

## EVALUATION OF DIFFERENT SOURCES AND LEVELS OF DIET DILUENTS ON BROILERS PERFORMANCE AND CARCASS QUALITY.

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### SUMMARY

This study aimed to investigate the effect of wheat bran (WB) and sugar beet pulp (BP) low density feed ingredients sources on the broiler performance and carcass quality. Both WB and BP were evaluated using diet dilution (DD) technique with different levels. Two hundred and seventy unsexed one-day old Arbor Acres broiler chicks were randomly allocated to nine experimental treatments; each treatment contains three replicates of ten chicks each. Control was the 1<sup>st</sup> treatment, the rest 8 treatments divided in to two main groups of DD first group (2, 3, 4 and 5 treatments) diluted with 2, 3, 4 and 5% wheat bran (WB2, WB3, WB4 and WB5) from the control diets and second group (6, 7, 8 and 9 treatments) diluted with 2, 3, 4 and 5% sugar beet pulp (BP2, BP3, BP4 and BP5). The result indicated that, DD with WB significantly recorded the highest starter, finisher and overall body weight (BW) and body weight gain (BWG) and significantly improve feed conversion ratio (FCR). Levels of dilution affected significantly on BW and BWG during all phases. Among all treatments, WB5 showed the highest BW and BWG compared to other treatments. The best FCR significantly was recorded by WB5 compared to all treatments during finisher and overall period. Broilers fed DD with BP were significantly had higher dressing, breast, wing, and drumstick % compared with WB. Increasing levels of DD reflected in increasing dressing%. Using the higher level of DD (5%) reflected in decreased the abdominal fat %. The interaction between DD and their levels showed significantly different on all carcass parameters except edible parts. The broiler fed BP4 and WB5 recorded the highest dressing % compared to all treatments. There was significant interaction between DD and levels in intestine length and index and tibia weight%. Using DD with WB significantly reduced respiration rate (RR) compared BP. However, levels had a significant effect on rectal temperature (RT) and blood oxygen (O<sub>2</sub>). The effect of the interaction had impact beneficial effect on decreased RT and RR and increased O<sub>2</sub>. All treatments improve the relative economic efficiency (REE) of production except WB2 and the highest one recorded by WB5. Dilution broiler diet with Wheat bran at 3, 4 and 5% and sugar beet pulp at 2, 3 and 4 % improve growth performance, carcass quality, intestine index, economic efficiency, feed cost and REE. Among examined levels the best results recorded by applying 5% WB and 4% BP.

**Keyword:** broiler, wheat bran, beet pulp, performance, carcass.

### INTRODUCTION

Constant improvement in nutrition and genetic selection, has led to a fast growth rate in modern broiler strains (Van Der Sluis, 1999). Unfortunately, this growth is accompanied by increased body fat deposition, high mortality and high incidence of metabolic diseases and skeletal disorders (Zubair and leeson, 1996). This situation most commonly occurs with broiler that consume feed *ad libitum* (Nir *et al.*, 1996). However, the availability of feed ingredients at affordable cost is a key to successful poultry operations. Currently, one of the major challenges in poultry studies is to improve gut health by dietary modulation, especially during the early stages of life. dietary fiber has gained special attention due to its various beneficial effects on poultry (Shang *et al.*, 2020). Increasing the structural components in the diet and manipulating the dietary fiber composition, has been shown to improve gut health, feed utilization and production efficiency and can alleviate enteric disease (Kheravii *et al.*, 2018).

Dietary non-starch polysaccharides (NSP), namely insoluble NSP, which have been shown beneficial effects on gut health, litter quality and nutrient utilization, by increasing crop and gizzard activity, stimulating digestive enzyme production and enhancing bacterial fermentation in the hind gut (Kheravii *et al.*, 2018). There is increasing evidence showing that moderate amounts of insoluble dietary fiber can

improve nutrient utilization by positively influencing the physiology of the gastrointestinal tract (Shang *et al.*, 2020).

Wheat bran (WB), a byproduct of the milling process, is rich in insoluble fiber, consisting mainly of arabinosylans and, to a lesser extent, cellulose and  $\beta$ -glucans (Kamal-Eldin *et al.*, 2009). The proximate analysis for WB according to RCF (2001) is 87 % dry matter, 15% crude protein, 1400 kcal/kg metabolic energy, 4% ether extract, 9.6 % crude fiber, 12% ADF, 40% NDF, 2.7% Lignin, 9.9% Cellulose, 5.6% Ash, 0.14% Calcium, 1.2% total phosphorus, 0.60% Available phosphorus, 0.56% lysine, 0.20% methionine, 0.50% methionine+ cysteine, 0.54% threonine and 0.24% tryptophan. Also, NRC (1994) recorded the proximate analysis for WB, 88% dry matter, 1300 kcal/kg metabolic energy, 15.4% protein, 3 % ether extract, 11 % crude fiber, 0.26% methionine, 0.32 % cysteine, 0.61 % lysine, 0.14 % calcium, 1.15 % total phosphorus, 0.20 % available phosphorus, 0.48 mg/ kg biotin, 186 mg/ kg niacin, 31 mg/ kg pantothenic acid, 4.6 mg/ kg riboflavin and 14 mg/ kg vitamin E. The WB has been shown to be involved in the regulation of gastrointestinal physiology such as gastric emptying time and intestinal transit rate, which may consequently influence digestive function (De Mora Ruiz-Roso, 2015). Besides, some studies demonstrated that WB plays an important role in metabolism (Liu *et al.*, 2014), feed with high soluble fiber content and low degree of lignification is prone to bacterial degradation and therefore has great influence on bacterial metabolism and production of short-chain fatty acids (SCFAs), such as acetate, propionate, and butyrate (Nyman *et al.*, 1990). In addition, arabinosylan (AX) or arabinosyl oligosaccharides (AXOS) derived from WB has been shown to improve gut health such as gut microbiota, which may in turn improve digestive traits (Akhtar *et al.*, 2012). Dietary fiber supplementation 0.05% arabinosylan-oligosaccharides in wheat-based broiler diets revealed that these AXOS boosted total tract wheat AX digestion in young broilers (Bautil *et al.*, 2020). Also, Sahraei and Shariatmadari (2007) reported that increased feed intake and decreased body weight and body weight gain compared to control when diluted broiler diet with 28% wheat bran (wt:wt). On the other hand, Shang *et al.*, (2020) observed that replacing 30 g WB/kg diet enhanced nutrient digestibility by improving antioxidant status, gizzard development, intestinal digestive enzyme activities and morphology of broilers and concluded that moderate amounts of insoluble dietary fiber can improve nutrient utilization by positively influencing the physiology of the gastrointestinal tract.

