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Effect of Pellet Binder on Broiler Production

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Abstract

Pellet binders are materials that are used to bind the various feed component together in order to maintain pellet integrity during successive operations after they are extruded from the pellet die. A total of 240 Cobb 400 Y chicks were procured from a renowned hatchery with good body weight, with 80 chicks randomly distributed into 3 treatments with two different pellet binders and one control respectively. Experiments were Carried Out in four replicates with 20 chicks each. Each replication is randomly distributed. Broiler starter ration containing CP: 22 per cent and ME:2900K.Cal./kg Feed was fed up to three weeks and broiler finisher ration containing CP: 19 per cent and ME:3000 k.cal/kg Fed up to four weeks. For the study of growth rate initial weight of each chick was recorded on arrival and then weekly. To determine the feed conversion ratio the feed consumption was recorded weekly. To study body weight, and feed intake, and data were recorded weekly to determine gain in weight and FCR. The data were also analyzed statistically. This article aims to determine weekly gain in the body weight of broiler chicks, feed consumption and feed conversion ratio (FCR) in broiler chicks fed on ration supplemented with pellet binder.

Key words: Binder, Broilers, FCR, Durability, Pellet, Feed intake.

1.0 INTRODUCTION

Animal husbandry is the management and care of farm animals by human beings. Animal husbandry has been practiced for thousands of years since the first domestication of different animals. Nutrition is the one of themajor aspects in animal husbandry which account for 80% of farm cost now a days for different species different nutrition aspect have to consider to raise successful farming among all poultry farming in animal husbandry account or contribute 60 % of agriculture GDP. Poultry Nutrition required for advance commercial farming here multiple feed additive added in the feed for better feed conversation ratio commercial pallet binder is one of the feed additives which added in poultry feed for better pelleting of feed.

Pelleting is widespread heat treatment in the production of poultry feed. The aim of pelleting is to grouped smaller feed particles into larger particles to improve the economics of production and increasing the feed intake thus growth performance and feed competence. However, due to the physical pressure, moisture and heat applied during acclimatizing and pelleting, some physical and chemical modifications occur that may have detrimental effects on feed components, gastrointestinal development and subsequent bird performance. During pelleting process gelatinize starch occurred to a minor extent, it may also lead to partial denaturation of proteins.

The process which possibly improve protein and starch digestibility by deactivation of proteinaceous enzyme inhibitors. The physical stress results in cell wall breakage, and result of it improved nutrient contents in pellet. Diets based on various cereals, nutrient availability negatively affected through increased digesta viscosity as a result of either an increase in soluble carbohydrate or changes in the molecular weight of soluble fibers or both, due to pelleting. Pelleting process is a destructive process in terms of stability of exogenously supplied feed enzymes and vitamins, which is a major concern of feed manufacturers. When the Particle size is reduced the property of pelleting may result in a suboptimal gizzard growth and thus reduces nutrient digestibility in poultry. The pellet quality is a critical factor to optimize feed efficiency and growth response of broilers. The balance between nutrient availability and physical quality of pellets is critical in determining the actual performance of broilers.

It has been observed that birds perform better when fed with good-quality pellets. Directing energy to growth performance of modern broilers progresses when caloric densityis enhanced by the addition of fat, and performance also increases when a higher proportion of pellets are present at the feeder (McKinny, 2004). The increase in ECV was 111 M cal/kg for Strain A and 189 Mcal/kg for Strain B. Time spent resting and eating was also observed. Results suggest that different strains may respond differently to pellet quality (Mathers et al, 1995).

1.1 Pellet durability and bird performance

The term “pellet durability” is used to describe the ability of the pellets to survive transport to the feeder without losing their physical form. Comparative study has been made when birds fed with poor-quality pellets and fed mash, had the same performance, while good-quality pellets resulted in

a significant increase in gain weight. Pellets of poor and good qualities had durability's of about 85 percent and 25 percent, respectively (McKinney et al 2004).

Increasing the level of mechanical energy is an option for improving durability. Tests has been studied and investigated in Israel on the pelleting degree and broiler performance (Nir, 1994). Chickens ate identical formulations supplied as mash, pellets or double- pelleted. Kahl hardness levels were 4.9 and 8.0 for pellets and double pellet, respectively. Pellets feeding birds spent more time on resting and had higher levels of abdominal fat, consistent with the idea of conservation and maintenance energy. It has been suggested that the birds may have found the pellets to be excessively hard. Pellet durability can be improved by shifting fat away from the mixer and applying it as acoating onto the finished pellets.

In other study observed that double-pellets were reground to remove the hardness factor, bird performance. The double-pellets fell below the starting mash (Shipe, 2011). Frictional heating increases with extended mechanical processing, i.e., double-pelleting or use of expanders, and may degrade some nutrients, thereby reducing the improvement in bird performance that should accompany better pellet durability. The best feed conversion and lowest abdominal fat pad occurred when pellets were conditioned to 85C with 4 percent mixer fat and contained supplemental enzyme.

1.2 Pellet binders are materials that are used to bind the different feed component together in order maintain pellet integrity during subsequent operations after extruded from the pellet die. The present commercial animal feed binders can be classified in the following categories: Lignin based binders/lignosulfonates Hemi-cellulose binders, Mineral binders (clays), Specialty binders (gums, starches, formulated products, etc.).

1.3 The Need for Pellet Binders

The presence of a pellet binder in animal feed significantly enhances the durability and hardness of pellets as well as increasing pelleting efficiency. The pelleting efficiency andrunning performance of the pellet is improved with the presence of a pellet binder during pelleting. This prolongs the life of the die and rollers as well as extending the life of the pellet press. Formed pellets are harder, more durable and less fines are present. Increasing durability means pellets are able to withstand the stresses of handling and delivery without breaking up. Increased hardness means that pellets will not break up due topressure in bulk bins, resulting in fewer fines. The presence of a pellet binder further allows increased fat levels without the negative impact in pellet quality.

