

## IMPACT OF NEWSPAPER AS BEDDING MATERIAL IN ARID LAND ON BROILER PERFORMANCE

By

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**Abstract:** *Two experiments were carried out to investigate the effect of using new and reused bedding materials on broiler performances. First experiment was conducted from 1 to 42 days of age, using seven hundred and twenty one day-old broiler chicks (Ross). Chicks were distributed to six treatments (four replicates for each). One hundred and twenty chicks were allocated for each treatment (30 birds for each replicates) in a completely randomized design. The six bedding materials were; shaving woods, barley straw, newspaper, 1:1 shaving woods + barley straw, 1:1 shaving woods + newspaper and 1:1 barley straw + newspaper, respectively. Second experiment was performed on reused bedding, which used in the first experiment, during the finishing period (28 to 42 days of age). Same protocol design and numbers of birds as in first experiment were followed in the second experiment.*

*The results indicated that broilers grown on shaving woods + barley straw and shaving woods + newspaper had significantly the highest body weight (BW), as well as body weight gain (BWG). In addition, same treated broilers consumed the highest amount of feed (F1), and recorded the best feed conversion ratios (FCR). Relative carcass and glands weights were not affected. However, relative full and empty gizzard, intestine and caeca weights and lengths as well as of broiler chicks were significantly influenced by different bedding materials. Newspaper and shaving woods + newspaper litters retained the highest percentages of moisture.*

*Reused of bedding materials had insignificant effect on final BW. Broiler grown on reused shaving woods + newspaper and barley straw + newspaper litters had the highest significant BWG and F1 and they recorded the best FCR. Broilers grown on reused barley straw + newspaper and shaving woods + barley straw litters had the highest significant relatives carcass weight. The highest significant relative full and empty gizzard weights, intestine and caeca weight and length were recorded for the broiler raised on reused barley straw + newspaper. Relative weights of glands (bursa of fabricius, adrenal and thyroid) were not significantly affected by reused bedding materials. The highest moisture percentage was recorded for reused newspaper litter.*

*In conclusion, newspaper can be used as bedding materials for rearing broiler during grown and finisher periods in arid land such as Saudi Arabia. Using mixture of newspaper and shaving woods or barley straw as bedding materials in broiler house improved the broiler performances and litter characteristics as well as good impact on environmental condition.*

**Keywords:** Newspaper, bedding, litter, broiler, performance

### INTRODUCTION

Bedding materials for broiler production have been selected based mostly

on their capacity to absorb water, density, low cost, absence of toxicity to the birds

(Ezzat, 2001). Shaving wood and sawdust are the most common materials used as litter in commercial broiler production in many areas. Low supplies, high cost, and unavailability of suitable materials have encouraged the search for alternative litter materials. Sami (2000), Lacy (2002) and Abd El-Maty (2005) reported that a good mattress should be characterized by light weight, medium-sized, good absorption property, fast drought, soft and easy to compress, a weak of conductivity of heat, absorbs the least amount of the air moisture, lower price and acceptable for use as fertilizer. However, many alternatives local materials could replace the wood sawdust, such as, softwood chipping fines (Parsons and Baker, 1985), rice hulls (Malone *et al.*, 1990), hardwood bark (Brake *et al.*, 1992), straw (Hermes, 1996), rice and wheat straw (Benabdeljelil and Ayachi, 1996), leaves (Willis *et al.*, 1997), peanut hulls (Lien *et al.*, 1998), rice hull ash (Chamblee and Yeatman, 2003) refused tea (Atapattu and Wickramasinghe, 2007), and ground corncob, chopped corn stalk and soybean straw (De Avila *et al.*, 2008). Some studies have included the re-use paper materials such as newsprint bounced chopped or sliced as alternative material for the litters, although some paper products are high in content of moisture (Lien *et al.*, 1992, Burke *et al.*, 1993, Malone and Gedamu, 1995 and Toghiani *et al.*, 2008).

Many studies in which alternative materials were tested have reported that the type of litter material used does not affect body weight (Lien *et al.*, 1992, Burke *et al.*, 1993, Grimes *et al.*, 2006 and De Avila *et al.*, 2008). On the other hand, Lien *et al.*, (1992) demonstrated that litter type affects the content of litter bacteria, therefore may indirectly affect body weight and immune system of broiler chicks. Bedding type can significantly affect growth performance and carcass quality of broilers (Malone *et al.*, 1983 and Billgilli *et al.*, 1999b). However, Toghiani *et al.* (2010) reported

that litter materials had no significant influence on feed conversion, carcass yield, abdominal fat, gizzard, intestine, ceca and lymphoid percentage.