Sugar beet pulp (BP) is the solid residue that remains after sugar extracted from sugar beetroots; high-temperature drying of sugar beet increases the concentration of nutrients by 4-5 times compared to the initial raw materials. One kilogram of dry pulp contains 9.7- 11.2 MJ metabolic energy and 102.7 g of protein. Rich in nitrogen-free extractive substances (70.6 %), relatively high in calcium, sodium, magnesium and trace elements (Koschayev *et al.*, 2019). Dried BP, has been used as a partial source of energy in the rations of broiler diets, the effect of BP levels in starter period showed that BP level at 1% was significant on broiler performance (Gonzalez Alvarado *et al.*, 2010). This result agrees with Mateos *et al.*, (2002) who reported that the inclusion of fiber in the diet might benefit nutrient digestibility and growth performance in broilers. Moreover, Gonzalez Alvarado *et al.*, (2007 and 2010) reported that young broiler chicks require minimal amount of fiber in the diet. Their results showed that data obtained during 11-24 days (grower period) indicated that BP level at 3% was the best compared with 3% oat hulls and control. These results supported the findings of Jimenez-Moreno *et al.*, (2009 a and b) showed that using dietary 3% BP recorded the best growth performance compared to the control during period from 1-25 days. Also, the same results were observed during finisher and total periods. These results agree with Koschayev *et al.*, (2019) who replaced 4% of chicken diet with dry BP during 21-41 days of age, and reported positive impact on their productivity, the quality of meat products and economics of production.

Therefore, this study aimed to evaluate using low density feed ingredients sources wheat bran and sugar beet pulp on broiler performance and carcass quality when used diet dilution technique at four levels 2, 3, 4 and 5% (wt:wt) of control standard broiler diets.

## **MATERIALS AND METHODS**

### ***Experimental diets and birds:***

The experiment was undertaken at Poultry Research Farm, Faculty of Agriculture, Cairo university, Egypt during March and April months. Two hundred and seventy unsexed one-day old Arbor Acres broiler chicks were randomly allocated in nine experimental treatments; each treatment contains three replicates of ten chicks each. Control was the 1<sup>st</sup> treatment, the rest 8 treatments divided to two groups of diet dilution (DD) the first group included 2, 3, 4, 5 treatments diluted (wt:wt) with 2, 3, 4 and 5% wheat bran (WB2,

WB3, WB4 and WB5) from the control diets and the second group included treatments 6 to 9 diluted with 2, 3,4 and 5 % sugar beet pulp (BP2, BP3, BP4 and BP5), the design was observed in Table (1).

**Table (1): The experimental design**

Ingredient	Treatment								
	Diet dilution (DD)								
	Control	Wheat bran				Sugar beet pulp			
	1	2	3	4	5	6	7	8	9
	WB2	WB3	WB4	WB5	BP2	BP3	BP4	BP5	
Control diet	100%	98%	97%	96%	95%	98%	97%	96%	95%
Wheat bran	-	2%	3%	4%	5%	-	-	-	-
Sugar beet pulp	-	-	-	-	-	2%	3%	4%	5%

The approximate analysis of fiber fraction for dilution sources (wheat bran and sugar beet pulp) was determined in Regional Center for Food and Feed

The control diets contained the requirements of all nutrients (Table 2), the calculated analysis for 1 % of fiber sources recorded in Table 3 according to (RCFF, 2001), so the reduction in diets nurturance when diluted with different levels of WB were between 0.12 to 0.30 % Crude

**Table (2): Composition and calculated analysis of the experimental control diets.**

Ingredients	Starter	Grower	Finisher
Yellow corn	47.7	54.26	58.20
Soybean meal (46% CP)	24.83	21.10	8.49
Extrude full fat soya (35% CP)	19.36	16.98	22.08
Corn gluten feed 22%	-	-	5.40
Corn gluten meal (60%)	2.00	2.00	2.01
Dried corn diet	2.00	-	-
Soy oil refined	-	1.69	-
Di-Ca Phosphate	1.50	1.40	1.07
Limestone	1.47	1.64	1.56
DL-methionine	0.39	0.18	0.22
NaCl	0.35	0.37	0.38
Vit. & Min. Premix *	0.30	0.30	0.30
Colin chloride (60%)	0.06	0.06	0.06
L lysinehydrochloride	0.40	0.02	0.23
Total	100	100	100
Calculated analysis **			
CP %	22.92	21.19	18.89
ME cal/ kg	3049.39	3169.96	3216.74
CF%	3.86	3.49	3.64
EE%	5.85	7.15	6.72
Ca %	0.912	0.95	0.85
Avi.P%	0.52	0.48	0.41
Lys.%	1.385	1.205	1.45
Meth%	0.80	0.56	0.55
Meth. +Cys.%	1.18	0.902	0.86

\* Premix contain per 3kg vit A 12 000 000 IU, vit D<sub>3</sub> 3300 000 IU, vit E 30 000 mg, vit K<sub>3</sub> 3000mg, vit B1 2200 mg, vit B2 8000 mg, vit B6 4400 mg, vit B12 22 mg, Niacin 66000 mg, Biotin 200 mg, Folic acid 1000 mg, pantothenic acid 12000 mg, Zinc 75 000 mg, Manganese 134 000 mg Iron 100000 mg, Copper 8000 mg, Iodine 480mg, Cobalt 200 mg, Selenium 300 mg and CaCO<sub>3</sub> to 3000 g

\*\* According the Egyptian Regional Center for Food and Feed (RCFF, 2001).

**Table (3): The calculated analysis for 1 % of fiber sources**

Chemical analysis*	wheat bran	sugar beet pulp
CP %	0.15	0.09
ME cal/ kg	14.00	6.46
CF%	0.10	0.20
EE%	0.04	0.001
Ca %	0.001	0.007
Avi.P%	0.003	0.0004
Lys.%	0.006	0.006
Meth%	0.002	0.0001
Meth. +Cys.%	0.005	0.0002

\*According the Egyptian Regional Center for Food and Feed (RCFF, 2001).

protein, 35 to 87.3 kcal/kg metabolic energy, 0.05 to 0.13 % ether extract, 0.02 to 0.04% calcium, 0.003 to 0.01 % available phosphors, 0.02 to 0.04 % lysine, 0.01 to 0.02 % methionine and 0.01 to 0.02 % methionine+ cysteine; and increased crude fiber by 0.13 to 0.32 %. Also, the reduction in diets nurturance when diluted with different levels of BP were between 0.24 to 0.60 % Crude protein, 50 to125 kcal/kg metabolic energy, 0.13 to 0.32 % ether extract, 0.004 to 0.01 % calcium, 0.007 to 0.023% Available phosphors, 0.01 to 0.04 % lysine, 0.01 to 0.04 % methionine and 0.02 to 0.04 % methionine+ cysteine; and increased crude fiber by 0.33 to 0.82 %. The price of experimental diets recorded in Table (4). All chicks were fed on experimental diets *ad libitum* in wire battery cages and received the same management and veterinary procedures during the experimental period (1 - 42 d). Growth performance parameters including live body weight (BW), body weight gain (BWG), feed intake (FI), and feed conversion ratio (FCR) were recorded during feeding phases and the overall experimental period. Rectal temperature and respiratory rate were recorded at the end of experimental.