The surface is the most sensitive part of a pellet that broken and resulting from cutting the pelleted feed into cylindrical pieces. The number of these sensitive breaks depends on the pellet length, with short pellet yielding a higher number per mass than longer pellets which results in a greater possibility for the creation of abrasion and fines. Keeping this view study was undertaken with following objectives:

1. To determine weekly gain in the body weight of broiler chicks fed on ration supplemented with pellet binder.

2. To find out weekly feed consumption and feed conversion ratio (FCR) in broiler chicks fed on ration supplementedwith pellet binder.

1.4 Binder effect on feed quality

Lignosulfonate is a natural polymer that is known to be effective as both a binder and lubricant in poultry diets. West Virginia University researchers included lignosulfonate in a 2-by-2 factorial experiment that used normal or high amino acids. Pelleting techniques and Density: 1 percent mixer-added fat plus sand or 3 percent mixer-added fat with 0.5 percent lignosulfonate researchers in New Zealand observed improved performance in broilers with pellets containing binder (fost 1976). Feeding poor quality pellets to broilers may negate some of the benefits of pelleting, but removing pellet fines via sifting is not warranted. However, neither rpellet quality nor the quantity of pellet fines was reported, making it difficult to conclude that pellet quality is negligible **(**Quentin *et al.* 2004). Performance of birds fed mash or pelleted diets with 0, 5, 15, 25, 35, 45, and 100% reground pellets (fines). There is no difference between birds fed mash and the diet made up from 100% reground pellets and observed that all pellet treatments resulted in superior body weight and feed conversion compared to the mash control. Further, the observation made is that as the level of fines increased in the diets, performance decreased, but the differences were non-significant (Proudfoot & Hulan 1980). Methods for determining and expressing fineness of feed materials by sieving. Page 325 in American Society of Agricultural Engineers Standard S 319. Am. Soc. Agric. Eng. Yearbook Standards, Am. Soc. Am. Eng., St. Joseph, MI. Pellet durability index was determined by sifting 500 g of pellets from a treatment through a No. 6 American Society for Testing and Materials (ASTM) screen before being deposited into a Pfost tumbler. The sifted pellets were then tumbled in the container, dimensions 5× 12 × 12 in., with a 2 × 9 in. plate fixed diagonally along the 12 × 12 in. side, for approximately 10 min at 50 rpm. The sample was then sifted again through the No. 6 (ASTM) mm screen, weighed, and the percentage of pellets was calculated by dividing the weight of pellets after tumbling by the weight of pellets before tumbling and then multiplying that value by 100. Modified pellet durability index was similarly measured, with the exception of the addition of five 13-mm hexagonal bolts to the 500 g of sample in the tumbler. Both analyses are meant to simulate the deleterious effects of transferring and handling the pellets (American Society for Agricultural Engineers 1983). The level of fines increases in a pelleted diet, bird weight gain is reduced. Though differences were found that parallel these reports, significant differences were not observed between 80%, 60%, and 40% pellet treatments (Zatari *et al.* 1990). Feed intake increased with increasing pellet quality. Similar results were observed in the current study. Reasons for the relatively poor performance of birds in this study may also include behavioral adaptation to pellets, and thus rejection of poor-quality pellets. Pelleting contributed 187 kcal/kg of diet due to broiler chickens resting more between meals. They also found that the energy value declined as pellet quality declined (McKinney & Teeter 2004). The good quality pellets resulted in the highest weight gain of broiler chickens when compared to chickens offered poor quality pellets or coarse mash.

Further, they discovered that chickens that ate mash required higher levels of lysine to achieve the same performance as pellet-fed chickens (Lemme *et al*. 2004). Effects of the addition of roller mill ground corn to pelleted feed during a fifty-six-day production period on growth performance and processing yields of broiler chickens (Dozier *et al*. 2009). Feed conversion ratios in broiler chickens will improve significantly when the percentage of fines is reduced in broiler feeds. Broiler chicken feed trials with crumble feed containing high quality pellet binders showed a feed conversion ratio improvement of 4.8% when compared to crumble feed without a pellet binder. Pellet binders save time, money, and resources and can enhance the quality of your stock by improve the quality of their feed (Lilly *et al*. 2011). Diets were crumbled and fed to turkey poults from d-10 through d-39. The highest average poult weight resulted from diets with high amino acids density, 3% mixer fat, and percent lignosulfonate binder (Lemons et al. 2012).

2.0 MATERIALS AND METHODS

Total 240 cobb 400 y chicks were procured from renowned hatchery with good bodyweight, with 80 chicks were randomly distributed into 3 treatments with two different pellet binder and one control respectively. During treatment four replication were carried out with 20 chicks each in each replication randomly distributed.

Commercial broiler feed (with two different pellet binder)

1. T0-Control
2. T1-pellet binder (dose of pellet binder 0.01%)
3. T2-Pellet binder (dose of pellet binder 0.01%)

2.1 Material Requires:

1. Drinker
2. feeder
3. Pollstress (liquid vitamin & electrolyte, liquid amino acid, tannic acid)
4. Cobb 400 Y DOC
5. Brooder and Thermometer

Table 1. Ingredient and nutrient composition of experimental diets (%DM)

Ingredients (%)	**Broiler Pre Starter (1-14day)**	**Broiler Starter (15-28day)**	**Broiler Finisher (29-42day)**
Maize	60	62	63
Hypro Soy	29.1	25.4	22.5
Meat Bone Meal	30	40	47
Lysin	3	3.5	4
Oil	10	12	15
Methionin	3	3.5	4
Threonin	0.5	0.6	0.7
Di Calcim Phosphate	10	13	15

Salt	2.50	3.0	4
Sodium by Carbonate	1	1.5	2
Pellet binder (g)	150	150	150
Vitmix	0.6	0.7	0.9
Toxin Binder	1	1.5	1.9
Livoliv	1	1.2	1.5
Antidiahrea	0.5	1	1.5
Antioxidant	0.1	0.7	0.9
Antibiotic	0.02	0.05	0.9
Nutrient composition			
Moisture (%)	6.29	6.79	6.98
Crude protein (%)	21	22	23
Total ash (%)	4	5	7

2.2 Experimental design

Two hundred fourty day old commercial broiler chicks (Cobb-400) comprising of both male and female are procured from hatchery and reared for 42 days under standard managemental regimes. The chicks with uniform comparable body weight were wing banded, weighed and randomly allotted to two (2) dietary treatment groups in a randomized block design. Each treatment groups were having four replicates with twentybirds in each replicate (80 birds / treatment).

