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Probiotic and acidifiers supplementation effect on carcass characteristics of broiler chicken

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Abstract
The research was carried out to study probiotic and acidifiers supplementation effect on carcass characteristics of broiler chicken. A total number of 300 birds were reared for a period of forty two days with dietary treatments; T_0 - control diet as per BIS (2007), T_1 - control + sodium diformate @ 0.2%, T_2 - control + sodium diformate @ 0.2 + probiotic @0.02%, T_3 - control + blends of acidifiers @0.2%, T_4 - control + blends of acidifiers @0.2% + probiotic @0.02%. Each treatment consist of sixty birds with four replicates containing fifteen birds per replicate. The values pertaining to dressing percentage, giblet percentage, boneless breast percentage and boneless leg percentage of all the treatment groups were found to be higher as compared to control with significant increase in dressing percentage, giblet percentage and boneless leg percentage.

Keywords: Probiotic, acidifiers, carcass traits, broiler, sodium diformate

Introduction
Probiotics are either single as well as blend of live microbial culture which elevate health benefits to the host (Fuller, 1992) [8]. Method of probiotics action includes competition with receptor sites in the intestinal tract, production of specific metabolites (short organic fatty acids, hydrogen peroxide, other metabolites possessing antimicrobial activity) and immune stimulation effect (Madsen *et al*., 2001) [16]. Bacteria and yeasts have been included as spores or as living micro-organisms. *Saccharomyces* (Batschinskaya) known to offer a good quality protein and B-complex vitamins. Due to immunomodulatory properties, yeast extract, the non-antibiotic functional product is suggested to be the potential non-antibiotic alternative for decreasing pathogenic bacteria in turkey production (Huff *et al.*, 2010) [12]. At present yeast cell derivatives are gaining importance as zootechnical feed additives. Microencapsulation of probiotic can be used to enhance the viability during processing and also for the targeted delivery in gastrointestinal tract. Acidifiers are being considered as one of the viable option of the antibiotics as of late due to their antimicrobial activity against extensive variety of pathogenic microorganisms in light of their capacity to prompt a pH reduction in the gut and these can enhance nutrient utilization in poultry diets. These have been used either as single acid or combination of several acids. Utilization of organic acids and their salts in poultry has been permitted as safe by the European Union (Adil *et al*., 2010) [2]. Organic acids have growth-promoting properties also its use could stimulate the natural immune response. Organic acid supplementation significantly increased the villus width, height and area of GI tract (Kum *et al*., 2010; Rodriguez-Lecompte *et al*., 2012) [15, 20]. Considering the wide scope for the research of combination of single or blends of acidifiers with probiotic to give optimum synergistic effect on carcass of broiler chicken, the present study is planned.

Materials and Methods
The research was completed at Poultry Research Center, Post Graduate Institute of Veterinary and Animal Sciences, Akola (MAFSU Nagpur).The research was conducted on one day old 300 chicks of Cobb 430 strain for a span of 42 days from 22 January to 5 March 2018. These chicks were assigned to 5 dietary treatments, T_0 (control diet as per BIS, 2007), T_1 (control plus sodium-diformate @ 0.2%), T_2 (control plus sodium diformate @ 0.2% plus probiotic @ 0.02%), T_3 (control plus blends of organic acid @ 0.2%), T_4 (control plus blends organic acid @ 0.2% plus probiotic @ 0.02%) with 60 birds in each group having 4 replicates of 15 birds each. Sodium diformate, mixes of various natural acids (Acidomix viz. buffered organic acids

like Calcium Propionate, Sodium Formate ,Fumaric acid, Sorbic acid and Citric acid in equal quantity) and probiotic [encapsulated *Saccharomyces cerevisiae* (Batschinskaya) @1 x 10^{10} CFU/g] were supported by Venkeys India Pvt. Ltd. Pune. The chemical analysis of different feed ingredients were carried out at Department of Animal Nutrition, PGIVAS, Akola. Based on chemical investigation, the diet was formulated for pre-starter, starter and finisher according to BIS (2007) [4] and shown in Table 1. Standard managemental practices were followed during entire trail period. At the end of experiment, two birds from each replicate were chosen according to the body weight near the mean. Birds were famished 12 hrs and *adlib* for drinking water was made accessible and after 12 to 16 hrs bird was slaughter by serving the jugular vein and carotid artery route and permitted to bleed for 1 to 2 min. Defeathering was done by keeping fowl in boiling water for 3-4 minutes and feathers were expelled physically. To calculate the carcass yield, it was considered the hot eviscerated carcass weight, without feet, head and abdominal fat, in relation to the live weight. **(**Fernandes *et al.,* 2013) [7]. Different carcass traits viz. eviscerated yield, edible meat yield, giblet weight were recorded and expressed in terms of live weight also dressing percentage and giblet meat percentage were calculated. Deboning broiler chicken leg meat was carried out by dislocation of articular cartilage followed by stripping periosteum. The whole thickness of articular cartilage at its center part was cut vertical to the articular surface. The cut covered the whole width of the cartilage and reached the top portion (~3 mm) of the periosteum; the cartilage was then dislocated to expose the surface of underlying growth plate attached to the subchondral bone and the portion of the cartilage attached to periosteum was pulled down to strip the periosteum tissue from the diaphysis to obtain bones (Nakano *et al.,* 2012) [18]. Breast was separated and muscles were removed from the left and right sides of each carcass using the technique of Hamm (1981) [10]. For calculation of boneless breast and leg meat yield percentage, boneless muscle yield percentage of both was separately calculated in relation to the eviscerated carcass **(**Fernandes *et al.,* 2013) [7]. The data collected during the study was analyzed statistically as per Snedecor and Cochran (1994) [21] through SPSS (2009) [22] and depicted in Table 2 and 3.