**Table (4): The price of experimental diets (LE/Ton of final feed).**

Treatment	Starter	Grower	Finisher
Control	7397	7022	6707
WB2	7323	6955	6647
WB3	7286	6922	6617
WB4	7249	6889	6587
WB5	7212	6856	6557
BP2	7293	6925	6617
BP3	7241	6877	6572
BP4	7189	6829	6527
BP5	7137	6781	6482

WB= wheat bran BP= sugar beet pulp

**Carcass measurements:**

At 42 days of age, 4 birds of each treatment were randomly chosen to carry out slaughtering and sample processing procedures. Dressing, abdominal fat, and edible parts (liver, gizzard and heart) as percentages of BW were recorded. Front quarter (breast and wing) and back quarter (thigh and drumstick) cuts weight were recorded. All weights of carcass cuts were calculated as percentage from carcass weight. Intestine length, intestine weight, tibia length and tibia weight were recorded. Intestine index was calculated by the proportions of:

$$\text{Intestine index} = \frac{\text{intestine length (cm)}}{\text{intestine weight (g)}}$$

Blood oxygen saturation % (O<sub>2</sub>) recorded during slaughtering. Blood samples were collected from birds during slaughter for blood oxygen determination of oxygen level using digital blood gas analyzer. Caecum pH was recorded by digital pH- meter. The economical and the relative economical efficiency (REE) were calculated in relation to local market prices at time of the experiment.

**Statistical analysis:**

Data of two sources of DD, wheat bran (WB) and sugar beet pulp (BP) with 4 levels were subjected to two-way analysis of variance to detect the effects of both sources and levels of DD. Also data of the 9 treatments including control were subjected to one-way analysis of variance to detect the differences between them.

Variables showing a significant F-test (p < 0.05) were compared to each other's using Duncan's Multiple Range Test (Duncan, 1955). The statistical procedures were computed using SAS (2001). The models of statistical analysis were:

Two-way analysis:

$$Y_{ijk} = \mu + D_i + L_j + (DL)_{ij} + e_{ijk}$$

Where:

Y<sub>ijk</sub> = Trait measured.

μ = Overall mean.

D<sub>i</sub> = Dilution sources, Wheat bran(BP) or sugar beet pulp dilution (WB).

L<sub>j</sub> = Levels of diet dilution.

DL<sub>ij</sub> = Interaction between sources and levels of diet dilution.

e<sub>ijk</sub> = Experimental error.

One-way analysis:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

Y<sub>ij</sub> = Trait measured.

μ = Overall mean of Y<sub>ij</sub>.

T<sub>i</sub> = Effect of treatment, i = (1,...,9).

e<sub>ij</sub> = Experimental error.

**RESULTS AND DISCUSSION**

**Analysis of fiber fraction:**

Analysis of fiber fraction for dilution sources (wheat bran and sugar beet pulp) are listed in Table (5).

**Table (5): Fiber fraction analyzes for diets and fiber sources.**

Fiber fraction	Wheat bran	Sugar beet pulp
Hemicelluloses	19.90	8.36
Cellulose	5.98	18.02
Lignin	3.14	3.90
Neutral Detergent fiber (NDF)	29.38	31.27
Acid Detergent fiber (ADF)	9.47	22.90
Acid Detergent lignin (ADL)	3.50	4.88

**Growth performance:**

Results in Tables (6 and 7) show the effect of dilution with WB and BP at different levels and their interactions on performance of broilers chicks. Dilution diet with WB significantly recorded higher BW and BWG at end of starter, finisher and overall periods compared BP by 4.3 and 1.1% for starter and finisher BW, and 5.7, 1.5 and 1.1 % for starter, finisher and final BWG, respectively. Also, broiler FCR significantly improved during all phases by dilution with WB except grower phase whereas BP showed better FCR. Stater, finisher and overall period FCR improved by 4.2, 2.5 and 1.3 %, respectively for WB dilution and grower FCR improved by 3.3 % for BP dilution.

**Table (6): Effect of DD using wheat bran or sugar beet pulp at deferent levels on the performance of broilers chicks during starter and grower periods.**

Treatment	Finisher(25- 42 d of age)				Overall period ( at 42 d of age)		
	BW (g)	BWG(g)	FI (g)	FCR	BWG (g)	FI (g)	FCR
Main effect				DD Sources			
Wheat bran	2192.9 <sup>a</sup>	1471.9 <sup>a</sup>	2255.1 <sup>b</sup>	1.54 <sup>b</sup>	2152.9 <sup>a</sup>	3266.1	1.52 <sup>b</sup>
Sugar Beet pulp	2168.7 <sup>b</sup>	1449.7 <sup>b</sup>	2285.0 <sup>a</sup>	1.58 <sup>a</sup>	2128.6 <sup>b</sup>	3271.5	1.54 <sup>a</sup>
Mean of SE	±5.56	±6.10	±8.53	±0.004	±6.04	±9.42	±0.004
Probability	**	*	*	**	**	NS	**
				DD Levels			
2 %	2177.4 <sup>b</sup>	1447.9 <sup>b</sup>	2307.1 <sup>a</sup>	1.59 <sup>a</sup>	2137.0 <sup>b</sup>	3326.3 <sup>a</sup>	1.56 <sup>a</sup>
3%	2161.7 <sup>b</sup>	1410.1 <sup>c</sup>	2223.7 <sup>b</sup>	1.58 <sup>a</sup>	2121.7 <sup>b</sup>	3239.3 <sup>c</sup>	1.53 <sup>b</sup>
4%	2206.3 <sup>a</sup>	1494.7 <sup>a</sup>	2297.3 <sup>a</sup>	1.54 <sup>b</sup>	2166.4 <sup>a</sup>	3279.7 <sup>b</sup>	1.52 <sup>b</sup>
5%	2177.8 <sup>b</sup>	1490.4 <sup>a</sup>	2252.0 <sup>b</sup>	1.52 <sup>c</sup>	2138.1 <sup>b</sup>	3230.0 <sup>c</sup>	1.52 <sup>b</sup>
Mean of SE	±7.87	±8.62	±12.06	±0.01	±8.54	±13.32	±0.01
Probability	**	**	**	**	**	**	**

Treatments

<sup>a-e</sup> = Means in the same raw with different superscripts, differ significantly. DD= diet dilution

BW = Body weight. BWG= Body weight gain. FI= Feed intake. FCR= feed conversion ratio.

WB= wheat bran BP= sugar beet pulp NS: Non-significant \*: P≤0.05. \*\*: P≤0.01. SE: Standard errors.