There are trends of multi-use of bedding and re-brush and cleaning bird houses after several successive sessions of the herds. Taylor *et al.* (2008) reported that age of litter and birds affected the properties of litter and the emission of nitrogen and production. Also, they concluded that the properties of litter and the distribution of nitrogen inside the bird's house due to using the new litter mattress or the re-use do not differ according to the use of rice hulls and sawdust, as well as broiler performance. El-Sheikh *et al.* (2005) found that raising broiler chicks on a new mattress has led to an increase in body weight at the age of 3 weeks, while there was no significant difference in body weight at marketing age (42 days).

The aim of this study was to investigate the effect of using new and re-used newspaper, shaving woods and barley straw bedding materials and there mixtures on broiler performance in arid land.

## MATERIALS AND METHODS

Two experiments were carried out at Hada Elsham experimental station, King Abdul Aziz University, Saudi Arabia. The first trail aimed to study the broiler performance grown on new bedding materials from 1 to 42 days of age while the goal of the second trail was to study the broiler performance raised on re-used bedding, which had been used in the first experiment, during the finishing period (28 to 42 days of age),

### First experiment:

Seven hundred and twenty one day-old broiler chicks (Ross) were allocated to six treatments (four replicates each), from 1 to 42 days. Each 120 chicks were allocated for every treatment (30 birds replicates) in a

completely randomized design. Housing floor was divided into squares (boxes), each square has 2x2 m; each four boxes (replicates) represented one treatment. The bedding materials of treatments were: shaving woods, barley straw, newspaper, 1:1 shaving woods + barley straw, 1:1 shaving woods + newspaper and 1:1 barley straw + newspaper, respectively, where 4 kg from each bedding materials/m<sup>2</sup> were used. Feed (Table, 1) and water were provided *ad-libitum* throughout the growing and finishing periods. The lighting program, vaccination and health care program were performed according to animal welfare protocol.

### Second experiment:

Similar chick's numbers and treatments design was used as in the first experiment one except re-used bedding materials of the first experiment during the finishing period (28 to 42 day of age). Top-dressing method was applied for that, in which a thin layer of new and clean litter material of the same litter treatment spread over the top of previously used litter prior to placement of a new flock. This style of litter management has only been mentioned briefly as background information in other studies and reviews (Malone *et al.*, 1992, Worley *et al.*, 1999 and National Research Council, 2003).

During both experiments, body weight (BW), body weight gain (BWG), feed intake (FI) and feed conversion ratio (FCR) were calculated weekly. Also, the proportions of the bedding (nitrogen and moisture percentages, the pH value) were measured.

At the end of both experiment (42 days of age), 5 broiler chicks from each treatment were selected around mean average body weight of treatment and slaughtered for carcass evaluation among treatments. Carcasses were eviscerated and head and shank were removed, gizzard, intestine, ceca and spleen were dissected from the viscera and weighed. Each portion was expressed as a percentage of life body weight.

Data were statistically analyzed according to SAS program (SAS, 2004) using GLM procedure. Mean differences were tested by Duncan's New Multiple Range Test (Duncan's, 1955).

## RESULTS AND DISCUSSION

### Growth Performance:

Broiler performance at the end of the experiment (42 day-old) was affected significantly ( $P \leq 0.01$ ) by different bedding materials (Table, 2). Broilers grow on shaving woods + barley straw and shaving woods + newspaper litters had the highest BW and BWG. However, those grew on shaving woods litter alone had the lowest BW and BWG. These results agreed with those of Malone *et al.*, 1983 and Billgilli *et al.*, 1999b, who observed that bedding type can significantly affect growth performance. Also, Toghiani *et al.* (2010) indicated that body weight of broilers at 42 days was significantly ( $P \leq 0.05$ ) affected by litter type. On the other hand, several studies conducted by Brake *et al.* (1992), Lien *et al.* (1992) and Wyatt and Goodman (1992) indicated that the performance of birds were not affected by different types of bedding (recycled paper, pine shavings, refined gypsum and hard wood bark).

