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RESEARCH ARTICLE

Carcass Characteristics of Rhode Island Red (RIR) Grower Chicks Feed On Different Levels of Dried Tomato Pomace (DTP)

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Abstract

This study was conducted to evaluate carcass yield and dressing percentage of RIR grower chicks fed on different levels of Dried Tomato Pomace (DTP) with commercial ration. A total of one hundred RIR grower chicks at eight weeks of age were grouped into 20 pens of 5 chicks each, and randomly assigned to five treatments (control fed a commercial ration; 5% DTP; 10% DTP; 15% DTP; 20% DTP) according to a completely randomized design. The mean edible carcass weight of birds placed on the control, 5, 10, 15, and 20% DTP was 892.5, 1007.5, 937.3, 926.8, and 888.5 g, respectively. Dressing percentage of birds fed on the control, 5, 10, 15, and 20% DTP were 62.9%, 67.1%, 64.6%, 63.7% and 63.3%, respectively. The mean value of 5% DTP was better than among those groups. Based on the obtained results it could be concluded that Dried tomato pomace could be incorporated in grower chick rations at the level of 20% without any adverse effect on carcass characteristics in order to decrease the feed cost.

Introduction

The total population of chicken in Ethiopia is about 39.6 million (CSA, 2009), which plays a significant role in human nutrition and as income sources. However, the contribution of poultry production to the country's economy is only 2-3% (Nigusse, 1999). This is due to shortage of poultry feed and nutrition under both rural smallholder and large-scale systems in the country (Taddele et al., 2003).

To alleviate the problem, the development and use of alternative feed resources should be the focus of research especially in food insecure countries such as Ethiopia. One such non-conventional feedstuff, which could be of value for poultry feeding, is tomato pomace. Tomato pomace is an inexpensive and primary by-product of tomato manufacturing. It consists mainly of the skins, seeds and hard tissues of the whole tomatoes. When tomatoes are processed into products, 10% to 30% of their weight becomes waste or "pomace" (King and Zeidler, 2004).

According to King and Zeidler (2004), tomato pomace contains 5.1% moisture, 11.9% fat, 26.8% protein and 26.3% crude fiber. Moreover, it contains 13% more lysine than soybean protein (AL-Betawi, 2005), a good source of vitamin B, fair source of vitamin A and no known antinutritive factors (Geisman, 1981), and 2130 Kcal/kg metabolizable energy (NRC, 1988).

In Ethiopia there are two tomato processing factories (Melgi-Wondo and Upper Awash Agro industry) that produce substantial amounts of tomato pomace. Annually around 23,490,200 kg of tomato can be processed into tomato paste and tomato juice (UAAI, 2009). Form this 7047060 kg waste is produced This huge by product has not yet been extensively utilized as a feed source for poultry, the majority of it is just dumped and allowed to decay in the surrounding areas near the factories as a form of compost (MOA, 2006).

So finding solutions to utilize these abundant and inexpensive wastes is very crucial. One of the best alternative means is to utilize this feed stuff as a feed ingredient in poultry ration to evaluate the carcass yield of Rhode Island Red (RIR) grower chicks.

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Material and Methods

The study area

The study was carried out in Ethiopia at Wolaita Zone in Soddo town, which is found in the Southern Region and located 390 km Southwest of Addis Ababa and 165 km from the town of the region-Awassa. Its total areas is 4383 km square (438370 ha). The mean annual temperature of the area is 19^0C. The average rainfall is 1014 mm.

Management of experimental birds

A total of 100 (60 male and 40 female) male and female Rhode Island Red (RIR) grower chicks at eight weeks of age were purchased from Awassa Poultry Multiplication Center. All the birds were randomly divided into 20 pens with 5 (3 male and 2 female) birds /pen . The 20 pens were randomly assigned to five treatment groups in Complete Randomized Design (CRD)

Experimental diet

Wet Tomato Pomace was dried by spreading and exposing to sunlight at an open place using plastic sheet as drying material. The particle size of pomace was reduced by beating using stick and hand crushing. Over sized DTP was ground using a hand mortar and passed through 3 mm sieve size. The formulated commercial grower chick ration was bought from Kaliti Animal Feed Processing Factory (KAFPF) & used as a control diet. The chicks were fed in the form of mash for grower diets from the age of eight weeks to eighteen weeks. Feed and water were provided on ad libitum basis. Feed intake and refusals were weighed and recorded every day to estimate the feed consumption for each replicate and treatment. Individual weight of each replicates was taken once per week. Body weight gain was calculated by subtraction of the live body weight at the beginning of the week from that of the second measuring date (BWG, g/d). Feed conversion ratio was calculated as gram feed intake /per gram body weight gain.