**Table (7): Effect of DD using wheat bran or sugar beet pulp at deferent levels on the performance of broilers chicks during finisher and overall experimental periods**

Treatment	Carcass			Front quarter (FQ)		Back quarter (BQ)		
	Dressing	Edible Parts	Abdominal fat	Breast	Wing	Total Weight	Thigh Weight	Drums Stick (DS)
Main effect								
				DD Source				
Wheat bran	73.16 <sup>b</sup>	4.22	0.82	20.13 <sup>b</sup>	3.14 <sup>b</sup>	14.50 <sup>b</sup>	9.55	4.95 <sup>b</sup>
Sugar Beet pulp	74.81 <sup>a</sup>	4.17	0.79	21.84 <sup>a</sup>	3.54 <sup>a</sup>	15.50 <sup>a</sup>	9.76	5.74 <sup>a</sup>
Mean of SE	±0.26	±4.22	±0.82	±20.13	±3.14	±14.50	±9.55	±4.95
Probability	**	NS	NS	**	**	**	NS	*
				DD Levels				
2 %	73.16 <sup>b</sup>	3.96	1.06 <sup>a</sup>	21.51 <sup>a</sup>	3.35 <sup>ab</sup>	14.61 <sup>bc</sup>	9.46 <sup>b</sup>	5.15
3%	70.78 <sup>c</sup>	4.19	0.67 <sup>b</sup>	19.34 <sup>b</sup>	3.20 <sup>b</sup>	14.39 <sup>c</sup>	8.82 <sup>c</sup>	5.57
4%	76.35 <sup>a</sup>	4.15	0.99 <sup>a</sup>	21.40 <sup>a</sup>	3.32 <sup>ab</sup>	15.32 <sup>ab</sup>	10.00 <sup>ab</sup>	5.32
5%	75.64 <sup>a</sup>	4.47	0.49 <sup>c</sup>	21.71 <sup>a</sup>	3.50 <sup>a</sup>	15.68 <sup>a</sup>	10.32 <sup>a</sup>	5.35
Mean of SE	±0.37	±0.21	±0.05	±0.35	±0.09	±0.28	±0.21	±0.33
Probability	**	NS	**	**	*	*	**	NS
				Treatments				
Control	71.22 <sup>c</sup>	3.87	1.37 <sup>a</sup>	20.30 <sup>c</sup>	3.03 <sup>d</sup>	14.15 <sup>cd</sup>	9.51 <sup>bcd</sup>	4.65 <sup>b</sup>
WB2%	72.02 <sup>c</sup>	3.94	1.24 <sup>a</sup>	20.54 <sup>bc</sup>	3.13 <sup>bcd</sup>	13.69 <sup>d</sup>	8.70 <sup>d</sup>	4.98 <sup>ab</sup>
WB3%	69.29 <sup>d</sup>	4.09	0.62 <sup>de</sup>	17.25 <sup>d</sup>	2.85 <sup>d</sup>	13.58 <sup>d</sup>	8.70 <sup>d</sup>	4.89 <sup>ab</sup>
WB4%	74.72 <sup>b</sup>	3.98	1.00 <sup>b</sup>	20.57 <sup>bc</sup>	3.07 <sup>cd</sup>	14.64 <sup>bcd</sup>	9.93 <sup>abc</sup>	4.72 <sup>b</sup>
WB5%	76.60 <sup>a</sup>	4.87	0.43 <sup>e</sup>	22.18 <sup>ab</sup>	3.51 <sup>ab</sup>	16.09 <sup>a</sup>	10.87 <sup>a</sup>	5.21 <sup>ab</sup>
BP2%	74.29 <sup>b</sup>	3.98	0.88 <sup>bc</sup>	22.49 <sup>a</sup>	3.58 <sup>a</sup>	15.54 <sup>ab</sup>	10.23 <sup>ab</sup>	5.31 <sup>ab</sup>
BP3%	72.27 <sup>b</sup>	4.29	0.73 <sup>cd</sup>	21.43 <sup>abc</sup>	3.55 <sup>ab</sup>	15.19 <sup>abc</sup>	8.95 <sup>cd</sup>	6.24 <sup>a</sup>
BP4%	77.99 <sup>a</sup>	4.31	0.98 <sup>b</sup>	22.23 <sup>ab</sup>	3.56 <sup>ab</sup>	16.01 <sup>a</sup>	10.08 <sup>ab</sup>	5.93 <sup>ab</sup>
BP5%	74.68 <sup>b</sup>	4.08	0.56 <sup>de</sup>	21.23 <sup>abc</sup>	3.48 <sup>abc</sup>	15.27 <sup>abc</sup>	9.78 <sup>abcd</sup>	5.49 <sup>ab</sup>
Mean of SE	±0.54	±0.30	±0.07	±0.52	±0.14	±0.41	±0.34	±0.44
Probability	**	NS	**	**	**	**	**	*

<sup>a-e</sup> = Means in the same raw with different superscripts, differ significantly. DD= diet dilution. BW = Body weight. BWG= Body weight gain. FI= Feed intake. FCR= feed conversion ratio. WB= wheat bran BP= sugar beet pulp \*: P≤0.05. \*\*: P≤0.01. SE: Standard errors.

The levels of dilution 2, 3, 4 and 5 % affected significantly on broiler BW and BWG during all phases of production. The levels 2, 3 and 4 % of DD improved starter and grower broilers BW and BWG

compared the level of 5 %. But during finisher phase broilers fed DD at 4 %, significant recorded the highest BW and BWG. Also broiler fed DD at 4 % recorded significantly the highest overall BWG. The levels of dilution had no significant effect during starter and grower phases on FI, while broilers fed diet diluted with 2 and 4 % significant increased FI compared with other levels during finisher phase. The highest overall FI significantly recorded by broiler fed diet diluted by 2 % followed by 4% while applying levels of 3 and 5 % DD showed the lowest consumed feed values, respectively.

Among DD levels, during starter phase level 5% DD showed the worst FCR, however, during grower phase, the best value of FCR was recorded by group of 3% of DD. The best FCR during finisher phase recorded by broiler fed DD at 5 % followed by 4 % compared with other levels. Regarding to overall period, levels of DD at 3, 4 and 5 % recorded the best significant FCR compared with level 2 %.

Among all treatments (included control group), broiler fed control, WB3, WB4, BP2 and WB2, respectively showed the highest BW and BWG during starter phase follow by other treatments. The broiler fed BP3 and BP5 significantly recorded the lowest BW and BWG compared control and WB3. On the contrary, during grower period BP3 significant recorded the highest BW and BWG followed by BP2 compared control and BP5. During the grower and final phase WB5 showed the highest BW and BWG compared with all other treatments, followed by WB4 and BP2. The lowest value for BW and BWG recorded by BP5.