Table 1: Composition of broiler ration

Ingredient	Pre-Starter					Starter					Finisher				
	T_0	T_1	T_2	T_3	T_4	T_0	T_1	T_2	T_3	T_4	T_0	T_1	T_2	T_3	T_4
Maize	46.2	46.2	46.2	46.2	46.2	49	49	49	49	49	54	54	54	54	54
Soya (DOC)	43.5	43.5	43.5	43.5	43.5	40.6	40.6	40.6	40.6	40.6	35.1	35.1	35.1	35.1	35.1
Soya oil	5.57	5.57	5.57	5.57	5.57	6.3	6.3	6.3	6.3	6.3	6.92	6.92	6.92	6.92	6.92
L-Lysine	0.01	0.01	0.01	0.01	0.01	-	-	-	-	-	-	-	-	-	-
DL-Methionine	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
LSP	1.13	1.13	1.13	1.13	1.13	1.15	1.15	1.15	1.15	1.15	1.1	1.1	1.1	1.1	1.1
DCP	2.01	2.01	2.01	2.01	2.01	1.86	1.86	1.86	1.86	1.86	1.79	1.79	1.79	1.79	1.79
Trace-min mix	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Vit mix	0.30	0.30	0.30	0.30	0.30	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Salt	0.30	0.30	0.30	0.30	0.30	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Choline chloride	0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Coccidiostat*	0.10	0.10	0.10	0.10	0.10	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Toxin binder*	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sodium diformate*	-	0.2	0.2	-	-	-	0.2	0.2	-	-	-	0.2	0.2	-	-
Probiotic*	-	-	0.02	-	0.2	-	-	0.02	-	0.02	-	-	0.02	-	0.02
Acid Mixtures*	-	-	-	0.2	0.02	-	-	-	0.2	0.2	-	-	-	0.2	0.2
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CP (%)	23	23	23	23	23	22	22	22	22	22	20	20.1	20.1	20.1	20.1
ME (Kcal/kg)	3000	3000	3000	3000	3000	3100	3100	3100	3100	3100	3200	3200	3200	3200	3200

Results and Discussions

The mean defeathered weight, eviscerated weight, giblet weight, dressing yield, edible meat and abdominal fat was calculated by scarifying eight birds from each treatment (two birds from each replicate) and are given in Table 2 and 3.

Table 2: Average percent carcass yield in broiler

Treatment	Dressing %	Giblet %	Edible%	Boneless breast meat yield %	Boneless leg meat yield %
T_0	$71.12^{a} \pm 0.56$	$4.27^{a} \pm 0.11$	$66.84^{a} \pm 0.57$	$28.28^{a} \pm 0.68$	$19.13^{a} \pm 0.35$
T_1	$72.59^{ab} \pm 0.28$	$4.48^{a} \pm 0.21$	$67.53^{a} \pm 0.58$	$29.42^{a} \pm 1.1$	$19.14^{a} \pm 0.25$
T_2	$73.05^{b} \pm 0.31$	$4.34^{a} \pm 0.18$	$68.34^{ab} \pm 0.55$	$30.71^{a} \pm 0.76$	$19.33^{a} \pm 0.3$
T_3	$73.11^{b} \pm 0.9$	$4.77^{a} \pm 0.15$	$68.38^{ab} \pm 0.87$	$30.25^{a} \pm 0.67$	$20.94^{b} \pm 0.75$
T_4	$74.22^{b} \pm 0.6$	$4.35^{a} \pm 0.16$	$69.72^{b} \pm 0.61$	$30.36^{a} \pm 0.81$	$19.6^{a} \pm 0.32$
Pooled Mean	72.82 ± 0.29	4.44 ± 0.08	68.16 ± 0.32	29.8 ± 0.37	19.63 ± 0.21

Treatment in column bearing common superscripts doesn't differ significantly ($P<0.05$)