In experiment two, performance of broiler grown during the finisher period (28-42 days of age) are summarized in Table 3. Final BW was insignificantly affected due to different re-used bedding materials. However, BWG was significantly ( $P \leq 0.01$ ) affected, by different reused bedding materials and those grew on re-used shaving woods + newspaper and barley straw + newspaper litters had the highest BWG while those grown on re-used newspaper litter had the lowest BWG. The present results agreed with Coufal *et al.* (2006a) who reported that there were insignificant differences in broiler BW between control and top-dressed treatments for all other flocks.

Results of feed consumption and feed conversion of the first experiment are presented in (Table. 2). Broilers grown on shaving woods + barley straw and shaving woods + newspaper litters consumed the highest significant ( $P \leq 0.01$ ) amount of feed, followed by those grown on barley straw litter. Feed conversion ratios were significantly ( $P \leq 0.01$ ) affected by bedding materials, since broilers raised on shaving woods + barley straw and shaving woods + newspaper litters had the best FCR (2.06 and 2.04, respectively). Our results may be due to the type of litter, age of birds and the experimental conditions. Tasistro *et al.* (2007) pointed out that there were no statistical differences in feed conversion ratio and mortality between each of the soft and coarse sawdust. Also, Toghyani *et al.* (2010) reported that the feed conversion and mortality of broilers were not affected by litter type.

Broilers chicks of the second experiment raised on re-used shaving woods + newspaper and barley straw + newspaper litters consumed the higher amount of feed and in the same times they recorded the best FCR. On the other hand, Coufal *et al.* (2006a) observed that feed conversion was not differed among treatments within nine consecutive flocks.

### **Carcass Yields:**

The results presented in Table (2) indicated that relative carcass weight was not significantly affected, while the other relative slaughter weights were significantly ( $P \leq 0.01$ ) influenced by litter types studied. Broilers raised on shaving woods and shaving woods + newspaper litters had the highest relatives full and empty gizzard and the lowest relative weight was recorded for those raised on barley straw litter. Broilers grew on barley straw, newspaper, shaving woods + barley straw and shaving woods + newspaper litters had the highest relative intestine and ceca weight and length while; the lowest was recorded for those grown on shaving woods

and barley straw + newspaper litters Table (3). The same results were obtained by Billgilli *et al.* (1999a) who observed that the quality of the carcass was not affected by bedding materials (sand and sawdust). Also, they reported that birds reared on pine shavings had higher clean gizzard weights and gizzard contents. Tasistro *et al.* (2007) reported that different types of bedding had no significant differences on the dressing percentage, liver, gizzard or broiler health. Alkis and Celen, (2009) observed that different bedding materials had no significant effect on the broiler breast, thighs, neck, heart and fat percentages.

Results of the second experiment showed that broilers raised on re-used barley straw and shaving woods + barley straw litters had the highest significant ( $P \leq 0.01$ ) relatives carcass weights, while broiler grew on other re-used bedding materials were equals and recorded the lowest significant relatives carcass weights. The highest significant relative full and empty gizzard weights were recorded for the broiler grew on reused barley straw + newspaper. Furthermore, the lowest relative weights were recorded for those grew on reused shaving woods + barley straw litter. Broilers grew on re-used barley straw + newspaper litter had the highest relative intestine and ceca weight and length, while the lowest relative intestine weight and length were recorded for those grown on reused newspaper litter. However, previous researchers demonstrated that different bedding materials had no effect on carcass, dressing and organs percentages (Billgilli *et al.* 1999a, Tasistro *et al.*, 2007, Alkis and Celen, 2009 and Toghyani *et al.*, 2010). Billgilli *et al.* (1999a) reported that birds reared on pine shavings had higher clean gizzard weights and gizzard contents. On the other hand, Toghyani *et al.* (2010) indicated that the percentage of proventriculus to live weight was significantly affected by litter type.

Relative weights of glands (bursa of fabricius, adrenal, and thyroid) were not

significantly affected by bedding materials in both experiments (Tables 2 and 3). These results were on line with results of Toghiani *et al.* (2010) who reported that the percentages of lymphoid organs (spleen and bursa of fabricius) of live weight were not significantly affected by litter type.

### Bedding Characteristics

Table (2) summarized some bedding characteristics which used as a litter for broilers. The pH value and moisture and nitrogen percentages for fresh litters were significantly different among different bedding materials.

