PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 8 (5): 635-641, 2009
ISSN 1680-5194

Effect of Replacement of Barley Grains by Wasted Bread Crumbs or Rejected Dates on Growth Performance and Carcass Traits of Growing Rabbits

S.A. AL-Shami and T.A. Mohammed
Department of Veterinary Public Health and Animal Husbandry,
College of Veterinary Medicine and Animal Resources, King Faisal University, Saudi Arabia

Abstract: Thirty five 10 weeks of age white New Zealand rabbits were assigned to investigate the effect of partial and complete replacement of barley grains by Wasted Bread Crumbs (WBC) or Rejected Dates (RD) on growth performance and carcass traits of growing rabbits. The rabbits were allotted into seven groups (5 rabbits per each). Seven diets were formulated, the control (No. 1) based on barley grains as the main energy source and the tested alternative energy sources (WBC and RD) replaced 33.33, 66.66 and 100% from the barley quantity of the control to formulate 6 diets respectively. The diets were offered for 40 days. The results indicated that WBC inclusion (15 or 30%) reduced ($p>0.05$) body weight, Daily Body Gain (DBG), Daily Feed Intake (DFI) and deteriorated Feed Conversion (FCR), Protein Efficiency Ratio (PER) and Efficiency of Energy Utilization (EEU) when compared with control, however, the higher inclusion level of WBC reduced ($p<0.05$) DBG and improved FCR, PER. On the other hand, RD addition at different levels decreased ($p<0.05$) DBG, increased DFI and deteriorated ($p<0.05$) FCR, PER, EEU and PI when compared with the control. The data revealed that WBC was more efficient, resulted in good and higher growth performance and rabbits utilized it better than RD. Both WBC and RD reduced dressing % and increased head and viscera relative weights when compared with the control while, WBC reduced ($p>0.05$) abdominal fat relative weight and RD increased ($p>0.05$) abdominal fat relative weight. Both WBC and RD had no effect on chemical composition of rabbit's meat. The data indicated that WBC posses good energy source at different levels for rabbit feeding while RD were less fit and require further investigation.

Key words: Rabbits, wasted bread crumbs, rejected dates, growth performance, carcass traits

INTRODUCTION

The rabbit (Oryctotagus cuniculus) is a pseudo-ruminant, raised widely in developing countries. Its production contributes to improved nutrition and economy in the family as a source of animal protein, as well as extra income by sale of animals. Consequently rabbit is recommended as good alternative and seem to be suitable to solve a part of this lack. Rabbit meat has a higher protein (20-21%), low calories (1749 Kcal/Kg), low fat content (10-11%), low cholesterol value (169 mg/100 g of dry matter basis) and low sodium content when compared with meat from most livestock species (Janieri, 1987), so rabbit meat has been listed in the USDA (1973), as an approved meat source for hypertensive patients. Moreover, rabbit production is suitable because as monogastric herbivores, they do not compete directly with man for both cereal and legume grains. Rabbit is also favored because of its high fecundity, low cost of investment, short generation interval, as well as ability to utilize diverse forages (Taiwo *et al*., 2004).

Rabbit feeding is a great bother to rabbit industry in Saudi Arabia. Raw materials used in the animal feeding are imported from outside, so the production of energy rich cereal grains in the kingdom for incorporation in rabbit diets is lacking and the industry relies on costly, irregular unguaranteed raw important material. Rabbit food includes forages, agricultural by-products, surplus garden products and food wastes. Food wastes have been tried as a diet for rabbits by many investigators (Leto *et al*., 1984; Alicata *et al*., 1988; Zahraa Abo El-Ezz and Manal Z El-Deen, 1996) as an attempt to reduce the high cost of rabbit feed.

Saudi Arabia kingdom is the largest producer of dates in the world with 14 million date palm trees producing 17.6% of the world dates and producing 568,000 tones mostly at Al-Ahsa, which considered the largest world oasis and the site of this product. There is a big quantity of rejected dates from the market and considered unfit for human use and that product with high energy content can provide alternative for conventional energy feed ingredients in the rabbit diets. This will help reduction of reliance on foreign imported raw materials and will cope with international policies of relying on agro-industrial by-products for animal feed to help reducing environmental pollution. Alternative feed energy sources for cereal have been investigated by many research workers who used dates as replacement of the conventional energy feeds in poultry diets (Kamel *et al*., 1981; Obese *et al*., 2001; Al-Bowait and Al-Sultan, 2007), however no available trial for using dates as en energy source for growing rabbits.

The main aim of the present study is to through light on the effect of partial and complete barley grain replacement by rejected dates or wasted bread crumbs on growth performance and carcass characteristics of growing White New Zealand rabbits.

MATERIALS AND METHODS

This work was conducted in the college of Veterinary Medicine and Animal Resources, King Faisal University, Saudi Arabia, to study the effect of partial and complete replacement of barley grain by Wasted Bread Crumbs (WBC) or by Refused Dates (RD) on growth performance and carcass traits of growing rabbits.