2.3 Experimental diet

The yellow maize and meat bone meal-based broiler diets (pre-starter, starter and finisher) were formulated. The control diet was formulated as per cob 400 manual to meet the nutrient requirement of Cobb broilers. Ground corn was offered to the flock within 12 hours of hatching and subsequently on a pre starter (days 1-14), a starter (days 15-28), anda finisher feed (days 29-42) was offered to each treatment group. Sample of Pellet binderwas analyzed for assay at laboratory before mixing with the experimental diet.

2.4 Parameters studied

Following parameters were studied to observe the effect of growth on broiler diets with and without pellets binder supplementation are described hereunder.

2.5 Body weight gain

Following the initial body weight on day one the chicks were weighted individually at weekly intervals to observe the body weight gain. Accordingly, the body weight gain in different dietary groups was compared among treatment groups. Comparison was also made between treatment groups. All the chicks were weighed in early hours of the day toavoid stress. The digital electronic top pan balance having the accuracy of one gram wasused for this purpose.

2.6 Feed consumption

Average weekly feed consumption was recorded for each replicate and was added to proceeding weeks feed consumption to calculate cumulative feed consumption.

2.7 Feed Conversion Ratio

The feed conversion ratio (FCR) expressed as the amount of feed consumed to the body weight gained under each group of birds arrived at each week and also cumulate.

$$FCR = \frac{\text{Feed consumption (in Kg)}}{\text{Body weight gain (in Kg)}}$$

3.0 RESULTS AND DISCUSSION

3.1 Body Weight of Broilers

The data regarding the body weight of broiler chicks from day old to five weeks ofage are presented in table 3.1 to 3.7.

3.1.1Body weight of day-old chicks (g)

The body weight of day-old chicks randomly distributed in different treatments (Table 3.1), it was noted that irrespective of treatments. Thebody weight of chicks in general ranged from 45.62-46.72 g. The highest mean body weight of chicks was recorded in T_1 (46.72 g), T_2 (45.90 g) and T_0 (45.62 g). The differences in these values between the treatments were found non-significant which indicated that the random distribution of the chicks among the different groups of treatments of the experiments was proper and unbiased **(Acar *et al.* 1991).**

Table 3.1: Average Body weight (g) of day-old broilers in three different treatments

Treatment				
Replication	**T0**	**T1**	**T2**	**Replicationmean**
R1	45.4	45.6	45.3	45.4333
R2	46.7	48.8	46.5	47.3333
R3	45	47	46.5	46.1667
R4	45.4	45.5	45.3	45.4
Total	182.5	186.9	183.6	46.0833
Treatment Mean	45.625	46.725	45.9	

3.1.2 Body weight of broiler chicks at one week of age

The body weight of one-week old chicks contained in Table 3.2, it was noted that irrespective of treatments, the body weight of chicks at one weekof age ranged 149.66-160.12 g. The highest mean body weight of chicks at first week of age was recorded in T_1(176 g), T_0 (171.75 g) T_2(165.75 g). The differences in these values were found to be non-significant; indicating there by a non-significant effect of pellet binder supplementation in water on body weight of chicks at first week of age. The broilers in registered non-significantly body weight compared to other treatments. The differences in body weight of broilers in T_1, T_2were Non-significant. The broilers in T_2 registered non significantly lowest body weight at one week of age. The results revealed that there is a beneficial effect of

supplementation of pellet binder of broilers on body weight.

Table 3.3: Average Body weight (g) of day-old broilers at first week of age in three different treatments

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	171.75	164.5	156.25	164.167
R2	144	151	165.75	153.583
R3	156.5	149	127	144.167
R4	136.94	176	149.66	154.2
Total	609.19	640.5	598.66	154.029
Treatment mean	152.2975	160.125	149.665	-

3.1.3 Body weight of chicks at two weeks of age

The body weight of two weeks old chicks contained in Table 3.3; it was noted that irrespective of treatments the body weight of chicks ranged from 352.59-369.56 g. The highest mean body weight of broiler chicks at two week of age was recorded in T_2 (369.56g) T_1 (366.75 g) and T_0 (352.59g) and the differences in these values were found to be non-significant, indicating there by a non-significant effect of treatments on body weight of chicks at two weeks of age. The broilers in T_2 registered non-significantly highest body weight (**Acar *et al.* 1991).**

Table 3.3 Average Body weight (g) of broilers at two weeks of age in threedifferent treatments.

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	417.5	367	363.68	382.727
R2	333.5	345.5	380.5	353.167
R3	312	363.5	364.5	346.667
R4	347.36	391	369.56	369.307
Total	1410.36	1467	1478.24	362.967
Treatment mean	352.59	366.75	369.56	

3.1.4 Body weight of broiler chicks at three weeks of age

The body weight of three weeks old chicks contained in Table 3.4; it was noted that irrespective of treatments the body weight of chicks ranged from 736.59-763.91 g. The highest mean body weight of broiler chicks at three weeks of age was recorded in T_2(763.91g), T_0(736.59 g), T_1(728.90 g). The differences in these values were found to be non-significant, indicating thereby a non-significant

effect of treatmentson body weight of chicks at three weeks of age. The broiler in T_2registered non-significantly highest body weight compared to other treatments. The results of the study indicate a beneficial effect of supplementation of different pellet binder of broilers on body weight.

Table 3.4 Average Body weight (g) of broilers at three weeks of age in threedifferent treatments.

