Effect of Phytoadditive Methiorep on Carcass and Cooked Meat Quality Attributes in Chicken

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Citation

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Abstract

Restriction to synthetic methionine inclusion in organic poultry feed has raised the challenge to find suitable alternatives. There is a dearth of scientific data on inclusion of alternatives to synthetic amino acids and its impact on carcass and cooked meat quality aspects. With this objective, a study was conducted in 50 unsexed day old broiler chicks to assess effect of polyherbal product on meat quality attributes. The polyherbal product is scientifically well established to mimic activity like that of methionine. Chicks were randomly divided into two groups (G1 & G2). Untreated control (G1) was administered basal diet only and no additional supplementation of methionine while G2 was offered phytoadditive (Methiorep) @1 Kg / tonne of feed (supplied by Ayurvet Ltd. Baddi, India) alongwith basal diet. Carcass quality traits, cooked meat quality attributes and proximate analysis of cooked meat were studied at the end of 6 week experimental trial. Supplementation of polyherbal formulation in basal diet was efficacious in improving overall meat quality attributes such as carcass yield, dressing percentage (%), giblet yield, fillet and tender yield, sensory meat characteristics, organoleptic cooked meat parameters, overall palatability and acceptability of meat. The product doesn't have any residual or adverse effect on eating & cooking quality of meat and is safe for usage.

INTRODUCTION

In present scenario, global food security is the major concern. Raw and cooked meat quality is of immense consideration to consumers. Appearance is the major criterion for purchase, selection and initial evaluation of meat quality. The ISO definition of quality is "the totality of features and characteristics of a product that bear on its ability to satisfy stated or implied needs" (ISO, 1986). Quality aspects of meat include food safety, sensory quality, animal welfare and sustainability of production. With respect to sensory quality, appearance is important in choosing meat and factors like taste may dominate over appearance in re-purchase of meat (Dransfield et al., 2005). Poultry meat is susceptible to development of off-flavour (Gray and Pearson, 1987), changes in texture and nutritive value (Pearson et al., 1983). Supplementation of amino acids in feed is well known to influence food and meat quality. Indispensable amino acids participate in protein synthesis and may have influence on muscle protein functional traits, which may get reflected in meat chemical, physical and sensory attributes. The overabundance of methionine methyl groups is utilized in synthesis of other endogenous amino acids Koreleski (2001). Schutte and Pack (1995) and Huyghebaert and Pack (1996) found that higher content of sulfur amino acids (methionine) in the feed lead to increase in broiler pectoral muscle weight and carcass fat content, which is undesirable. Applying DL-methionine supplements in the feeding of turkey-cocks resulted in changes in physico-chemical traits of fresh & freeze dried meat such as lower acidification, darkening of meat color and better water-binding capacity. Sensory examination of cooked meat also revealed faded tenderness and juiciness (Gardzielewska et al., 2005).

The use of synthetic methionine is controversial in organic poultry production and nutritionists have been challenged to find suitable alternatives to synthetic methionine. As per National Organic Standards Board (NOSB), additional arguments against synthetic methionine application are that the use of any synthetic amino acid discourages the integration of a whole-system approach to cycling of nutrients, particularly nitrogen, as part of an integrated crop-livestock production system. Keeping this into view, Moritz et al. (2005) conducted an experiement in which broilers were offered restricted organic feed deficient in synthetic methionine. In this experiement, it was concluded that methionine deficiency in organically reared commercial broilers can be overcome by foraging during growing period.

There has been resurgence of interests for "all natural" medicinal plants like herbal feed additives, plant extracts with growth, flavour, colour enhancing, antioxidant and antibacterial activities (Adodo, 2002; Omojasola and Awe, 2004). However, there is dearth of data on efficacy of supplementing herbal phytoadditives to poultry, especially on its carcass characteristics and cooking attributes. There is one study published by Halder and Roy (2007), in which comparison of herbal phytoadditive (Herbomethione) and synthetic methionine was studied on performance, cost benefit ratio, raw meat and feather quality of broiler chicken; but not on microwave cooked meat quality. Taking this into consideration, the present study was undertaken to evaluate carcass traits, effect of microwave cooking and sensory evaluation of cooked meat of broilers supplemented with phytoadditive (Methiorep). Methiorep is a phytoadditive containing herbal ingredients that mimics methionine like activity. Methiorep is claimed for proper protein accretion and performance in birds at a rapid pace (Kalbande et al., 2009). Its constituent herbs namely Cicer arientinum, Phaseolus mungo, Mucuna pruriens, Triticum sativum and many more are scientifically well established for having highly bioavailable methionine and for having potential role in promoting growth (Harms et al., 1961).