The percentage of moisture for newspaper and shaving woods + newspaper litters recorded highest significant ( $P \leq 0.01$ ) percentages. Also, it seems that the newspaper litter tends to the formation of many clusters of brush. The lowest moisture percentage was measured in shaving woods + barely straw and barley straw litters. Increasing the moisture content of newspaper and shaving woods + newspaper litters may be due to the holding capacity characteristics. On the other hand, the decreased moisture content of barley straw may be due to the higher content of cellulose Elwinger and Svensson (1996) reported that, the dry matter content was 91.6–92.2% for fresh litter materials, and was about 64% at 35 days of age.

Table (3) summarized some re-used bedding characteristics such as moisture, nitrogen percentages and pH. The pH value and moisture and nitrogen percentages of re-used litters were significantly ( $P \leq 0.01$ ) affected by different bedding materials. The moisture percentage of re-used newspaper litter was highest, while lowest ones were with re-used shaving woods + barely straw litter. Increasing the moisture content of newspaper litters may be due to its holding capacity of water is more than the other bedding materials Table (3). Lien *et al.*, (1992) found that the level of humidity in addition to the natural characteristics of the litter mattress affect the formation of clusters.

In general, the differences in litter moisture may be due to many factors (temperature, humidity, bird health, and the rate of ventilation). The same researcher also found that there is a close relationship between the content of moisture in bedding mattress and its poor condition. Meluzzi *et al.* (2008) demonstrated that using shaving woods are more easily turned by the chickens than wheat straw, therefore, moisture was decreased. Wheat straw has lower water holding capacity than wood shavings, probably because of its lower cellulose content, and the cutin to waxy coating of plant stems (Ward *et al.*, 2000 and 2001).

The highest pH measured was recorded for newspaper and having + newspaper litters and the lowest pH value was recorded for the barely straw litter (Table, 2).

The highest pH measured was found (Table, 3) in re-used newspaper litter and the lowest pH content was recorded for the reused shaving woods + barely straw litter. However, the pH which recorded for all re-used litters were lower than pH 7. The pH value of manure is one of the most important factors that determines the aqueous phase ammonia concentration, and therefore influences ammonia release. Research has demonstrated that ammonia release from litter is negligible at litter pH below 7 (Reece *et al.*, 1985). Meluzzi *et al.* (2008) observed that the pH was unaffected by both rearing condition and litter type (wood shavings or chopped wheat straw).

The highest nitrogen percentage (2.52 %) was recorded for barely straw litter, without differences with the nitrogen percentage of shaving woods + newspaper litters. On the other hand, the lowest percentages (1.68 and 1.73%) were measured on newspaper and shaving + newspaper litters Table 2. Since, the newspaper bedding had highest humidity percentage which reflected on decrease the nitrogen percentage content and that may be due to loss of

nitrogen in the form of ammonia. So that using newspaper as bedding materials for grown broiler must be used under highest controlling of broiler house ventilation to decrease the ammonia levels. Carr *et al.* (1990) pointed out that moisture in the mattress should be less than 30% so as to control the amount of ammonia. Moore *et al.* (1996) noted that litters with a high level of humidity lead to loss of nitrogen in the form of ammonia. Elwinger and Svensson (1996) detected no differences in total N<sub>2</sub> concentrations between wheat straw and wood shavings.

The highest nitrogen percentages were measured in reused shaving woods + barley straw and shaving woods litters, respectively, while the lowest percentage was measured in reused newspaper litter and its statistically equal with the content in reused barely straw and barely straw + newspaper litters Table 3. On the other hand, Coufal *et al.* (2006 b) reported that

the practice of top-dressing recycled broiler litter would not be recommended as a strategy to reduce the volatilization of N from broiler rearing facilities.

In conclusion, newspaper can be used as bedding materials for rearing broiler during grown and finisher periods in arid land such as Saudi Arabia. Using mixture of newspaper and shaving woods or barley straw as bedding materials in broiler house improved the broiler performances and litter characteristics as well as good impact on environmental condition.

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**Table1:** Composition and chemical analysis of the experimental diets.