Treatments				
Replication	**T0**	**T1**	**T2**	**Replicationmean**
R1	857.5	772.5	764.73	798.243
R2	708.94	611.11	772.5	697.517
R3	648.82	746	754.5	716.44
R4	731.11	786	763.91	760.34
Total	2946.37	2915.61	3055.64	743.135
Treatment mean	736.5925	728.9025	763.91	-

3.1.5 Body weight of chicks at four weeks of age

The body weight of four weeks old chicks contained in Table 3.5; it was noted that irrespective of treatments, the body weight of chicks ranged from 1241.63-1293.83 g. The highest mean body weight of broiler chicks at four weeks of age was recorded in T_1 (1293.83g) followed by T_2 (1293.83g) and T0 (1241.63g). The differences in these values were found to be non-significant, indicating thereby a non- significant effect of treatments on body weight of chicks at four weeks of age. The body weight of broilers in T_1 registered non-significantly highest body weight compared to allother treatments. The results indicate a beneficial effect of different pellet binder supplementation on body weight of broilers.

Table 3.5 Average Body weight (g) of broiler at four weeks of age in three differenttreatments

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	1448.5	1341.57	1282.1	1357.39
R2	1175.26	1246.25	1273	1231.5
R3	1113.33	1258.5	1293	1221.61
R4	1229.44	1329	1282.7	1280.38
Total	4966.53	5175.32	5130.8	1272.72
Treatment mean	1241.6325	1293.83	1282.7	

3.1.6 Body weight of broiler chicks at five weeks of age

The body weight of five weeks old broiler chicks contained in Table 3.6, it was noted that in respective of treatments, the body weight of chicks ranged from 1807.93g. The highest mean body weight of broiler chicks at five weeks of age was recorded in T_1 (1870.91g) followed by T_2(1862.34g) and T0 (1807.93g). The differences in these values were found to be non-significant, indicating there by a non-significant effectof treatments of on body weight of chicks at five weeks of age. Non-significantly highest body weight of broilers was recorded in T_1compared to all other treatments. Results revealed that inclusion of Different Pellet binder to enhance the body weight of broilers.

Table 3.6 Average Body weight (g) of broiler at five weeks of age in threedifferent treatments

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	2056	1965.55	1878.42	1966.66
R2	1764.44	1813.12	1816.32	1797.96
R3	1585.71	1855.5	1892	1777.74
R4	1825.6	1849.5	1862.62	1845.91
Total	7231.75	7483.67	7449.36	1847.07
Treatment mean	1807.9375	1870.918	1862.34	

3.1.7 Average weekly body weight of broilers.

Weekly body weight of broilers, contained in Table 3.7 and Fig. 3.1; itmay be noted that mean body weight of broilers, irrespective of treatments at one, two three four and five weeks of age was 154.03, 362.96, 733.47, 1272.72 and 1847.07 g respectively; and the differences in these were significant, indicating thereby a significant effect of age on the body weight of broilers in all treatments. These results were as expected, because under normal conditions the increase in body weight with the intake of feed is what one would expect with the increase in age of birds. When treatment-wise body weight of broilers was observed, it was noted that highest weekly mean body weight of broilers was recorded in T_1 (883.70 g) followed by T_2 (880.23 g) and T_0 (858.21 g). The differences in these values of treatments were also found non- significant, on body weightof broilers.

Table 3.7Average weekly mean body weight of broiler chicks (g) of differenttreatments.

Treatment				
Weeks	**T0**	**T1**	**T2**	**Replication mean**
1	152.3	160.13	149.67	154.033
2	352.59	366.75	369.56	362.967
3	736.6	726.9	736.91	733.47
4	1241.63	1293.83	1282.7	1272.72
5	1807.94	1870.92	1862.34	1847.07
Total	4291.06	4418.53	4401.18	874.051
Treatment mean	858.212	883.706	880.236	

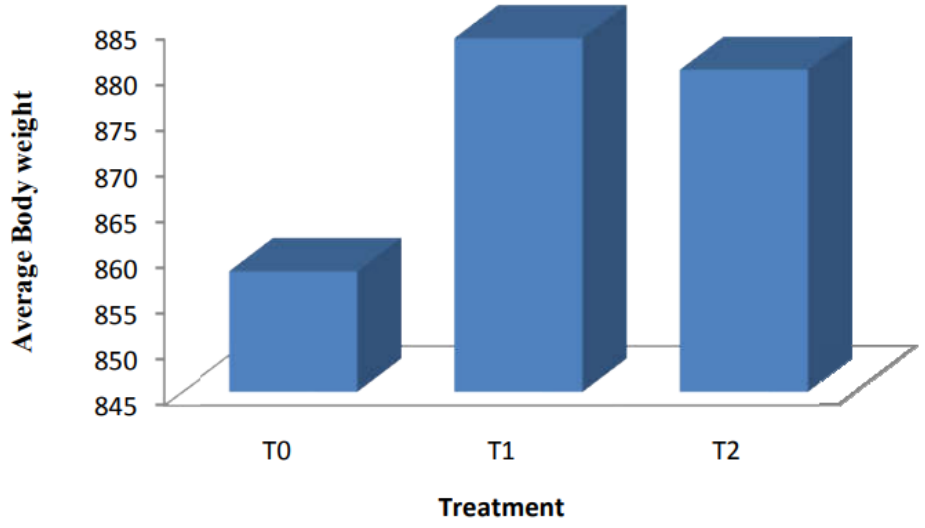

Fig 3.1: Average weekly body weight (g) per broiler in three different treatments type of pellet binder.

3.2 FEED INTAKE IN BROILERS

The feed intake of broilers during fifth week experimental periodare presented in Tables from 3.8 to 3.13.

