



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>

INTERNATIONAL JOURNAL
OF ADVANCED RESEARCH

RESEARCH ARTICLE

A NEW POLYHERBAL FORMULATION FOR LEAN MEAT PRODUCTION IN BROILERS

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Manuscript Info**Manuscript History:**

Received: 14 October 2013

Final Accepted: 22 October 2013

Published Online: November 2013

Key words:Dressing percentage, Fat,
Hypolipidaemic,
Hypocholesterolemic,
Lean meat.**Abstract**

Meat fat contains saturated fat and cholesterol which may increase the risk of atherosclerosis & other associated diseases. A study was conducted for 42 days to evaluate the efficacy of dietary supplementation of herbal formulations for production of lean meat (AV/LMP/10 supplied by m/s Ayurved Ltd Baddi, India) on meat quality attributes in broilers. 90 day-old Ven Cobb broiler chicks were divided equally into 3 groups of 30 birds each. All the groups were fed standard basal ration. T1 was control group (without AV/LMP/10), group T2 and T3 were supplemented with AV/LMP/10 @ 500g/ton and 1kg/ton of diet, respectively. At day 42 significantly better results in term of mean final body weight, mean total feed intake, mean FCR and dressing percentage were obtained in treated groups. Significantly high ($P<0.05$) breast muscle (156.51, 199.46, 196.12 g) and thigh muscle weight (309.37, 395.01, 426.24 g) was obtained in treated groups as compared to control group. The meat/bone ratio for breast and thigh was also significantly high ($P<0.05$) in treated groups as compared to control group. Highest protein content (%) was obtained in T3 followed by T2 and lowest in T1, while highest fat percent was obtained in muscles of control group T1 followed by T2 and T3. It can be concluded from the present study that the herbal lean meat product AV/LMP/10 was found to be effective in production of lean meat (chicken), which may be attributed to hypolipidaemic and hypocholesterolemic properties of constituent herbs viz. *Commiphora mukul*, *Allium sativum* & *Trigonella foenum graecum* of lean meat product AV/LMP/10.

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Introduction

Meat and poultry are valuable sources of protein and other important nutrients. But meat and poultry can also be sources of unhealthy fat and cholesterol (Mallika et al. 2009). Chicken meat contains about two to three times as much polyunsaturated fat than most types of red meat when measured as weight percentage. Diets high in n-6 PUFA lead to increased concentrations of arachidonic acid in membrane phospholipids, which results in an overproduction of eicosanoids that may contribute to hardening of the arteries and other chronic conditions (Simopoulos, 2002). This meat fat also contains saturated fat and cholesterol which are useful upto a certain limit, but, on regular consumption these may increase the risk of atherosclerosis & other associated diseases (Nutrition, 2009). Nutritional guidelines suggest that dietary fat should provide between 15-30 % of total calories and that saturated fats should be limited between 0-10 % of caloric intake (WHO 1990). Modern broilers contain minimum 100 g fat per kg body weight, (10%) which is physiologically inessential and economically of a great loss with today's burning issue of high feed cost and increasing trend in eating habits of processed chicken (Ramamoorthy, 2011). The increasing concerns for health lead the efforts to develop new foods with positive health benefits (Mallika et al., 2009). The ability to produce leaner animals/ meat has a significant impact on meat fat. Reducing the fat content in meat leads to a firmer, rubbery, less juicy product with dark color, prevent rancidity, increase shelf life and more cost (Trout et al. 1992, Paneras et al. 1996). Along with low fat & high protein the meat should be light in colour, of good smell &

of good taste (Keeton, 1994). AV/LMP/10 is a scientifically developed non hormonal herbal blend in which constituent herbs are useful in producing low fat meat with better organoleptic properties. Herbs of AV/LMP/10 viz. *Commiphora mukul*, *Allium sativum* & *Trigonella foenum graecum* are scientifically known to reduce cholesterol & saturated fat from the body and can effect metabolization to lower and decompose a greater portion of fat as well as reduce the synthesis of fat (Joanna et al., 2003 and Andrianova et al., 2004). The present experimental study was conducted to evaluate the efficacy of new polyherbal formulation for lean meat production (AV/LMP/10) in poultry.