Feedstuffs	Diets (%)	
	Starter Diet (1-3 Wks)	Finisher Diet (4-6 Wks)
Yellow corn	54.00	58.70
Soybean meal (44%)	39.00	32.30
Limestone	1.00	1.45
Dicalcium Phosphate	1.90	1.90
Premix*	0.30	0.30
Vegetable oil	2.90	4.50
Table Salt	0.50	0.50
D L.Methionine	0.20	0.25
L. Lysine	0.20	0.10
Total	100.0	100.0
<b>Chemical analysis</b>		
Crude protein %	21.50	19.00
ME kcal / kg	2950	3100
Ether Extract %	5.30	7.08
Crude fiber %	3.40	3.12
Calcium %	0.90	1.04
P. (available) %	0.50	0.49
Lysine %	1.38	1.09
Methionine %	0.51	0.32
Methionine + cysteine %	0.86	0.84

Supplied per Kg diet: Vit. A, 12000 IU; Vit. D<sub>3</sub>, 3000 IU; Vit. E, 10mg; Vit. C, 3 mg; Vit. K, 4 mg; VitB<sub>1</sub>, 3 mg; Vit B<sub>2</sub>, 20 mg; Vit B<sub>6</sub>, 1.5 mg; Vit B<sub>12</sub>, 10.0 mg; pantothenic acid, 10 mg; Folic acid, 2 mg; Biotin, 50 mg; Cobalt, 0.050 mg; Copper, 10 mg; Iodin, 30 mg; Manganese, 55 mg; Selenium, 0.2 mg and Zinc, 70 mg.

**Table (2):** Effect of newspaper and their mixture on broiler performance, carcass yield, and bedding characteristics through first experiment at 42 days of age.

Parameters	Shaving woods	Barley straw	Newspaper	Shaving woods + Barley straw	Shaving woods + newspaper	Barley straw+ newspaper	SEM	Sig
<i>Broiler Performance</i>								
Body weight at 42 days	1967.50 <sup>d</sup>	2094.25 <sup>b</sup>	2047.75 <sup>bc</sup>	2193.50 <sup>a</sup>	2221.25 <sup>a</sup>	2026.50 <sup>bc</sup>	120.35	**
Body weight gain (g)	1928.49 <sup>d</sup>	2053.73 <sup>b</sup>	2005.63 <sup>bc</sup>	2157.75 <sup>a</sup>	2180.94 <sup>a</sup>	1985.38 <sup>bc</sup>	89.40	**
Feed Intake (g/chick)	4274.57 <sup>c</sup>	4354.95 <sup>b</sup>	4265.87 <sup>c</sup>	4458.17 <sup>a</sup>	4448.15 <sup>a</sup>	4234.86 <sup>c</sup>	24.54	**
Feed conversion ratio <sup>1</sup>	2.23 <sup>a</sup>	2.12 <sup>b</sup>	2.11 <sup>b</sup>	2.06 <sup>c</sup>	2.04 <sup>c</sup>	2.13 <sup>b</sup>	0.14	**
<i>Carcass Yields (g/100 g weight)</i>								
Carcass	73.98	73.93	73.81	72.93	72.22	72.64	1.59	NS
Full Gizzard	2.63 <sup>a</sup>	2.15 <sup>c</sup>	2.36 <sup>bc</sup>	2.43 <sup>b</sup>	2.65 <sup>a</sup>	2.41 <sup>b</sup>	0.38	**
Empty Gizzard	1.71 <sup>a</sup>	1.31 <sup>d</sup>	1.33 <sup>cd</sup>	1.40 <sup>b</sup>	1.63 <sup>ab</sup>	1.33 <sup>cd</sup>	0.22	**
Intestine weight	5.52 <sup>c</sup>	6.97 <sup>ab</sup>	7.76 <sup>a</sup>	7.73 <sup>a</sup>	6.22 <sup>ab</sup>	5.56 <sup>c</sup>	1.22	**
Intestine Length	9.12 <sup>c</sup>	9.28 <sup>ab</sup>	9.71 <sup>a</sup>	9.58 <sup>a</sup>	9.34 <sup>ab</sup>	9.18 <sup>c</sup>	0.25	**
Ceca weight	0.79 <sup>c</sup>	0.89 <sup>b</sup>	1.0118 <sup>a</sup>	0.9723 <sup>ab</sup>	0.9028 <sup>b</sup>	0.7600 <sup>c</sup>	0.19	**
Ceca length	1.07 <sup>c</sup>	1.19 <sup>ab</sup>	1.24 <sup>a</sup>	1.23 <sup>a</sup>	1.11 <sup>b</sup>	1.07 <sup>c</sup>	0.11	**
Spleen weight	0.110	0.109	0.107	0.100	0.111	0.109	0.045	NS
Bursa weight	0.061	0.058	0.062	0.061	0.062	0.061	0.004	NS
Adrenal weight	0.022	0.022	0.021	0.019	0.021	0.021	0.001	NS
Thyroid weight	0.042	0.043	0.041	0.039	0.042	0.041	0.005	NS
<i>Bedding Characteristics</i>								
Moisture %	31.88 <sup>b</sup>	26.83 <sup>d</sup>	40.86 <sup>a</sup>	26.38 <sup>d</sup>	37.72 <sup>a</sup>	29.54 <sup>c</sup>	1.45	**
pH	7.01 <sup>b</sup>	6.70 <sup>d</sup>	7.24 <sup>a</sup>	6.67 <sup>d</sup>	7.18 <sup>a</sup>	6.85 <sup>c</sup>	0.08	**
Nitrogen %	1.91 <sup>c</sup>	2.52 <sup>a</sup>	1.68 <sup>d</sup>	2.37 <sup>b</sup>	1.73 <sup>d</sup>	2.12 <sup>a</sup>	0.04	**