MATERIALS AND METHODS

A study was conducted on day old 50 unsexed broiler chicks, in Department of Veterinary Public Health, College of Veterinary & Animal Sciences Udgir, Dist. Latur, Maharashtra. Chicks were randomly assigned equally in two groups of dietary treatments, G1 & G2 and were offered standard basal diet. Two types of basal diets (starter and finisher) were formulated to cover the nutrient requirements of broiler chicks as per standard recommendations of NRC, (1994). Ad libitum water was offered throughout the experimental period as well as artificial lighting was provided 12 hours daily. Both the groups were housed in a brooder cum grower house randomly with standard and identical managemental, nutritional and environmental conditions. All the chicks were vaccinated as per routine farm practices. Untreated control (G1) group wasn't given any additional treatment. G2 was supplemented with phytoadditive (Methiorep) @1 Kg/tonne of feed (supplied by Ayurvet Ltd. Baddi, India) from 0-6 weeks alongwith basal diet.

Post-Slaughter observations: At the end of 6 week study i.e. during last week of experimental trial, all the birds of group G1 and G2 were slaughtered and dressed following humane methods and hygienic aspects. Dressed weight, fillet and tender yield, total giblet weight (combined weight of heart, liver and gizzard) were recorded.

Proximate analysis of microwave cooked breast fillets (MWBF) and microwave cooked chicken tenders (MWCT) and Cooked yield: carcasses were dressed into basic parts (breasts, thighs, drumsticks, wings, pelvis and backs) as per the method prescribed by Poultry Meat Quality Regulation (Official Gazetteer of the SFRY 1/81 and 51/88). Dressed carcasses were packed in LDPE bags and kept for chilling in refrigerator at 4±1°C for 20 hours. From the breast, fillets (Pectoralis major) and the tenders (Pectoralis minor) were removed without disturbing the shape. These dressed carcasses were further used for the evaluation of cooked meat quality attributes, microwave cooked breast fillets and microwave cooked chicken tenders. Standard power-time combination (prescribed by the manufacturer) was followed for the cooking and grilling of meat. Marinated fillets and tenders were forked and grilled using definite power-time combination. Weight of the marinated fillets & tenders was recorded. In the proximate analysis of microwave cooked fillets & tenders; moisture, protein and fat percentage (%) was determined as per the standard AOAC method (1995).

Organoleptic and sensory evaluation: Sensory testing of the broiler breast fillets was done as per the method given by Keeton, (1983). A minimum of 60 consumer panellists were used in this study. Tenderness, juiciness, flavour and overall preference on microwave cooked chicken breast fillets and tenders of two groups were determined. Parameters were evaluated by a trained panel of 6 members using 8 point hedonic scale, score 8 as excellent and score 1 as extremely poor. Data was summarized in tabular form for each individual group and the data was analyzed using randomized block design as per the method of Snedecor and Cochran (1994).

RESULT & DISCUSSION

Evaluation of carcass and meat quality parameters revealed significantly ($P \leq 0.05$) higher dressed and eviscerated % in the treated group than control (table1). Data of breast muscle and fillets (gm) revealed significantly ($P \leq 0.05$) higher yield in the treatment group G2 (215.83 of fillet & 59.08 of tender) than control G1 (188.0 of fillets & 48.5 of tender), (table1).

Figure 1

Table1: Mean Carcass traits of slaughtered birds of two groups (G1 & G2)

Carcass traits	G1 (Control)	G2 (Methiorep)
Carcass yield (gm)	1067.75±2.56[a]	1248.42±1.8[b]
Dressing %	53.22	60.67
Fillet yield (gm)	188±2.07[a]	215.83±4.02[b]
Tender yield (gm)	48.5±1.98[a]	59.08±3.45[b]

Means bearing different superscripts differ from each other at (P≤0.05)

Total giblet yield (gm) was found to be significantly (P≤0.05) higher in treated birds (111.75±2.07) than control (85.33±0.91gm) (table 2). This is suggestive of beneficial effect of herbal product in improving total carcass yield, giblet yield and dressing %.

Figure 2

Table 2: Mean giblet Weight of slaughtered birds of two groups (G1 & G2)

Weight (gm)	G1 (control)	G2 (Methiorep)
Liver	35.33±0.69[a]	53.25±1.98[b]
Heart	41.50±1.23[a]	46.67±1.74[b]
Gizzard	8.50±1.40[a]	11.67±1.03[b]
Giblet Weight	85.33±0.91[a]	111.75±2.07[b]

Means bearing different superscripts differ from each other at (P≤0.05)

It can also be inferred that the active constituents of herbal feed supplement Methiorep plays important role in improving quantitative carcass traits of broilers.