At the end of the experiment 60 birds (30 male and 30 female) of the experimental birds were used to determine dressing percentage and parts yield. The grower chicks were starved for eight hours, slaughtering weight measured and killed. They were immersed in a bucket of hot water, and defeatherd by hand plucking. The carcass was then eviscerated (heart, crop, pancreas, lungs digestive and urogenital tracts, lower leg and head) removed suspended from the evisceration line and allowed to drain for 15 minutes prior to weighing. The back, two thigh, two drum sticks, two wings and breast were used to evaluate the carcass yield on a commercial basis. Dressing percentage was calculated from carcass weight as a percentage of slaughter weight. Gizzard, skin and liver are edible in most places in Ethiopia and were, therefore, included in the edible component. These were added to the carcass weight and another version of dressing percentage was also calculated.

Laboratory Analysis

Representative samples of experimental diets were taken to Debre Zeit National Veterinary Institute for chemical analysis from each of the feed ingredients used in the experiment and analyzed before mixing with the actual dietary treatments. Feed samples were analyzed for dry matter (DM), crude protein (CP), ether extract (EE), crude fiber (CF) and ash (A.O.A.C., 2000). The metabolizable energy (ME) levels of feed ingredients was calculated using the formula ME (Kcal/kg DM) = 3951 + 54.4 EE - 88.7 CF - 40.8 Ash (Wiseman, 1987) presented on table 2.

Experimental design and statistical analysis

The experiment was arranged in completely randomized design (CRD).The data were analysed to one way ANOVA using SPSS (2002) (Version .13). When treatment effects were found to be significant ($P<0.05$), mean separation was undertaken using Turkey HSD test. All values were calculated on a pen average basis.

Results and Discussion

Dry Matter (DM) intake

The average daily dry matter intake among the treatments that comprised DTP ranged from 72.75 to 73.15 g/bird, and as a significantly ($P<0.05$) differed from the control group (72.10 g/bird). The maximum cumulative DM consumption per bird was 5120.50g in the birds fed on T5. The intake was highly improved when birds fed different levels of DTP than those fed on the commercial ration alone.

Mean body weight gain

The mean daily body weight gain of grower chicks during this study was 13.5, 15.3, 14.6, 13.8 and 13.3 gram fed on T1, T2, T3, T4 and T5, respectively. The diet containing 5% DTP led to significantly higher body weight gain than those placed on a 20% DTP and the control diet. Although statistically not significant from the other treatments, the least mean daily body weight gain was recorded from chicks fed on diets containing 20% DTP.

Table 1 : Ingredients of experimental diets fed to the RIR Grower Chicks

Feed ingredients	**T1 (%)**	**T2 (%)**	**T3 (%)**	**T4 (%)**	**T5 (%)**
DTP	0	5	10	15	20
Corn	30	28.5	27	25.5	24
Wheat bran	10	9.5	9	8.5	8
Wheat middling	27.15	25.65	24.15	22.65	21.15
Nouge cake	15	14.25	13.5	12.75	12
Soya bean	5	4.75	4.5	4.25	4
Rape seed	10	9.5	9	8.5	8
Lime stone	2	2	2	2	2
Salt	0.5	0.5	0.5	0.5	0.5
Vitamin premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.05	0.05	0.05	0.05	0.05
Methionone	0.05	0.05	0.05	0.05	0.05
Total	**100**	**100**	**100**	**100**	**100**
CP (%)	18.66	19.84	21.36	18.82	18.77
ME(kcal/kg DM)	3157.08	3087.07	3084.95	2789.60	2163.48

Source: Control diet from KAFPF, 2009

Table 2 chemical analysis of experimental diets on Dry Matter basis

Nutrient content	Unit	**DTP**	**Experimental Diets**				
			T1	**T2**	**T3**	**T4**	**T5**
DM	%	93.2	90.56	91.42	91.37	91.28	91.36
OM	%	94.00	89.27	90.28	90.75	91.24	92.64
CP	%	21.6	18.66	19.84	20.36	18.82	18.77
ME	kcal/kg DM	773.3	3157.08	3087.07	3084.95	2789.60	2163.48
CF	%	38.8	8.67	9.26	10.21	13.46	17.00
EE	%	9.5	7.59	6.5	7.26	7.16	7.61
MM	%	6.2	10.73	9.71	8.71	8.75	8.06
NFE	%	24.1	54.35	54.68	52.92	51.80	60.89
Ca	%	0.54	0.64	0.56	0.47	0.64	0.39