The results showed that the worst FCR during starter phase significant recorded by BW5, BP3 and BP5 1.47, 1.48 and 1.48, respectively compared with control. The best FCR significant recorded by WB3 and WB4 1.32 and 1.34, respectively compared with WB5, BP3 and BP5. During grower phase BP3 surpassed and improved FCR (1.41) compared with all treatments and significant compared with control, WB2, WB4 and BP5 (1.54, 1.54, 1.54 and 1.53, respectively). The FCR for broiler fed WB5 significant recorded the best value compared with all treatments during finisher and final phase followed by WB4, BP3, BP2 and BP4 compared control, WB2 and BP5.

These results are in agreement with those reported by Sahraei and Shariatmadari (2007) who showed improving of body weight in different levels of DD at levels 7, 14 or 21 % using WB (wt:wt) compared with control group while level 28% increase feed intake. Also, Shang *et al.*, (2020) reported replacing 30 g WB/kg (3%) diet enhanced nutrient digestibility by improving antioxidant status, gizzard development, intestinal digestive enzyme activities and morphology in broilers. They concluded that wheat bran could be used for improving feed efficiency in broilers. AbouSekken *et al.*, (2013) reported that sugar beet pulp as a source of digestive fibers could be used in broiler diets up to 3% without negative effects on performance and the effect of BP levels in starter period showed that beet pulp level at 1% was significant on broiler performance. This result agrees with Mateos *et al.*, (2002) who reported that the inclusion of fiber in the diet might benefit nutrient digestibility and growth performance in broilers. Moreover, Gonzalez Alvarado *et al.*, (2007 and 2010) reported that young broiler chicks require minimal amount of fiber in the diet. Data obtained during grower period indicated that BP level at 3% was the best compared with 3% oat hulls and control. These results supported the findings of Jimenez-Moreno *et al.*, (2009 a and b) showed that using dietary 3% BP recorded the best growth performance compared to the control during period from 1-25 days. Also, the same results were observed during finisher and total periods. These results agree with Koschayev *et al.*, (2019) who found that replacing chickens diets by 4% of dry BP during 21-41 days has a positive impact on their productivity.

#### ***Carcass quality and morphometric parameters:***

Effects of DD of using WB and BP with different levels and their interactions on broiler carcass quality at 42 days are presented in Table (8). Results recorded significant differences between broilers fed DD with WB compared with BP, the dressing, breast, wing, total weight of BQ and DS % were significantly higher for those fed PB. Increasing levels of DD reflected on increasing dressing percent, the broiler fed 4 and 5 % recorded the higher percent 76.35 and 75.64 %, respectively compared with 2 and 3 % (73.16 and 70.78 %, respectively).

Applying the higher level of dilution 5% decreased the abdominal fat percent by 53.77 % compared with level 2%. However, DD at 2 and 4% showed the higher values of abdominal fat %. Among levels of DD, general reduction of breast meat, wings, BQ and thigh% was observed for level 3% compared with other levels, while levels 4 and 5% showed the highest value of such cuts.

Results of treatments showed significant differences on all carcass traits except edible parts. The broiler fed BP4 and WB5 recorded the highest dressing % compared with all treatments 77.99 and 76.60 %, respectively. While, the lowest value of dressing % recorded by broilers fed WB3 (69.29 %) compared with all treatments. All treatments significantly decreased abdominal fat% compared to control except WB2. The lowest values recorded by WB3, WB5 and BP5 by 45.74, 68.61 and 59.12%, respectively.

While results of breast meat, wings and BQ showed different trend, whereas samples of WB5, BP2 and BP4 recorded significantly highest values compared with other treatments. However, the highest value of DS recorded by broiler fed BP3 compared to control and WB4.

These results agree with Koschayev *et al.*, (2019) recorded that replacing chickens diets by 4% of dry BP has a positive impact on the quality of meat products. AbouSekken *et al.*, (2013) reported that BP as a source of fibers could be used in broiler diets up to 3% without negative effects on carcass characteristics. No significant differences between broiler groups fed experimental dietary BP levels, except the relative weight of gizzard and heart which was significantly increased with release of BP level.

Data of intestine length, intestine index (cm/g), caecum pH, tibia length and weight % as affected by DD using WB and BP at different levels and their interactions at 42 day of age are presented in Table (9). The obtained results indicated no significant effects due to experimental factors on the examined mentioned parameters, however, tibia weight % increased by WB compared to BP (1.27 vs.1.09 %). Among DD levels, 4% showed the lowest value of tibia weight (0.98%), while 3 and 4 % recorded the highest values (1.31 and 1.32 %) compared with levels 5 and 2%, respectively.

Concerning interaction between DD sources and levels, results cleared significant effect on intestine length, intestine index and tibia weight %. The intestine length recorded higher values for WB4, BP2, WB5 compared to others. Broiler fed WB3 and WB4 were showed significantly the highest intestine index compared to WB2. Treatments WB4, WB5 and BP2 showed increased values of both intestine length and intestine index. In addition, WB5 recorded the highest value of tibia weight (1.67%) compared with most of treatments including control group. While groups of WB4, BP4 and BP5 recorded the lowest value (0.98%). The obtained results of caecum pH for main factors and treatments showed nonsignificant effect. While BP4 showed the higher numerical value (6.4) followed by BP4(6.03) and control (6.08). The rest of treatments ranged between 5.33 to 5.75. Values recorded by WB4 and WB5 showed the lowest numerical values of caecum pH (5.33 and 5.4, respectively).

**Table (8): Effect of wheat bran and sugar beet pulp with deferent levels on some carcass parameters of broiler chicks at 42 days of age.**

