TC and Demattê L**C** (2008) *Brazilian Journal of Poultry Science* **10**, 227–232.
HassanS.M (2014) *Asian Journal of Poultry Science* **8**, 23–31.

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