Material and Methods

Experiment was conducted in Department of Animal Nutrition, College of Veterinary & Animal Sciences, Anjora, Durg, Chattisgarh, India. In the experiment total 90 Ven Cobb broiler chicks were procured and maintained under standard housing and management condition. The birds were randomly assigned equally to three groups (n=30), each group having three replicates of 10 chicks each. Group T1: control (basal diet without supplemented of herbal lean meat product AV/LMP/10), Group T2: basal diet supplemented with herbal lean meat product AV/LMP/10 @ 500g/ton and Group T3: basal diet supplemented with herbal lean meat product AV/LMP/10 @1kg/ton of diet. The standard management practices were followed throughout the experiment and were fed standard soya-maize based basal diet throughout the experiment.

Among the tested parameters Growth performance (Weekly feed consumption, Weekly live body weight and mean Feed conversion ratio FCR), Carcass characteristics, Physico-chemical characteristics, Sensory attributes, and Lipid profile.

For estimation of carcass characteristics 4 birds from each replicate were slaughtered by at the end of trial. Abdomen was opened for evisceration and carefully all the viscera including organs of alimentary tract, air sacs, giblets (gizzard, liver and heart) and spleen were separated from carcass by the method of Walter et al. 1962. The organs like gizzard, liver, heart, spleen and different cuts of carcass like thigh, wing, back and neck and breast were weighed separately. Lastly eviscerated carcass along with giblets and spleen were weighed for calculating dressing percentage (edible carcass yield). In physico-chemical properties, pH was determined by pH meter and lipid peroxidation (TBA value) in hemolysate sample was measured by the method of Placer *et al.*, (1966). Proximate composition (moisture, protein, ether extract and ash) was determined by AOAC (2000). For Sensory attributes Standard sensory evaluation method using 8-point descriptive (hedonic) scale with set perform were followed where 8=excellent; 1=extremely poor (Keeton, 1983). Appearance/colour, flavour, juiciness, connective tissue residue, tenderness and overall acceptability parameter were evaluated under standard procedure. In lipid profile samples were analyzed for total cholesterol and triglycerides in semi automated analyzer by using diagnostic kits (Bayer Autopk biochemistry kits- Baroda). Total lipid in thigh muscles was determined as per the procedure of Bligh and Dyer (1959), Phospholipids as per Wagner (1968). Fatty acids in thigh muscle were determined by using gas chromatography.

Statistical analysis

The data obtained were subjected to statistical analysis by the software SPSS 10 (SPSS, 1997). Levels of significance were calculated as per the standard method described by Duncan (1995) whenever any effect was found significant.

Results

The results of proximate analysis of feed are presented in table 1.

Growth performance

At the end of experiment at day 42 significant results in term of feed consumption, body weight gain and mean FCR were obtained. Feed consumption of T3 was 3% and 4% more than T2 and control group respectively. In finisher stage highest average body weight were recorded in T3 and it was 7% and 5% more in last week than control and T2 group, respectively. All the values were significantly different with each other. Significant difference was noticed in FCR and best efficiency to convert feed for getting weight was recorded in high dose AV/LMP/10 supplemented group T3 (1.75), followed by T2 (1.78) and least in control (1.80).

Effect on Carcass characteristics

The dressed weight of carcass and weight of its various cuts have been presented in table 3. The dressing percentage significantly ($P<0.05$) increased in high dose AV/LMP/10 supplemented group (T3) (74.08%) followed by T2 (68.59%) and lowest in control group (68.32%). No significant effect of AV/LMP/10 supplementation was noticed for weight of liver, gizzard, breast and giblet though they varied numerically. Highest thigh ($P<0.01$) and proventriculus ($P<0.05$) weight were recorded in T3 (426.24, 10.63 g) whereas highest wing weight recorded in T2

(412.28 g). There was no significant difference in heart weight between T2 and T3 but both had higher than control. The level of AV/LMP/10 in diets had no significant effect on carcass contents of breast meat (lean), breast and thigh bone and a breast meat/bone ratio. Whereas the thigh meat (lean) and thigh meat/bone ratio significantly ($P < 0.05$) improved with supplementation of AV/LMP/10 and thigh meat (lean) in T3 was 16% and 8% more than control and T2 respectively. The length of intestine increased significantly with AV/LMP/10 (108.79 in T2 and 150.50 in T3) as compared to control (101.14).