PROXIMATE ANALYSIS OF COOKED MEAT

Moisture, protein and fat percentage of cooked meat in treated group (G2) was well comparable & non-significantly different from control group (G1) (table 3). Similarly, protein and fat percentage of tenders & fillets in treated group was also in confirmation and non-significantly different from control suggesting that supplementation of herbal phytoadditive in the diet of broilers is efficacious in improving eating quality of meat and in optimizing protein and fat content of microwave cooked meat.

Figure 3

Table 3: Mean Proximate Analysis data of microwave cooked meat of group 1 &2

Traits/groups	Fillet		Tender	
	G1	G2	G1	G2
Moisture %	70.11	66.07	70.29	66.01
Protein %	55.25	56.16	59.88	55.37
Fat %	7.46	6.28	9.47	6.38

Sensory evaluation of microwave cooked meat of both the groups revealed that appearence of fillets & tender in treated group was better than untreated control (table 4). Appearance of fillets in G2 was scored higher (6.66) than control group G1 (6.3). Similarly, appearance of tenders in treated groups was well in confirmation with the control group. This suggests that administration of herbal product has a positive impact in improving organoleptic characteristics of meat in addition to improving dressing percentage and it do not exert any adverse effect on the quality or acceptability of meat (with reference to appearance). Color & odour of cooked poultry meat is important because consumers associate it with the product's freshness and they decide whether or not to buy the product based on their opinion of its attractiveness. It is the only species known to have muscles that are dramatic extremes in color (white and dark meat). Breast meat is expected to have a pale pink color when it is raw while thigh and leg meat are expected to be dark red when raw. There are times when poultry meat does not have the expected color and this has created some special problems for the poultry industry. The desirable meat colour, most accepted to consumers is pinkish to red and the light meat colour, which is scored higher on hedonic scale than dark meat colours (Keeton, 1983).

Figure 4

Table 4: Mean Sensory evaluation of microwave cooked meat (fillets & tenders) of group 1 &2

Traits/groups	Fillet		Tender	
	G1	G2	G1	G2
Appearance	6.3	6.66	6.83	6.66
Colour	6.1	6.83	6.5	6.5
Odour	5.8	6.66	6	6
Juiciness	6.1	6.83	6.33	6.5
Texture	6.3	6.5	6.5	6.66
Tenderness	6.16	6.33	6.5	6.83
Flavour	6.0	6.5	6.5	6.5
Overall Palatability	6.3	6.83	6.83	6.5

Meat colour scores measured on 8-point scale revealed that meat colour 45 minutes post-slaughter were desirable in the treated & control groups, well comparable to each other. However, colour of fillets of treated group G2 (6.83) was scored higher than control (6.1). Similarly, colour of tender muscle of both the groups was non-significantly different from each other. More lighter is meat colour, higher is the score on hedonic scale and greater is the acceptability by the consumers. Several researchers have also demonstrated that a significant negative correlation exists between breast meat lightness color values and breast meat pH (Allen et al., 1997). Similarly, off-odours are the major criteria of raw and cooked meat rejection. The odour and juiciness of microwave cooked fillets of both the groups were in confirmation to each other & in normal range. It can be concluded that administration of herbal product do not lead to any deterioration in colour and odour of cooked meat or exert any undesirable effect on organoleptic characteristics of meat and the product is completely safe for usage. Flavour & tenderness of meat are another most important organoleptic characteristic that also regulates acceptability of meat. In present experiement, supplementation of phytoadditive Methiorep has been shown to improve the flavour and tenderness of microwave cooked meat. Flavour and tenderness of fillets of treated group (6.5 & 6.33) was scored higher on hedonic scale than the untreated control (6.0 & 6.16). It can be inferred that supplementation of phytoadditive product, might have lead to improvement in collagen and myofibrillar solubility which in turn improves the tenderness of edible muscles. Brown et al., (2008) also reported that flavour liking and overall palatability of meat from birds produced in the standard system was most preferred as observed by a small panel of assessors on the basis of hedonic scale assessments of meat quality attributes. Data of sensory evaluation showed that the treated group has comparatively better overall palatability and acceptability.

CONCLUSION

It can be concluded that supplementation of herbal product Methiorep, an alternative to synthetic methionine supplementation, was efficacious in improving overall meat quality attributes such as carcass yield, dressing percentage, giblet yield, fillet & tender yield, proximate values, organoleptic cooked meat parameters, overall palatability and acceptability of meat. The product doesn't have any residual or adverse effect on carcass traits, eating and cooking quality of meat. The product is completely safe for usage.

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