a, b, c, ... means having different letter (s) in the same row are significantly different (P < 0.01).

NS : not significant

\*\* : significant P < 0.01 <sup>1</sup> FCR: g feed / g gain

**Table (3):** Effect of reused newspaper and their mixture on broiler performance, carcass yield, and bedding characteristics through second experiment at 42 days of age.

Parameters	Shaving woods	Barley straw	Newspaper	Shaving woods + Barley straw	Shaving woods + newspaper	Barley straw + newspaper	SEM	Sig
<b>Broiler Performance</b>								
Body weight at 42 days	2163.03	2178.16	2129.02	2184.58	2218.08	2223.76	104.98	NS
Body weight gain (g)	1370.52 <sup>cd</sup>	1383.15 <sup>cd</sup>	1333.11 <sup>d</sup>	1392.64 <sup>bc</sup>	1427.12 <sup>a</sup>	1424.84 <sup>a</sup>	82.84	**
Feed Intake (g/chick)	3262.48 <sup>b</sup>	3214.54 <sup>bc</sup>	3200.46 <sup>c</sup>	3254.52 <sup>b</sup>	3282.55 <sup>a</sup>	3268.54 <sup>ab</sup>	10.43	**
Feed conversion ratio <sup>1</sup>	2.39 <sup>nb</sup>	2.32 <sup>bc</sup>	2.40 <sup>a</sup>	2.34 <sup>b</sup>	2.30 <sup>c</sup>	2.31 <sup>c</sup>	0.02	**
<b>Carcass yields (g/100 g weight)</b>								
Carcass	74.52 <sup>b</sup>	77.52 <sup>a</sup>	74.58 <sup>b</sup>	77.51 <sup>a</sup>	74.85 <sup>b</sup>	74.48 <sup>b</sup>	1.95	**
Full Gizzard	2.35	2.20	2.25	1.90	2.24	2.50	0.01	**
Empty Gizzard	1.28 <sup>ab</sup>	1.21 <sup>bc</sup>	1.21 <sup>bc</sup>	1.12 <sup>d</sup>	1.23 <sup>bc</sup>	1.32 <sup>a</sup>	0.01	**
Intestine weight	3.99 <sup>ab</sup>	3.64 <sup>b</sup>	3.42 <sup>c</sup>	3.64 <sup>ab</sup>	3.89 <sup>ab</sup>	4.03 <sup>a</sup>	0.00	**
Intestine Length	9.12 <sup>bc</sup>	9.10 <sup>bc</sup>	9.02 <sup>d</sup>	9.58 <sup>ab</sup>	9.34 <sup>ab</sup>	9.71 <sup>a</sup>	0.01	**
Ceca weight	0.89 <sup>ab</sup>	0.82 <sup>bc</sup>	0.76 <sup>c</sup>	0.87 <sup>ab</sup>	0.90 <sup>ab</sup>	1.01 <sup>a</sup>	0.08	**
Ceca length	1.20 <sup>ab</sup>	1.14 <sup>bc</sup>	1.09 <sup>c</sup>	1.11 <sup>bc</sup>	1.12 <sup>ab</sup>	1.24 <sup>a</sup>	0.07	**
Spleen weight	0.118	0.121	0.122	0.119	0.119	0.121	0.008	NS
Bursa weight	0.062	0.059	0.064	0.061	0.059	0.063	0.004	NS
Adrenal weight	0.018	0.018	0.021	0.021	0.019	0.021	0.001	NS
Thyroid weight	0.042	0.042	0.041	0.043	0.042	0.041	0.005	NS
<b>Bedding characteristics</b>								
Moisture %	36.65 <sup>b</sup>	37.79 <sup>b</sup>	42.43 <sup>a</sup>	34.72 <sup>c</sup>	38.53 <sup>b</sup>	37.86 <sup>b</sup>	3.77	**
pH	6.66 <sup>c</sup>	6.74 <sup>b</sup>	6.93 <sup>a</sup>	6.51 <sup>d</sup>	6.80 <sup>b</sup>	6.66 <sup>c</sup>	0.06	**
Nitrogen %	2.03 <sup>a</sup>	1.74 <sup>bc</sup>	1.71 <sup>c</sup>	2.04 <sup>a</sup>	1.86 <sup>ab</sup>	1.82 <sup>abc</sup>	0.09	**