3.2.1 Feed intake in broilers during first week of age (g.)

The feed intake in broilers during first week, contained in Table 3.8; it was noted that irrespective of treatments, feed intake per broiler during first week of age in general ranged from 120.95-123.80 g. The highest mean feed intake per broiler during the first week was recorded in T_2(123.80 g) followed by T_0(121.46 g) and T_1 (120.95 g). The differences in these values were found to be non-significant, indicating thereby a non-significant effect of treatments on feed intake of broilers. This indicates that all treatments irrespective of level of different commercial pellet binder were more or lessequally beneficial.

Table 3.8 Average feed intake per broiler during first week of age.

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	141.1	118	112.8	123.967
R2	115.26	117.5	128.9	120.553
R3	107.9	137	129.7	124.867
R4	121.6	111.3	123.8	118.9
Total	485.86	483.8	495.2	122.072
Treatment mean	121.465	120.95	123.8	

3.2.2 Feed intake in broilers during second week of age (g).

From the perusal of data on feed intake in broilers during second week of age, contained in Table 3.9; it was noted that irrespective of treatments, feed intake per broiler during second week of age in general ranged from 392.37-419.24 g. The highest mean feed intake per broiler during second week was recorded in T_2(419.24g) followed by T_0(412.71g), and T_1(392.37g). The differences in these values were found to be non- significant, indicating thereby a non-significant effect of treatments on feed intake of broilers. The broilers in T_2 registered non-significantly highest feed intake compared to other treatments. The results of study indicate a beneficial effect of supplementation of different commercial pellet binder in diet of broilers in feed intake.Table 3.9 Average feed intake per broiler during second week of age.

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	476	383	434.5	431.167
R2	426.84	398.5	413.74	413.027
R3	394.5	418.5	409.5	407.5
R4	353.5	369.5	419.24	380.747
Total	1650.84	1569.5	1676.98	408.11
Treatment mean	412.71	392.375	419.245	

3.2.3 Feed intake in broilers during third week of age (g).

From the perusal of data on feed intake in broilers during third week, contained in Table 3.10 indicated that irrespective of treatments, feed intake per broiler during third week of age ranged from 898-943.01 g. The highest mean feed intake per broiler during the three weeks of age was

recorded in T_0 (943.01 g) followed by T_2 (932.32 g), and T_1(880.5g). The differences in these values were found to be non-significant, indicating thereby a non-significant effect of different commercial pellet binders supplementation inthe diet on feed intake of chicks at three weeks of age. The broilers in T_0 registered non-significantly highest feed intake. The results of study indicate a beneficial effect of supplementation of different commercial pellet binder in the diet of broilers in feed intake.

Table 3.10 Average feed intake per broiler during third week of age

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	1037.5	859	939	945.167
R2	914.64	908	929	917.213
R3	942.29	928.5	929	933.263
R4	877.61	826.5	932.3	878.803
Total	3772.04	3522	3729.3	918.612
Treatment mean	943.01	880.5	932.325	

3.2.4 Feed intake in broilers during fourth week of age (g).

The feed intake in broilers during fourth week, contained in Table 3.11 indicated that irrespective of treatments, feed intake per broiler during fourth week of age in general ranged from 1702.72-1740.83 g. The highest mean feed intake per broilers at four weeks was recorded in T_1(1740.83 g) followed by T_0 (1704.98 g) and T_2 (1702.72 g). The broilers in T_1 registered non-significantly highest feed intake. The feed intake of broilers in T_0, T_1 and T_2were non-significant. The differences in these were found to be non-significant, indicating thereby a non-significant effect of treatments on intake of broilers. The results of study indicate a beneficial effect of supplementation of different commercial pellet binders in the diet of broilers in feed intake.

Table 3.11 Average feed intake per broiler during fourth week of age

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	1948.5	1701.5	1727.5	1792.5
R2	1669.08	1992.21	1694.2	1785.16
R3	1666.08	1677.5	1686.5	1676.69
R4	1536.28	1592.12	1702.7	1610.37
Total	6819.94	6963.33	6810.9	1716.18
Treatment	1704.985	1740.833	1702.725	

mean				

3.2.5 Feed intake in broilers during fifth week of age (g).

Table 3.12: Average feed intake per broiler during fifth week of age

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	2354.86	2198.45	2189.67	2247.66
R2	2287.23	2254.67	2188.34	2243.41
R3	2103.45	2097	2089.68	2096.71
R4	2367.43	2035.76	2168.34	2190.51
Total	9112.97	8585.88	8636.03	2194.57
Treatment mean	2278.2425	2146.47	2159.008	

3.2.6 Average weekly feed intake of broilers of different treatments (g)

From the perusal of data on weekly feed intake of broilers, contained in Table 3.13, it may be noted that mean feed intake of broilers, irrespective of treatments at one, two, three, four and five weeks of age was 122.07g, 408.11g, 918.61g, 1716.18g and 2194.57 g respectively. The broilers in T_0 registered significantly highest feed intake. These results were as expected because under normal conditions an increase in feed intake with the increase in age is a normal phenomenon.

Table 3.13 Average weekly mean feed intake (g.) per Broiler of differenttreatments

Treatment				
week	**T0**	**T1**	**T2**	**Replication mean**
1	121.47	120.95	123.8	122.073
2	412.71	392.38	419.25	408.113
3	943.01	880.5	932.33	918.613
4	1704.99	1740.83	1702.73	1716.18
5	2278.24	2146.47	2159	2194.57
Total	5460.42	5281.13	5337.11	1071.91
Treatment mean	1092.084	1056.226	1067.422	