Effect on Physico-chemical parameters

The mean pH content of meat sample ranged from 7.51 to 7.63 and it was nonsignificant with each other. The lipid peroxidation in erythrocytes was determined in terms of malonaldehyde production and expressed as mM MDA/mg Hb. The lowest concentration of MDA observed due to high dose of AV/LMP/10 (0.13) followed by T2 (0.15) and highest in control (0.19). Regarding proximate composition of meat, moisture and ash content of meat were not influenced significantly by dietary supplementation of AV/LMP/10, while protein percentage numerically increased in T2 and T3. Ether extract percentage significantly increased in high dose AV/LMP/10 supplemented group (T3) (4.86%).

Effect on sensory attributes of raw meat and roasted meat

The sensory scores pertaining to appearance, flavour, juiciness and texture of raw chicken meat samples did not show any significant differences and ranged between (6.40-6.72). However, the overall palatability score of T3 (6.89) samples was significantly ($P < 0.05$) higher than T2 (6.79) and control (6.53). Regarding roasted meat product the results showed that the treatment with 1kg/ton diet AV/LMP/10 gained the best colour, best appearance and the highest acceptability.

Effect on lipid profile

Serum total cholesterol concentration were significantly lowered ($P < 0.01$) in broiler fed with 1kg/ton feed AV/LMP/10 (173.92 mg/dl) when compared with other treatments whereas triglyceride concentration was nonsignificant amongst treatments. Total lipid percentage of thigh muscle significantly ($P < 0.01$) reduced as the level of AV/LMP/10 increased and it was found lowest in T3 (0.57%) followed by T2 (0.76%) and control (0.90%) respectively. Phospholipid content was not influenced by dietary supplementation of AV/LMP/10. Linoleic acid concentration of thigh muscle was significantly increased with rising level of AV/LMP/10 and found highest in T3 (20.47%) followed by T2 (16.06%) and lowest in control (12.70%) whereas the oleic acid concentration did not significantly influenced by dietary supplementation though there was numerical increase in the values.

Table 1: Composition of basal diet

Phase	CP (%)	ME (Kcal/Kg feed)
Starter	23	2950
Grower	21.5	3025
Finisher	20	3100

Table 2: Effect of AV/LMP/10 on growth performance parameters of birds

Group	Feed Intake (g)	Body weight (g)	FCR
T1	3537.81 ^a ± 1.89	1967.05 ^a ± 1.12	1.80
T2	3576.44 ^b ± 0.45	2009.90 ^b ± 0.95	1.78
T3	3701.86 ^c ± 8.54	2115.65 ^c ± 0.27	1.75

The values with different superscripts differ significantly

Table 3: Effect of AV/LMP/10 on Carcass characteristics and composition

Parameters	T1	T2	T3
Live weight (g) (before slaughter)	1831.75 ^a ±80.0	2172.25 ^b ±104.7	2190.75 ^b ±30.6
Dressed weight (g)	1251.50 ^a ±66.9	1490.00 ^a ±1.73	1623.00 ^b ±11.0
Dressing %	68.32 ^a ±0.66	68.59 ^a ±0.69	74.08 ^b ±0.70
Thigh (g)	309.37 ^a ±13.20	395.01 ^a ±0.43	426.24 ^b ±21.51
Proventriculus (g)	6.33 ^a ±0.70	9.87 ^a ±0.75	10.63 ^b ±0.65
Heart (g)	7.43 ^a ±0.58	10.52 ^b ±0.61	10.38 ^b ±0.80
Breast (g)	156.51±23.31	199.46±0.87	196.12±7.79
Wing (g)	329.36 ^a ±9.16	412.28 ^b ±0.58	377.78 ^{ab} ±8.95
Intestine	101.14 ^a ±2.56	108.79 ^b ±2.21	150.50 ^c ±7.08
Meat/bone Ratio (breast)	5.56	5.70	5.68
Meat/bone Ratio (Thigh)	3.83 ^a	3.78 ^a	4.00 ^b
Protein percentage	18.93 ± 0.49	19.15 ± 0.20	19.26 ± 0.28
Ether extract %	4.70 ^a ± 0.15	4.68 ^a ± 0.08	4.86 ^b ± 0.13