Table 3: Average carcass yield (g) in broilers at the end of 6th week of age

Particular Treatment	Fasting Body Wt.(g)	After Blood loss Wt. (g)	Defeathering Wt. (g)	Eviscerated Wt. (g)	Edible Wt. (g)	Giblet Wt. (g)
T_0	$2299.38^{a} \pm 46.56$	$2235.88^{a} \pm 49.16$	$2078.88^{a} \pm 62.5$	$1540.63^{a} \pm 29.1$	$1536.63^{a} \pm 31.56$	$98^{a} \pm 1.81$
T_1	$2349^{a} \pm 84.1$	$2226.75^{a} \pm 77.25$	$2118.25^{a} \pm 79.04$	$1647.75^{ab} \pm 81.97$	$1588^{a} \pm 64.14$	$107.63^{b} \pm 2.4$
T_2	$2468.38^{a} \pm 62$	$2294.5^{a} \pm 74.28$	$2182.38^{a} \pm 69.73$	$1755.25^{b} \pm 39.77$	$1688^{a} \pm 50.21$	$106.75^{b} \pm 3.54$
T_3	$2355.38^{a} \pm 97.58$	$2237.75^{a} \pm 75.34$	$2082.25^{a} \pm 75.52$	$1618.88^{ab} \pm 65.62$	$1614.13^{a} \pm 80.83$	$111.5^{b} \pm 2.05$
T_4	$2307.13^{a} \pm 80.77$	$2183.88^{a} \pm 74.18$	$2086.38^{a} \pm 75.13$	$1661.5^{ab} \pm 63.47$	$1608.25^{a} \pm 57.19$	$99.5^{a} \pm 2.14$
Pooled Mean	2355.85 ± 33.76	2235.75 ± 30.53	2109.63 ± 31.39	1644.8 ± 27.4	1607 ± 26.21	104.68 ± 1.33

Treatment in column bearing common superscripts doesn't differ significantly (P<0.05)

The values pertaining to dressing percentage of carcass was found to be significant. The numerically highest dressing percentage was observed in treatment group T_4 whereas the lowest dressing was observed in T_0 control group. Treatment groups T_1, T_2, T_3 and T_4 were found to at par. Similar results were observed to Hassan *et al.* (2010) [11] who determined effect of using organic acid to substitute antibiotic growth promoters on dressing percentage and found significant difference among treatment. However Adil *et al.* (2011) [3] and Abdel-fttah *et al.* (2008) [1] reported non-significant difference among all treatments supplemented with organic acids for dressing percentage. There were non-significant differences among all treatment groups. The highest value for giblet percentage was observed in treatment group T_3 (diet containing mixtures of acidifiers) whereas the lowest giblet percentage was found in control group. These results corroborates with Islam *et al*. (2008) [13] who found non-significant difference among treatments when birds fed with citric and acetic acid. The values pertaining to boneless leg meat yield percentage of carcass was found to be significant. Treatment group T_3 found to be significantly higher body weight among all the treatment groups. Numerically lowest boneless leg meat yield percentage was found in control. Raga and Korany (2016) [19] found similar results on formic acid (5g/kg diet) and potassium diformate (5g/kg diet) supplemented diet on boneless thigh muscle yield. Brzoska *et al.* (2013) [5] reported numerical increase in leg muscle yield when acidifier fed at 3g/kg and 6g/kg of feed as compared to 9gm/kg of feed. On the other hand Denli *et al*. (2003) [6] reported that organic acid mixture of propionic and FA had no effect on the carcass yield at the end of experiment compared with control. Similarly Garcia *at al*. (2007) [9] recorded that FA supplementation at 0.5% or 1% did not affect right thigh yields of broilers. There were non-significant differences among treatment groups. The highest boneless breast meat yield was obtained from group T_4 fed with mixtures of acidifiers with probiotic. Whereas lowest boneless breast meat yield was obtained from control group. Similar results were obtained by Garcia *et al*. (2007) [9] who observed that FA supplementation at 0.5% or 1.0% did not affect right breast yield of broilers meat yield of broilers. Mohammed (2016) [17] reported insignificant weight of breast meat yield when used acetic and citric acid in the diet. Kopecky *et al.* (2012) [14] also found non-significant differences among treatments for breast weight. On the contrary Raga and Korany (2016) [19] found significant effects of formic acid (5 g/kg diet) and potassium di-formate (5 g/kg diet) in broiler ration on boneless breast muscle yield.

Conclusion

All treatment groups containing either single or blends of acidifiers with or without probiotic have shown better carcass characteristics viz. dressing percentage, giblet meat percentage, edible meat percentage, boneless breast meat percentage, boneless leg meat percentage as compared to control group. Treatment group T_4 containing blends of acidifiers with probiotic were found to be highly effective for most of the carcass characteristics of broiler chicken among all the treatment groups.

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