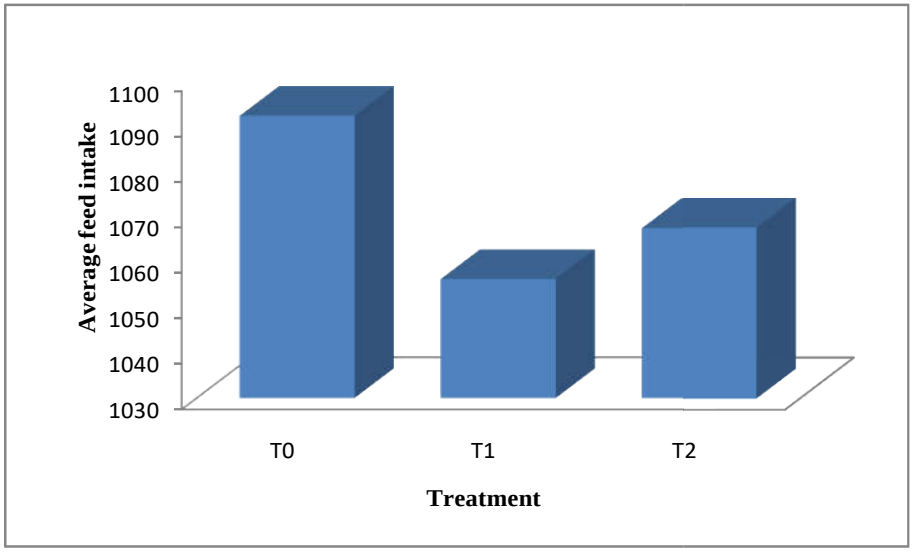

Fig 3.2: Average weekly feed intake of broilers on diets supplemented with differenttypes of pellet binder.

3.3 AVERAGE GAIN IN WEIGHT BROILERS

The gain in weight per broiler during five weeks experimentalperiod are presented in Table 3.14 to 3.19.

3.3.1Average gain in weight of broilers during one week of age (g).

The perusal of data on average gain in weight per broiler during one week of age, contained in Table 3.14, indicate that irrespective of treatments the average gain in weight per broilers during one week of age ranged from 103.71-113.4 g. The highest mean average gain in weight per broiler during first week was recorded in T_1 (113.4g) followed by T_2 (109.30g), T_0 (106.67g), and T_2 (103.71g). The differences in these values were found to be non-significant, indicating there by a non-significant effect of treatments of different commercial pellet binder gain in weight of broilers at one week of age. The broilers in T_1registered non-significantly highest gain in weight. The broilers in T_2(control) registered non-significantly lowest gain in weight at one week of age.

Table 3.14 Average gain in weight of broilers (g.) during one week of age

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	126.35	118.9	110.95	118.733
R2	97.3	102.2	119.25	106.25
R3	111.5	102	80.3	97.9333
R4	91.54	130.5	104.36	108.8
Total	426.69	453.6	414.86	107.929
Treatment mean	106.6725	113.4	103.715	

3.3.2 Average gain in weight of broilers during second week of age (g).

The perusal of data on average gain in weight per broiler during second week of age, contained in Table 3.15, indicate that irrespective of treatments the average gain inweight per broilers during second week of age ranged from 200.16-219.89 g. The highest mean average gain in weight per broiler during second week was recorded in T_2 (219.89g) followed by T_1(206.62g) and T_0(200.16g). The differences in these values were found to indicating thereby a non-significant effect of treatments in gain inweight of broilers at two weeks of age.

Table 3.15 Average gain in weight of broilers (g.) at two weeks of age

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	245.75	202.5	207.43	218.56
R2	189	194.5	214.75	199.417
R3	155.5	214.5	237.5	202.5
R4	210.42	215	219.9	215.107
Total	800.67	826.5	879.58	208.896
Treatment mean	200.1675	206.625	219.895	

3.3.3 Average gain in weight of broilers during third weeks of age (g).

The perusal of data on average gain in weight per broiler during third week of age contained in Table 3.16 indicate that irrespective of treatments the average gain in weight per broiler at three weeks of age ranged from 368.90-395.61 g. The highest mean average gain in weight per broiler during third week was recorded in T_2 (395.61g) followed by T_0(384.00g) and T_1 (368.90g). The differences in these were found to be non-significant indicating thereby a non-significant effect of treatments in gain in weight at three weeks of age. The broilers in T_2registered non-significantly highest gain in weight. The gain in weight of broilers in T_1 registered non-significantly lowest body weight at third week of age. The results of study indicate a beneficial effect of supplementation of different commercial pellet binder in feed of broilers in gain weight.

Table 3.16 Average gain in weight of broilers (g.) at third week of age

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	440	405	401.05	415.35
R2	375.44	265.61	392	344.35
R3	336.82	382.25	390	369.69
R4	383.75	422.5	399.41	401.887
Total	1536.01	1475.36	1582.46	382.819

Treatment mean	384.0025	368.84	395.615	-

3.3.4 Average gain in weight of broilers during fourth week of age (g).

The perusal of data on average gain in weight per broiler during fourth week of age contained in Table 3.17 indicate that irrespective of treatments the average gain in weight per broiler at four weeks of age ranged from 505.03-564.92 g. The highest mean average gain in weight per broiler during fourth week was recorded in T_1 (564.92 g) followed by T_2 (518.79 g), and T_0 (505.03 g). The differences in these were found to be non-significant indicating thereby a non-significant effect of treatments of different commercial pellet binder supplementation in feed on average gain in weight of broilers during fourth week ofage.

Table 3.17 Average gain in weight of broilers (g.) during fourth week of age.

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	591	569.07	517.3	559.123
R2	466.32	635.14	500.5	533.987
R3	464.5	512.5	538.5	505.167
R4	498.33	543	518.79	520.04
Total	2020.15	2259.71	2075.09	529.579
Treatment mean	505.0375	564.9275	518.7725	

3.3.5 Average gain in weight of broilers during fifth week of age (g).

The perusal of data on average gain in weight per broiler during fifth week of age contained in Table 3.18 indicate that irrespective of treatments the average gain in weight per broiler at five weeks of age ranged from 566.30-579.63g. The highest mean average gain in weight per broiler during fifth week was recorded in T_2(579.63 g) followed by T_1(576.96 g) and T_0 (566.30 g). The differences in these were found to be non-significantindicating thereby a non-significant effect of treatments in gain in weight at five weeks of age. The broilers in T_2 registered significantly highest gain in weight, however it was found at par with gain in weight of broilers in $T_0$and T_1 being non-significant difference between the treatments. The results of study indicate a beneficial effect of supplementation of different commercial pellet binder in feed of broilers in gain weight.