a, b, c, ... means having different letter (s) in the same row are significantly different (P < 0.01).

NS : not significant

\*\* : significant P < 0.01<sup>1</sup> FCR: g feed: g gain



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## المخلص العربي

### تأثير ورق الصحف كمادة فرشته في المناطق الجافة على اداء كتاكيت اللاحم

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اجريت تجربتان لدراسة تأثير استخدام ورق الصحف كمادة للفرشة واعاده استخدامها مره اخرى على الاداء الانتاجي للكتاكيت اللاحم. اجريت التجربة الاولى على ٧٢١ كتكوت لاحم (روس) من عمر ١ الى ٤٢ يوما، وزعت الكتاكيت على ست معاملات (اربع مكررات لكل منها). وتم تخصيص مائة وعشرين كتكوت لكل معاملة (٣٠ بكل مكرره) باستخدام التصميم العشوائي الكامل. وكانت مواد الفرشة المستخدمه هي نشاره الخشب، تبن الشعير، ورق الصحف، ١:١ نشاره الخشب + تبن الشعير، ١:١ نشاره خشب+ ورق صحف و ١:١ تبن الشعير + ورق صحف على التوالي. و اجريت التجربة الثانية باستخدام الفرشة نتج التجربة الاولى وذلك أثناء فترة التشطيب من (٢٨ إلى ٤٢ يوما من العمر)، وتم اتباع نفس التصميم.

أشارت النتائج إلى أن كتاكيت اللاحم التي نمت على نشاره الخشب+تبن الشعير ونشاره الخشب+ ورق الصحف كانت اعلى وزن جسم فضلا عن الزيادة في وزن الجسم المكتسب، بالإضافة إلى ذلك فإن هاتين المعاملتين استهلكتا كمية اكبر من العلف وسجلتا اعلى نسب تحويل، لم يتأثر وزن الذبيحه النسبي والغدد. ولكن قد تؤثر الوزن النسبي للقونصه الممتلئه، القونصه الفارغه، الأمعاء والاعورين وكذلك اطوالهم بشكل كبير.

الفرشة المعاد استخدامها لم تؤثر على وزن الجسم النهائي، الكتاكيت النامي على نشاره الخشب+ورق الصحف وتبن الشعير+ورق الصحف كانت اعلى معنويه في وزن الجسم النامي والغذاء المأكول وسجلت أفضل كفاءة تحويل. وقد كان وزن ذبيحه الفراريج النامي على فرشة من تبن الشعير و ورق الصحف ونشاره الخشب و ورق الصحف كانت اعلى معنويه.

وقد سجلت الطيور المرباه على تبن الشعير و ورق الصحف زياده معنويه في وزن القونصه الفارغه والممتلئه ووزن وطول الامعاء والاعورين. بينما لم يتأثر معنويا الوزن المرتبط للغدد (البرسا، الفوق كظريه والدرقيه).

الخلاصه هي انه يمكن استخدام ورق الصحف كماده للفرشه لتربية الفراريج خلال فترات النمو والناهي في الأراضي الجافة كالمملكة العربية السعودية واستخدام خليط من ورق الصحف ونشاره الخشب او تبن الشعير كمادة فرشة في غاير التسمين تحسن من الاداء الانتاجي لكتاكيت اللاحم وخواص الفرشه، فضلا عن تأثيرها الجيد على الظروف البيئية.