Treatment	Carcass			Front quarter (FQ)		Back quarter (BQ)		
	Dressing	Edible Parts	Abdominal fat	Breast	Wing	Total Weight	Thigh Weight	Drums Stick (DS)
Main effect								
DD Sources								
Wheat bran								
Sugar Beet pulp	73.16 <sup>b</sup>	4.22	0.82	20.13 <sup>b</sup>	3.14 <sup>b</sup>	14.50 <sup>b</sup>	9.55	4.95 <sup>b</sup>
Mean of SE	74.81 <sup>a</sup>	4.17	0.79	21.84 <sup>a</sup>	3.54 <sup>a</sup>	15.50 <sup>a</sup>	9.76	5.74 <sup>a</sup>
Probability	±0.26	±4.22	±0.82	±20.13	±3.14	±14.50	±9.55	±4.95
	**	NS	NS	**	**	**	NS	*
DD Levels								
2 %	73.16 <sup>b</sup>	3.96	1.06 <sup>a</sup>	21.51 <sup>a</sup>	3.35 <sup>ab</sup>	14.61 <sup>bc</sup>	9.46 <sup>b</sup>	5.15
3%	70.78 <sup>c</sup>	4.19	0.67 <sup>b</sup>	19.34 <sup>b</sup>	3.20 <sup>b</sup>	14.39 <sup>c</sup>	8.82 <sup>c</sup>	5.57
4%	76.35 <sup>a</sup>	4.15	0.99 <sup>a</sup>	21.40 <sup>a</sup>	3.32 <sup>ab</sup>	15.32 <sup>ab</sup>	10.00 <sup>ab</sup>	5.32
5%	75.64 <sup>a</sup>	4.47	0.49 <sup>c</sup>	21.71 <sup>a</sup>	3.50 <sup>a</sup>	15.68 <sup>a</sup>	10.32 <sup>a</sup>	5.35
Mean of SE	±0.37	±0.21	±0.05	±0.35	±0.09	±0.28	±0.21	±0.33
Probability	**	NS	**	**	*	*	**	NS
Treatments								
Control	71.22 <sup>c</sup>	3.87	1.37 <sup>a</sup>	20.30 <sup>c</sup>	3.03 <sup>d</sup>	14.15 <sup>cd</sup>	9.51 <sup>bcd</sup>	4.65 <sup>b</sup>
WB2%	72.02 <sup>c</sup>	3.94	1.24 <sup>a</sup>	20.54 <sup>bc</sup>	3.13 <sup>bcd</sup>	13.69 <sup>d</sup>	8.70 <sup>d</sup>	4.98 <sup>ab</sup>
WB3%	69.29 <sup>d</sup>	4.09	0.62 <sup>de</sup>	17.25 <sup>d</sup>	2.85 <sup>d</sup>	13.58 <sup>d</sup>	8.70 <sup>d</sup>	4.89 <sup>ab</sup>
WB4%	74.72 <sup>b</sup>	3.98	1.00 <sup>b</sup>	20.57 <sup>bc</sup>	3.07 <sup>cd</sup>	14.64 <sup>bcd</sup>	9.93 <sup>abc</sup>	4.72 <sup>b</sup>
WB5%	76.60 <sup>a</sup>	4.87	0.43 <sup>e</sup>	22.18 <sup>ab</sup>	3.51 <sup>ab</sup>	16.09 <sup>a</sup>	10.87 <sup>a</sup>	5.21 <sup>ab</sup>
BP2%	74.29 <sup>b</sup>	3.98	0.88 <sup>bc</sup>	22.49 <sup>a</sup>	3.58 <sup>a</sup>	15.54 <sup>ab</sup>	10.23 <sup>ab</sup>	5.31 <sup>ab</sup>
BP3%	72.27 <sup>b</sup>	4.29	0.73 <sup>cd</sup>	21.43 <sup>abc</sup>	3.55 <sup>ab</sup>	15.19 <sup>abc</sup>	8.95 <sup>cd</sup>	6.24 <sup>a</sup>
BP4%	77.99 <sup>a</sup>	4.31	0.98 <sup>b</sup>	22.23 <sup>ab</sup>	3.56 <sup>ab</sup>	16.01 <sup>a</sup>	10.08 <sup>ab</sup>	5.93 <sup>ab</sup>
BP5%	74.68 <sup>b</sup>	4.08	0.56 <sup>de</sup>	21.23 <sup>abc</sup>	3.48 <sup>abc</sup>	15.27 <sup>abc</sup>	9.78 <sup>abcd</sup>	5.49 <sup>ab</sup>
Mean of SE	±0.54	±0.30	±0.07	±0.52	±0.14	±0.41	±0.34	±0.44
Probability	**	NS	**	**	**	**	**	*

<sup>a-d</sup> = Means in the same column with different superscripts, differ significantly. DD= diet dilution

WB= wheat bran BP= sugar beet pulp NS: Non-significant \*: P≤0.05. \*\*: P≤0.01. SE: Standard errors.



Generally, the results showed healthy impact of applying DD to broiler diets on intestine and bone characterization. Birds of WB4 and WB5 showed healthy indicators of intestine as intestine length and intestine index had increased combined with numerical reduction in caecum pH. These results confirmed the previous reports by Shang *et al.*, (2020) and Vermeulen *et al.*(2017). Shang *et al.*, (2020) reported WB supplementation (30g/kg) in broilers diet the relative length of small intestine did not significantly vary with any of the dietary treatments. Also, Vermeulen *et al.* (2017) observed that fine wheat bran addition can improve colonization by lactate and butyrate producing microbiota. Subsequently fermentation by the microbiota in the chicken's gastrointestinal tract (GIT) can then even lead to a beneficial impact. The different segments of the chicken's GIT are characterized and colonized by a diverse and complex set of microorganisms, which strongly impact nutrient uptake and utilization, GIT development, physiology and immunity, and invasion of GIT pathogens (Apajalahti *et al.*, 2007; Pan and Yu, 2014 and Rehman *et al.*, 2007). The better tibia length and weight recorded by WB5 may be due to the high content of WB from available phosphorus (0.6%) which support bone quality.

**Table (9): Effect of wheat bran and sugar beet pulp with deferent levels on some Intestine and bone measurements of broiler chicks at 42 days of age.**

Treatment	Intestine		Caecum pH	Tibia	
	Length (cm)	Index		Length (cm)	Weight %
Main effect					
DD Sources					
Wheat bran	198.92	1.46	5.54	10.37	1.27 <sup>a</sup>
Sugar Beet pulp	198.00	1.41	5.93	10.12	1.09 <sup>b</sup>
Mean of SE	±198.92	±1.41	±0.23	±10.37	±1.27
Probability	NS	NS	NS	NS	*
DD Levels					
2 %	198.17	1.37	6.07	10.50	1.11 <sup>ab</sup>
3%	195.83	1.44	5.62	10.33	1.31 <sup>a</sup>
4%	198.67	1.53	5.68	10.00	0.98 <sup>b</sup>
5%	201.17	1.40	5.57	10.17	1.32 <sup>a</sup>
Mean of SE	±3.51	±0.05	±0.33	±0.41	±0.08
Probability	NS	NS	NS	NS	*
Treatments					
Control	191.33 <sup>bcd</sup>	1.52 <sup>ab</sup>	6.08	10.07	1.08 <sup>b</sup>
WB2%	180.66 <sup>d</sup>	1.27 <sup>b</sup>	5.75	11.33	1.11 <sup>b</sup>
WB3%	197.66 <sup>bc</sup>	1.54 <sup>a</sup>	5.68	9.83	1.33 <sup>ab</sup>
WB4%	213.66 <sup>a</sup>	1.55 <sup>a</sup>	5.33	10.00	0.98 <sup>b</sup>
WB5%	203.66 <sup>ab</sup>	1.46 <sup>ab</sup>	5.40	10.33	1.67 <sup>a</sup>
BP2%	215.66 <sup>a</sup>	1.47 <sup>ab</sup>	6.40	9.67	1.11 <sup>b</sup>
BP3%	194.00 <sup>bcd</sup>	1.34 <sup>ab</sup>	5.57	10.83	1.29 <sup>ab</sup>
BP4%	183.66 <sup>cd</sup>	1.50 <sup>ab</sup>	6.03	10.00	0.98 <sup>b</sup>
BP5%	198.66 <sup>bc</sup>	1.34 <sup>ab</sup>	5.73	10.00	0.98 <sup>b</sup>
Mean of SE	±4.73	±0.07	±0.44	±0.54	±0.12
Probability	**	*	NS	NS	*

<sup>a-d</sup> = Means in the same colum with different superscripts, differ significantly. WB= wheat bran BP= sugar beet pulp NS: Non-significant DD= diet dilution. \*: P≤ 0.05. \*\*: P≤ 0.01. SE: Standard errors.