The values with different superscripts differ significantly

Table 4: 11. Effect of AV/LMP/10 on sensory attributes of roasted meat

Particulars	T1	T2	T3
Colour	3.24 ^a ± 1.04	3.52 ^a ± 1.03	4.24 ^b ± 0.70
Appearance	3.52 ^a ± 0.93	3.38 ^a ± 0.92	4.23 ^b ± 0.67
Acceptability	2.52 ^a ± 1.12	3.24 ^b ± 1.18	4.57 ^c ± 0.68

The values with different superscripts differ significantly

Table 5: Effect of AV/LMP/10 on lipid profile of broilers

Parameters	T1	T2	T3
Serum total cholesterol (mg/dl)	196.77 ^b ±2.13	188.55 ^{ab} ±4.95	173.92 ^a ±5.36
Total lipid of muscle (%)	0.90 ^c ±0.03	0.76 ^b ±0.00	0.57 ^a ±0.10
Oleic acid (g/100g of fat from muscle)	27.24±2.56	28.89±2.83	28.56±3.43
Linoleic acid (g/100g of fat from muscle)	12.70 ^a ±3.86	16.06 ^b ±5.60	20.47 ^c ±8.54

The values with different superscripts differ significantly

Discussion

Abdel, 2006 and Guo et al., 2004 reported similar results in terms of feed consumption when *Trigonella foenum graecum* was added to broiler feed as growth promoter. Similarly, Sultana et al., 2009 and Meraj, 1998 also reported increase in feed intake of broiler chicken supplemented with *Allium sativum*.

Overall no definite pattern were noticed in weight gain and feed conversion efficiency following AV/LMP/10 supplementation in treatments. But allover high level of AV/LMP/10 improves the body weight and feed conversion efficiency as compared to other treatments. This may be attributed to the efficacy of constituent herbs of AV/LMP/10 namely *Commiphora nukul*, *Trigonella foenum graecum*, *Allium sativum* & many more which are scientifically well proven for improving growth, productivity & hepatoprotective action (Rahimi et al., 2011). The results of present study are in agreement with the findings of Farman Ullah Khan et al., 2009 and Azoua, 2001 who observed gain in the body weight of broilers chicken when fed with extract of *Trigonella foenum graecum*. These results are also in line with the findings of Ahmad, 2005 who reported higher weight gain in broilers fed on rations supplemented with *Allium sativum*. The results of FCR are in accordance with the findings of Abdel, 2006 and Meraj, 1998, who also reported increase in feed conversion efficiency of broiler chicken when fed with *Trigonella foenum graecum* and *Allium sativum* supplemented diet respectively.

The increase in the carcass yield of the broiler chicken was also observed by Abdel, 2006 and Azoua, 2001 in case of *Trigonella foenum graecum*, Sultana et al., 2009 and Ahmad, 2005 in case of *Allium sativum*.

There is some evidence from randomized clinical trials that *Commiphora mukul*, *Trigonella foenum-graecum* (Joanna et al., 2003) and *Allium sativum* preparations (Andria nova et al., 2004 and Chetty et al., 2003) reduces serum cholesterol. Studies indicated reduction in triglycerides and cholesterol (including both LDL and VLDL) and a raise in HDL cholesterol after regular use of *Commiphora mukkul* (Mahmood et al. 2010). There are well documented therapeutic uses of *Trigonella foenum-graecum* for its hypoglycemic and hypolipidemic activity (Prasanna et al., 2000).

Conclusion

Finally it can be concluded from the present study that the herbal formulation AV/LMP/10 at both the inclusion rates was found to be effective in production of lean meat though better results were evident at 1 Kg/tonnes. However, addition of AV/LMP/10 @500g /tonne also brought significant differences in various fat & cholesterol related parameters as compared to untreated control.

Acknowledgement

The Author is thankful to Dean College of veterinary & animal sciences, Anjora, Durg, Chattisgarh, India for providing all the necessary facilities for the successful conduct of the trial and Ayurved Ltd. Baddi for providing necessary samples.

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