DM -Dry Matter ;OM-Organic Matter ;CP-Crude Protein; ME-Metabolizable Energy; CF-Crude Fiber; EE-Ether Extract; MM-Mineral Matter NFE-Nitrogen free Extract; Ca-Calcium

Table 3: Carcass yield and dressing % of RIR grower chicks fed with different levels DTP

Parameters	Experimental Diets									
	Control	**5% DTP**	**10% DTP**	**15% DTP**	**20% DTP**	**Mean**	**C.V.**	**SEM**	**F**	**P**
Slaughter weight(g)	1422	1503.8	1452.8	1453	1405.5	1447.4	8.40	85.99	0.381	0.819NS
Plucked weight(g)	1242.8	1347.8	1294.5	1284.0	1252.5	1284.3	8.3	75.29	0.606	0.665 NS
Plucked weight (%)	87.4	89. 7	89.2	88.4	89.1	88.7	1..5	0.93	1.765	0.188 NS
Carcass yield(g)	755	846.3	793.5	775.8	753.3	784.8	7.8	43.36	1.547	0.239 NS
Dressing percentage	53.2	56.4	54.7	53.4	53.7	54.3	4.3	1.64	1.293	0.317 NS
Edible weight(g)	892.5	1007.5	937.3	926.8	888.5	930.5	8.0	52.96	1.640	0.216 NS
Dressing percentage	62.9	67.1	64.6	63.7	63.3	64.3	4.1	1.89	1.609	0.223 NS
Thigh (g)	155.5	177.3	164.5	157.8	151.3	161.3	9.3	10.60	1.836	0.174 NS
Drum stick(g)	133.3	164.5	145.8	150.8	144.5	147.8	12.3	12.82	1.566	0.234 NS
Breast(g)	198.8	214.3	208.5	216.8	200.8	207.8	7.4	10.95	1.059	0.410 NS
Back(g)	145.3	160.3	158.5	139.5	141.5	149.0	12.4	13.09	1.101	0.392 NS
Shank(g)	51.5	58.0	54.0	55.0	50.8	53.9	16.7	6.36	0.417	0.794 NS
Wing(g)	122.3	130.0	116.5	116.0	115.5	120.0	11.3	9.62	0.830	0.527 NS
Head(g)	47.8	51.8	47.8	50.0	51.0	49.7	18.7	6.59	0.156	0.957 NS
Neck(g)	40.8	46.0	49.3	51.3	44.0	46.3	18.3	6.00	0.963	0.456 NS
Liver(g)	28.5	35.3	32.5	36.0	30.8	32.6	11.5	2.66	2.754	0.067 NS
Kidney(g)	2.0	2.5	2.8	3.0	2.5	2.6	21.7	0.40	1.737	0.194 NS
Heart(g)	6.5	6.0	6.5	7.3	5.8	6.4	16.9	0.76	1.136	0.377 NS
Spleen(g)	9.0	11.8	9.5	11.0	10.5	10.2	14.8	1.07	1.456	0.265 NS
pancreas(g)	3.5	4.0	3.5	3.8	3.8	3.7	19.1	0.50	0.350	0.840 NS
Gizzard(g)	36.5	45.5	39.5	44.0	41.8	41.5	13.7	4.01	1.597	0.226 NS
Lung(g)	10.0	13.0	9.8	10.8	12.8	11.3	22.2	1.77	1.492	0.254 NS
Crop(g)	10.3	8.8	10.5	11.0	7.3	9.6	21.7	1.48	2.167	0.123 NS
Skin(g)	72.5	80.8	71.8	71.0	62.8	71.8	17.9	9.13	0.978	0.449 NS
Blood (g)	34.8	35.3	29.8	41.8	37.3	35.8	33.9	8.58	0.513	0.727 NS
Feather(g)	81.5	78.5	91.8	72.5	71.8	79.2	44.7	25.03	0.211	0.929 NS
Intestines(g)	77.0	82.5	87.0	83.5	82.8	82.6	11.2	6.56	0.599	0.669 NS
Proventricules (g)	15.3	17.3	13.0	14.5	11.0	14.2	26.4	2.65	1.580	0.231 NS

NS-None significant difference

Feed Conversion Ratio

There was no statistically marked variation in the feed conversion ratio among all treatments compared to the control group. The mean feed conversion ratio was 5.3, 4.2, 5.0, 5.3 and 5.5 for the group fed on T1, T2, T3, T4 and T5, respectively. A group fed with a diet containing 5% dried tomato pomace had significantly higher feed conversion ratio compared with a group that fed a diet containing 20% DTP. Thus, more feed was needed to attain a unit gain compared with a bird fed a diet containing 5% DTP; this may be due to the higher crude fiber content in the experimental diet.