Regarding to BP, BP3 showed combined indicators of intestine health and bone quality. This support results by AbouSekken *et al.*, (2013) showed that length and total counts of microflora in ceca significantly increased with the highest level of BP up to 5%. Diao *et al.*, (2020) feeding a high-fiber diet (5.74% CF, obtained from BP as 25% from diets) to pigs exerted beneficial effects by improving the intestinal health of growing pigs. The beet pulp group had a higher weight of the whole intestine and small intestine, higher density of the whole intestine and large intestine, and longer length of the large intestine than the control group. Bautil *et al.*, (2019) concluded that , depending on the dietary ingredients and the age of broilers, microbiota will contribute differently to fiber degradation and fermentation. Hence, nutritional intervention strategies need to take into account and encourage the age-related and diet-adapted fiber degrading potential of the intestinal microbiota. Stimulating the microbial hydrolysis and fermentation capacity of dietary arabinoxylan substrates at young broiler ages. Older broilers compared to younger chicks will better perform on NSP-rich diets, due to a decrease in their susceptibility

towards the anti-nutritional factors of dietary NSP. Furthermore, the establishment of a mature intestinal microbiome and a fully developed GIT at later ages further enhances the digestibility of NSP-rich diets towards slaughter age (Batal and Parsons, 2002; Noy and Sklan, 2002; Masey O'Neill *et al.*, 2012 and Lee *et al.*, 2017).

It could be concluded that using low density feed ingredients during starting and growing periods could enhance the final marketed weight throw its effect on intestine health and GIT capacity. Using DD material which contains good levels of minerals (like WB), has better opportunity to support mineralization of bones during early stages and this help to enhance muscles growth during finisher phase.

**Stress indicators:**

The effect of DD of using WB and BP at different levels and their interactions on respiration rates (RR), rectal temperature(RT) and blood oxygen saturation % (O<sub>2</sub>) presented in Table (10). The results showed that no significant effects of DD source on the examined parameters except RR, the DD using BP significantly higher than WB (63.3 vs 59.5). Whoever, their levels had a significant effect on RT and O<sub>2</sub> %. The broiler which subjected to 4% DD recorded significantly the lowest value of RT (40.63°C) compared with other levels (41.33°C). Also, the broiler which subjected to 5% and 2% DD showed increased level of blood oxygen saturation % (78.44 and 75.39, respectively).

Among experimental treatments, all treatments decreased RT significantly compared to control. Both BP4 and WB4 recorded the lowest RT 40.6 and 40.7 °C, respectively compared to other treatments. Also, WB3, WB4 and WB5 decreased RR significantly compared with control. The lowest value recorded by WB5 (57.0) compared to other treatment, followed by WB4

**Table (10): Effect of wheat bran and sugar beet pulp with deferent levels on Respiration rates, rectal temperature and blood oxygen of broilers chicks.**

Treatment	RT (°C)	RR (No. times of breath/ bird/min)	O <sub>2</sub> (%)
Main effect	Fibers		
Wheat bran	41.2	59.5 <sup>b</sup>	73.8
Sugar Beet pulp	41.1	63.3 <sup>a</sup>	75.5
Mean of SE	±0.1	±0.8	±1.1
Probability	NS	*	NS
		Levels	
2 %	41.3 <sup>a</sup>	63.6	75.4 <sup>a</sup>
3%	41.3 <sup>a</sup>	61.1	70.2 <sup>b</sup>
4%	40.6 <sup>b</sup>	60.5	74.4 <sup>ab</sup>
5%	41.3 <sup>a</sup>	60.4	78.4 <sup>a</sup>
Mean of SE	±0.1	±1.2	±1.5
Probability	**	NS	**
		Treatments	
Control	42.9 <sup>a</sup>	66.7 <sup>a</sup>	64.4 <sup>d</sup>
WB2%	41.3 <sup>b</sup>	63.9 <sup>ab</sup>	73.9 <sup>bc</sup>
WB3%	41.5 <sup>b</sup>	58.7 <sup>bcd</sup>	67.5 <sup>cd</sup>
WB4%	40.7 <sup>cd</sup>	58.4 <sup>cd</sup>	72.6 <sup>bc</sup>
WB5%	41.4 <sup>b</sup>	57.0 <sup>d</sup>	81.1 <sup>a</sup>
BP2%	41.3 <sup>b</sup>	63.2 <sup>abc</sup>	76.8 <sup>ab</sup>
BP3%	41.2 <sup>cb</sup>	63.4 <sup>abc</sup>	72.9 <sup>bc</sup>
BP4%	40.6 <sup>d</sup>	62.6 <sup>abc</sup>	76.2 <sup>ab</sup>
BP5%	41.2 <sup>bc</sup>	63.8 <sup>ab</sup>	75.8 <sup>ab</sup>
Mean of SE	±0.2	±1.6	±2.1
Probability	**	**	**

<sup>a-d</sup> = Means in the same colum with different superscripts, differ significantly.

WB= wheat bran BP= sugar beet pulp RR= Respiration rates RT= Rectal Temperature O<sub>2</sub> = blood oxygen , NS: Non-significant \*\*: P≤0.01. SE: Standard errors.

and WB3 recorded 58.4 and 58.7, respectively which were significantly lower compared control. The rest treatments recorded insignificant lower value compared control. On the other hand, all experimental treatments increased blood O<sub>2</sub> significantly compared to control except WB3 which showed numerical (nonsignificant) increase, while the highest value was recorded by WB5 (81.1) compared to other treatments.

It is clear that the insignificant change of RR, increased blood O<sub>2</sub>, and decreased RT are healthy indicators of the effect of experimental treatments on broiler detected physiological parameters.

All recorded RT were in the normal range according to report of Robertshaw (2004) who showed that the normal rectal temperatures in chickens have a range from 40.6 to 43.0°C. While Elson (1995) reported cloacal temperatures of 41 and 42°C for broilers, comfort conditions. Hypoxia occurs as a result of diminished partial pressure of oxygen, such as occurs with increasing altitude, or reduced oxygen percentage in the air capillaries of the lung (Druyan, 2012). Also, oxygen blood records were in the same range which recorded by Elmenawey *et al.*, (2020) from 74 to 86 %.