Table 3.18 Average gain in weight of broilers during fifth week of age (g).

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	607.5	623.98	596.32	609.267
R2	589.18	566.87	543.31	566.453
R3	472.38	597	599	556.127
R4	596.16	520	579.92	565.36
Total	2265.22	2307.85	2318.55	574.302
Treatment mean	566.305	576.9625	579.6375	

3.3.6 Average weekly gain in weight of broilers of different treatments (g.)

The gain in weight per broiler contained in Table 3.19 and Fig. 3.3, it may be noted that mean average gain in weight per broiler irrespective of treatments during I, II, III, IV and V week of was 107.32, 208.9, 382.82, 529.58 and 574.3 g respectively. The differences in these were non-significant, indicating a non-significant effect of age on the average gain in weight per broiler in all treatments. The broilers in T_2registered non-significantly highest gain in weight compared to other treatments. Theseresults were as expected because under normal conditions, increase in average gain in weight with the increase in age is as expected of effect of treatments of different commercial pellet binder in feed supplementation in diet on growth of broilers.

Table 3.19 Average weekly mean gain in weight (g.) per broiler of differenttreatments

Treatment				
Week	**T0**	**T1**	**T2**	**Replication mean**
1	106.67	113.4	103.72	107.93
2	200.17	206.63	219.9	208.9
3	384	368.84	395.62	382.82
4	505.04	564.93	518.77	529.58
5	566.31	576.96	579.63	574.3
Total	1762.19	1830.76	1817.64	360.706
Treatment mean	352.438	366.152	363.528	

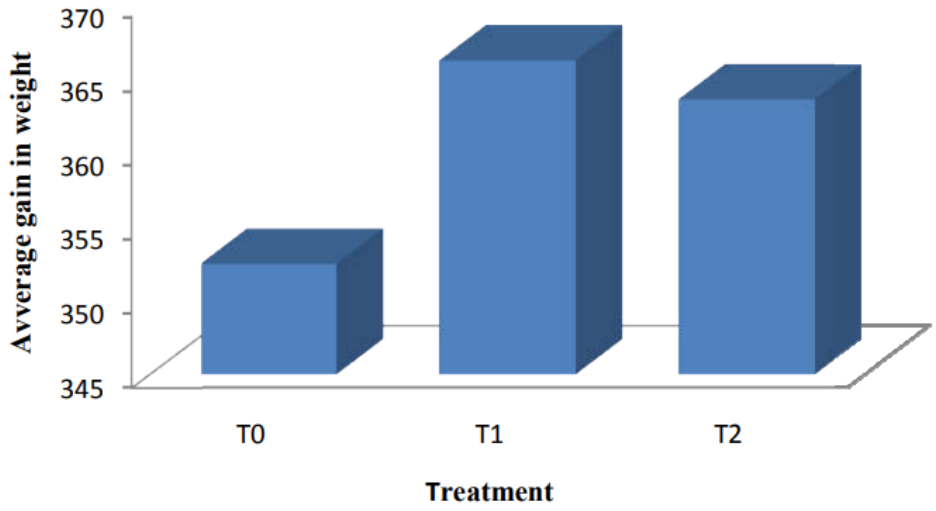

Fig 3.3: Average weekly gain in weight of broilers on diet supplemented with differenttype of pellet binder.

3.4 FEED CONVERSION RATIO (FCR)

The data regarding average FCR of broilers during experimental period are presented in Table 3.20 to 3.27.

3.4.1 Average feed conversion ratio of broilers at one week of age (kg. feed per kg. of weight gain)

The FCR of chicks during first week of age, contained in Table 39, it was noted that irrespective of treatments, FCR per broiler chick during one week of age in general ranged from 0.051-0.052 kg. The highest mean average FCR per chick during the one week was recorded in T_2 (0.052) followed by T_0 (0.052), and T_1 (0.051) The differences in these were found to be non-significant.

Table 3.20 Average feed conversion ratio (FCR) per broiler during first week of age.

	Treatment			
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	0.062	0.051	0.057	0.05667
R2	0.046	0.045	0.056	0.049
R3	0.054	0.05	0.048	0.05067
R4	0.048	0.06	0.05	0.05267
Total	0.21	0.206	0.211	0.05225
Treatment mean	0.0525	0.0515	0.05275	

3.4.2 Average FCR of broilers during second weeks of age (kg. feed per kg. of weightgain)

From the perusal of data on FCR of chicks at two weeks of age, contained in Table 3.21, it was noted that irrespective of treatments, FCR per chick at two weeks of age in general ranged from 0.76-0.83 kg. The highest mean average FCR per chick at the two weeks wasrecorded in T_2 (0.83) followed by T_0 (0.80) and T_1(0.76) kg. The differences in these values were found to be significant, indicating thereby a significant, effect of treatments on FCR of broiler at two weeks of age. The FCR of

broilers in T_2 registered non- significantly better feed conversion ratio compared to all other treatments. The results indicate a beneficial effect of supplementation on feed conversion ratio in broilers.

Table 3.21 Average feed conversion ratio (FCR) per broiler during second week ofage

Treatments				
Replications	**T0**	**T1**	**T2**	**Replication mean**
R1	0.82	0.72	0.73	0.75667
R2	0.8	0.78	0.77	0.78333
R3	0.69	0.921	1.02	0.877
R4	0.89	0.63	0.83	0.78333
Total	3.2	3.051	3.35	0.80008
Treatment mean	0.8	0.76275	0.8375	-

3.4.2 Average FCR of broilers during third week of age (kg. feed per kg. of weightgain)

From the perusal of data on FCR of chicks during third week of age, contained in Table 3.22, it was noted that irrespective of treatments, FCR per chick during third week ofage in general ranged from 1.07-1.32kg. The highest mean average FCR per chick during the third week was recorded in T_0 (1.32) followed by T_2 (1.13) and T_1 (1.07) kg. However, the differences in these were found to be non-significant, indicating thereby a non-significant effect of treatments of feed supplementation pellet binder in diet on FCRof broilers at third week of age.