Carcass characteristics

Data on carcass characteristics is presented in Table 3. The mean edible weight, and carcass yield values were higher for a group fed on 5% DTP compared with other treatment groups. But statistically there were no significant difference betw een the groups. This result is in agreement with El-H assan (1999) who indicated that at the levels of 2.5 an d 5.0% dietary TP exhibited higher values of carcass dressing weight of chick. The present result also agrees with Ghazi and Drakhshan (2002) who underlined that inclusion of Tomato Pomace up to the level of 15% in the commercial ration did not show any significant difference compared with the control group.

The back, breast, drum stick, thigh, wing, liver, gizzard and skin are part of the edible carcass weight in Ethiopian condition (Asrat, 2007). As shown in Table 3, the mean edible carcass weight was 892.5, 1007.5, 937.3, 926.8 and 888.5 g for the groups fed on the control diet, 5% DTP, 10% DTP, and 15% DTP and 20% DTP, respectively. The dressing percentage was 62.9%, 67.1%, 64.6%, 63.7% and 63.3% of groups fed on the control diet, 5% DTP, 10% DTP, 15% DTP and 20% DTP, respectively. Dressing percentage was no significantly affected by the level of inclusion of DTP. The result agrees with Ghazi and Drakhshan (2002) who showed that the dressing percentage was not significantly affected by the inclusion of DTP on the diet. The mean dressing percentage value found in this study (64.3%) confirms the results of Asrat (2007) and Negussie (1999), who reported 64.94% and 63%, respectively. Ghazi and Drakhshan (2002) and El Hassen (1999) reported that including tomato pomace at different levels gave no significant differe nces in carcass yield.

The commercial carcass parts collectively referred to as carcass weight included two wings, two thighs, two drumsticks, back, and breast. The mean carcass weight was 755,846. 3, 793.5, 775.8 and 753.3 gram for a group fed on the control diet, 5% DTP, and 10% DTP, and 15% DTP and 20% DTP, respectively. Carcass weight was not significantly ($P>0.05$) influenced by the inclusion of DTP on the diet. The mean dressing percentage was, 53.2%, 56.4%, 54.7%, 53.4% and 53.7% for the control, 5% DTP, 10% DTP, 15% DTP, and 20% DTP, respectively. There were no statistically significant ($p>0.05$) difference in dressing percentage. The result was in close agreement to reports from Bangladesh by Munira et al. (2006) in their comparative study on carcass characteristics of different genetic groups of hens indicated similar dressing percentage (56%) of RIR hens regardless of diet. Tek etel (1986) indicated range of dressing of 51.5 to 57.8 %, depending on strains of the local chicken in Ethio pia.

The present result agrees with Ghazi and Drakhshan (2002) who reported that the overall performance of the broiler chicks was not statistically affected by the inclusion of DTP in different levels. Commercially important carcass yield throughout the world includes only back, breast, drum stick, thigh and wing (Asrat, 2007).

Conclusions

Based on the result obtained in this study concluded that the lowest and highest DM intake were observed at the control group and 20% DTP inclusion level, respectively. Birds fed on at 5%DTP inclusion level had the highest body weight gain than the control group. Higher fed conversion ratio (FCR) was obtained when DTP was included at 5 % level compared with 20% inclusion level. Significantly similar carcass yield and dressing percentage was observed at 20% of DTP inclusion on grower chicks.

Recommendations

Based on the results of the study the following recommendations are made:

- ✓ Using DTP as a feed ingredient during ration formulation for RIR grower chicks at 20 % inclusion level helps to reduce the production cost and maximizes profit without deleterious effect on the overall performance of grower chicks.
- ✓ Technology dissemination about the advantage of this feed stuff is very advisable especially for commercial poultry farm owners and intensive system broiler producers to reduce their production cost.

- ✓ Further research on treatment of the DTP when included at higher level is necessary to know the effect of this feed staff beyond 20% inclusion

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