**Economic efficiency:**

The effect of experimental diets on economic efficiency (EE) of broiler production is presented in (Table 11). The calculation based on the price of raw materials in Egyptian market, and the fixed cost and price of one Kg live weight was calculated as annual averages 19 and 21 LE, respectively. The obtained results showed that only WB2 group gained lower EE relative to control EE (97.43), while all treatments improve the relative economic efficiency (REE) of production and the highest REE value recorded by WB5 (245.81). Although, BP5 showed the lower feed cost/bird, the REE (107.03) was decreased as a result of decreased final BW compared with other treatments. The improving in REE by using DD with WB compared BP especially in higher levels 4 and 5% may be due to the WB having a higher nutritional content and lower fiber content in relation to BP.

**Table (11): Effect of experimental treatments on economic efficiency of broiler production**

Treatment	BW	Feed cost/B	Fixed cost/B	Feed cost/kg BW	Relative FC/kg BW	Revenue / Bird	Net Revenue (Profit)L.E	EE	REE
Control	2110	22.25	19	10.55	100	44.3	3.05	7.40	100
WB2	2094	22.04	19	10.53	99.8	44.0	2.96	7.21	97.43
WB3	2152	21.96	19	10.20	96.7	45.2	4.24	10.35	139.86
WB4	2227	21.96	19	9.86	93.5	46.8	5.84	14.26	192.70
WB5	2296	21.80	19	9.49	90.0	48.2	7.42	18.19	245.81
BP2	2260	22.84	19	10.10	95.8	47.5	5.66	13.53	182.84
BP3	2171	21.52	19	9.91	94.0	45.6	5.08	12.54	169.46
BP4	2184	21.78	19	9.97	94.5	45.9	5.12	12.55	169.59
BP5	2058	21.03	19	10.22	96.9	43.2	3.17	7.92	107.03

WB= wheat bran BP= sugar beet pulp B = bird BW = body weight

Total price for feeds was calculated according to the price of different ingredients available in ARE., Price of one Kg live weight was 21LE, <sup>1</sup>Net Revenue= total revenue/ chick- total feed cost/chicks,

<sup>2</sup>Economical efficiency= net revenue/ total feed cost/chicks, <sup>3</sup>Relative economic efficiency (REE) of the control, assuming that the relative EE of the control =100 %

This results agree with Koschayev *et al.*, (2019) using in 21-41 days, chicken diets replacing by 4% of dry BP has reduced the feed costs per unit which leads to an increase in profitability by 4.7%. AbouSekken *et al.*, (2013) indicated that dietary the net revenue by increasing dietary BP up to 3%.

**CONCLUSION**

In conclusion dilution broiler diet with wheat bran at 3, 4 and 5% and sugar beet pulp at 2, 3 and 4 % improve growth performance, carcass quality, intestine index, economic efficiency, feed coast and REE. Among examined levels the best results recorded by applying 5%WB and 4%BP.

It could be recommended WB5% and BP 4% were the best enhancer DD treatment of broilers according to the obtained results.

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## تقييم تخفيف العليقة بمصادر ومستويات مختلفه علي الأداء الانتاجي وجودة الذبيحة لكتاكيت التسمين.

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تهدف الدراسة الي تقييم تأثير استخدام نخالة القمح (WB) وتفل بنجر السكر (BP) كمصادر علييه قليلة الكثافة علي أداء دجاج التسمين وجودة الذبيحة . تم تقييم كلا منهم باستخدام تقنية تخفيف العليقه (DD) بمستويات مختلفة . تم استخدام 270 كتكوت لحم أربو ايكز عمر يوم وتم توزيعهم عشوائي علي تسع معاملات كل منها تحتوي علي 3 مكررات بكل منها 10 كتاكيت . تم تقسيمهم الي 9 معاملات مجموعة الكنترول وهي المعاملة الاولى وباقي المعاملات الثمانية تم تقسيمهم الي مجموعتين من التخفيف (DD) المجموعة الاولى تضم المعاملات 2 و 3 و 4 و 5 تخفيف بنخالة القمح بنسبة 2% و 3% و 4% و 5% (WB2, WB3, WB4 and WB5) والمجموعة الثانية تضم المعاملات 6 و 7 و 8 و 9 تخفيف بتفل البنجر بنسبة 2% و 3% و 4% و 5% (BP2, BP3, BP4 and BP5).

أظهرت النتائج ان التخفيف بنخالة القمح خلال مراحل البادي والناهي والمتوسط النهائي للفترة حقق فرق معنوي في وزن الجسم ووزن الجسم المكتسب و حسن معدل التحويل الغذائي. وأثرت نسب التخفيف معنويا علي وزن الجسم ووزن الجسم المكتسب خلال كل المراحل. حققت WB5 خلال كل المعاملات أعلى وزن جسم ووزن جسم المكتسب بالمقارنة بباقي المعاملات. أعطت للطيور التي تغذت علي WB5 أحسن قيمة لمعدل التحويل الغذائي بالمقارنة بكل المعاملات خلال مرحلة الناهي والمتوسط النهائي للفترة. حققت الطيور المغذاه علي عليقة مخففه بتفل البنجر أعلى وزن للذبيحة ووزن الصدر و الجناح والديوس بالمقارنة بنخالة القمح . أدي استخدام المستوى العاليي من التخفيف 5% الي انخفاض نسبة دهن البطن. أظهر التداخل بين التخفيف ومستوياته إختلاف معنوي في كل قياسات الذبيحة ماعدا وزن الاجزاء المأكولة. سجلت الطيور المغذاه علي WB5 و BP4 اعلي وزن للذبيحة مقارنة بباقي المعاملات . كان التداخل بين التخفيف ومستوياته له تأثير معنوي واضح علي طول الامعاء و دليل الامعاء ووزن التيبيا. خفض استخدام التخفيف بنخالة القمح معنويا معدل التنفس بالمقارنة بتفل البنجر. كانت مستويات التخفيف لها تأثير علي درجة حرارة المستقيم واكسجين الدم. كان التداخل بين التخفيف بمصادر مختلفه ومستوياتها له تأثير مفيد علي الطيور عن طريق تقليل درجة حرارة المستقيم و معدل التنفس وزيادة نسبة الاكسجين في الدم. حسنت كل المعاملات من الكفاءة الاقتصادية النسبية ما عدا WB2 وكانت احسن كفاءه إقتصادية نسبياه سجلته المعاملة المخففه بنخالة القمح بنسبة 5% (WB5).

نستخلص من ذلك ان تخفيف علائق الدواجن بنخالة القمح بنسبة 3 و 4 و 5% وتفل البنجر بنسبة 2 و 3 و 4% كان له تأثير مفيد علي الأداء الإنتاجي وجودة الذبيحة ودليل الامعاء وتكلفة العليقه والكفاءه الإقتصادية النسبية. كانت أحسن المعاملات بالمقارنة بباقي المعاملات هما معاملة التخفيف بمستوى 4% لتفل البنجر ومعاملة التخفيف بمستوي 5% لنخالة القمح.