Table 3.22 Average feed conversion ratio (FCR) per broiler during third week of age

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	1.73	1.04	1.2	1.32333
R2	1.28	1.16	1.08	1.17333
R3	1.27	1.15	1.12	1.18
R4	1.02	0.95	1.14	1.03667
Total	5.3	4.3	4.54	1.17833
Treatment mean	1.325	1.075	1.135	

3.4.3 Average FCR of broilers during fourth week of age (kg. feed per kg. of weightgain)

From the perusal of data on FCR of chicks during fourth week of age, contained in Table 3.23, it was noted that irrespective of treatments, FCR per chick during fourth week ofage in general ranged from 1.22-1.29 kg. The highest mean average FCR per chick at thefour weeks was recorded in T_0 (1.29), followed by T_1 (1.22) and, T_2 (1.22) kg. The differences in these were found to be non-significant,

indicating thereby a non-significant, effect of treatments on average FCR per broiler at four weeks of age.

Table 3.23: Average feed conversion ratio (FCR) per broilers during fourth week ofage.

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	1.2	1.12	1.23	1.18333
R2	1.3	1.49	1.2	1.33
R3	1.46	1.24	1.25	1.31667
R4	1.2	1.05	1.23	1.16
Total	5.16	4.9	4.91	1.2475
Treatment mean	1.29	1.225	1.2275	

3.4.4 Average FCR of broilers during fifth week of age (kg. feed per kg. of weightgain)

From the perusal of data on FCR of chicks during fifth week of age, contained in Table 3.24, it was noted that irrespective of treatments, FCR per chick during fifth week of age in general ranged from 1.42-1.52 kg. The highest mean average FCR per chick at the five weeks was recorded in T_0 (1.52) followed by T_2(1.47) and T_1 (1.42) kg. The differences in these were found to be significant, indicating thereby a non- significant, effect oftreatments on average FCR per broiler chicks.

Table 3.24 Average feed conversion ratio (FCR) per broiler during fifth week of age

Treatment				
Replication	**T0**	**T1**	**T2**	**Replication mean**
R1	1.49	1.38	1.48	1.45
R2	1.53	1.48	1.47	1.49333
R3	1.67	1.46	1.46	1.53
R4	1.4	1.39	1.47	1.42
Total	6.09	5.71	5.88	1.47333
Treatment mean	1.5225	1.4275	1.47	

3.4.5 Average weekly FCR of broilers of different treatments (kg. feed per kg. ofgain in weight)

From the perusal of data on weekly average FCR per broiler, contained in Table 3.25 and **fig. 4**, it may be noted that the mean average FCR per broiler, irrespective of treatments during I, II,III, IV and V week of age was 0.52, 0.80, 1.18, 1.22 and 1.47 kg respectively. The differences in these were found to be significant which indicated a significant effect of age on the average FCR per broilers in all treatments. Since the differences between values of weekly FCR of broilers between the

treatments were not significant this indicates feed supplementation played no significant role on the FCR of broilers, because it was found to be at par with control. Therefore, it can be concluded that pellet binder essential for improvement of FCR or the performance of broilers. That the feed supplementation had influence on the FCR of broilers.

Table 3.25 Mean average feed conversion ratio (FCR) or feed efficiency per broiler.

Treatment				
week	**T0**	**T1**	**T2**	**Replication mean**
1	0.0525	0.0515	0.0527	0.05223
2	0.8	0.77	0.84	0.80333
3	1.33	1.075	1.14	1.18167
4	1.29	1.23	1.14	1.22
5	1.53	1.43	1.47	1.47667
Total	5.0025	4.5565	4.6427	0.94678
Treatment mean	1.0005	0.9113	0.92854	

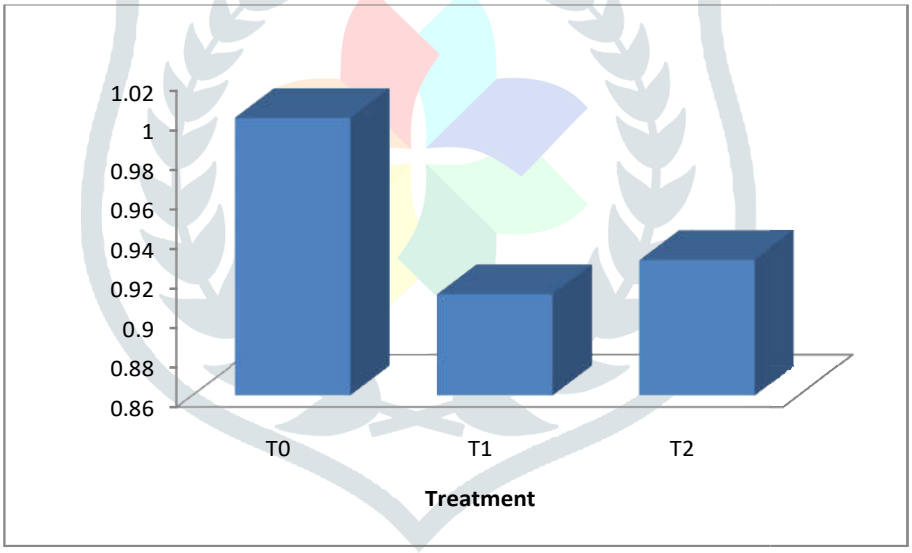

Fig 3.4 Average weekly feed conversion ratio of broilers in feed supplemented withdifferent type of pellet binder

CONCLUSION

It is concluded that there was a beneficial effect of both pellet binders supplementation in diet of broilers on body weight, gain in weight and feed intake of broilers. For economic point of ration supplemented with T1 and T2 basal diet of pellet binder1 (dose of pellet binder 0.01%) Pellet binder2 (dose of pellet binder 0.01%) fed wasfound the best compared to control.

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