Rabbits and procedures: Thirty-five of apparently healthy male White New Zealand growing rabbits (10 weeks of age) having average body weight (1600 g) were allotted into 7 equal groups (5 rabbits each). All rabbits were treated with Ivomec to be free from internal and external parasites. Sulphadimidine powder also offered to rabbits as a safeguard against coccidiosis. Metal-wire bottom cages were used for keeping the experimental rabbits. Feed and water were provided ad libitum. All cages were placed in a semi-controlled environmental temperature in a suitable building. The building was well ventilated and electrically lighten (14:10 h light to dark photoperiod) throughout the experiment. The rabbits were weighed individually at the start and after 40 days (at the end of the experimental period) and the live body weight and weight changes were taken as a measure of growth. Body weight gain (expressed in grams) was calculated. The diets were provided regularly at 9.0 o'clock AM daily. The daily feed intake was calculated by the difference between the weight of feed offered and the remained part then divided by the number of the rabbits in each group per day and totalized for the whole experimental period (40 days). Feed Conversion Ratio (FCR) and Protein Efficiency Ratio (PER) were calculated according to Lambert *et al.* (1936) and McDonald *et al.* (1987) respectively while, Efficiency of Energy Utilization (EEU) and Performance Index (PI) were calculated according to North (1981).

Diet preparation: WBC and RD used in this study were purchased from a local known bakery and Al-Ahsa date factory, respectively. Other feed ingredients used to composite the experimental diets were procured and processed in a commercial local feed mill. Ingredients needed for formulation of various experimental diets were finely ground by using hammer mill screen size 3.0 mm, then weighing of different ingredients at required amount for each experimental diet and thoroughly mixed with the liquid portion. The mixed feed ingredients were blended with a good quality steam and the required molasses quantity was added at this stage of feed processing. The conditioned feed was passed through 3.5 mm holes then sun dried.

Experimental design: Seven diets were formulated to study the effect of different levels of the selected energy source feeds for growing rabbits on growth performance and carcass traits. The control diet was formulated according to NRC (1977) to meet the requirements of the growing rabbits. In order to evaluate the suitability and nutritional characteristics of both selected feeds as energy sources for growing rabbits, several experimental diets containing different levels of these sources were formulated. Barley grain was the chief energy source in the control diet and in low graded levels in the other diets containing the tested sources. Three different inclusion levels of the tested sources (WBC and RD) were used, replacing 0.0, 33.3, 66.6 and 100% of the barley grain quantity in the control diet (w/w) as outlined in Table 1. Ingredient composition and chemical analysis of the experimental diets are presented Tables 2 and 3.

Slaughter weight characteristics and meat chemical composition: At the end of the experimental period, 5 rabbits from each group were randomly chosen and slaughtered. Rabbits were kept off feed for 16 h before slaughter and carcass measurements were obtained as following: the blood, skin, distal portion of legs, urinary balder, digestive tract and head were removed to obtain the carcass weight (Blasco *et al.*, 1992). Pre-slaughter live body weight and the dressed carcass weights were recorded. The dressing percentage was calculated. Head, viscera and abdominal fat were immediately obtained and their proportions to the live body weight were calculated. Meat samples were collected from both leg and breast of each carcass and grinded together several times for homogenization and then stored at-4°C until analysis.

Analytical methods: Analytical DM contents of diets, meat samples were determined by oven-drying at 105°C for 48 h (AOAC, 1990; method 930.15). Ash contents of diets and meat samples were determined by incineration at 550°C overnight. Crude protein was determined by using Kjeldahl method according to Randhir and Pradhan (1981) and ether extract was determined according to Bligh and Dyer (1959) technique as modified by Hanson and Olly (1963). Crude fiber in feed and tested raw materials were determined according to (AOAC, 1990; method 973.18).

Statistical analysis: Data collected from rabbits fed WBC and RDF were treated as separate statistical entities, although they were run simultaneously with the same control. Analysis of variance (Snedecor and Cochran, 1967), in a complete randomized design, was done for statistical analysis of the data after arc sine transformation to percentage data. When differences were significant ($p<0.05$), student "t" test was used to determine differences among treatment means.

Table 1: Outline of the experimental design

Groups No.	Diet No.	Energy sources % Barley	WBC	RD
1	1 (control)	100	0	0
2	2	66.66	33.33	0
3	3	33.33	66.66	0
4	4	0	100	0
5	5	66.66	0	33.33
6	6	33.33	0	66.66
7	7	0	0	100

Table 2: ingredient composition of the used diets

Ingredients	Experimental diets No. 1 (control)	2	3	4	5	6	7
Alfalfa hay	38.5	38.5	38.5	38.5	38.5	38.5	38.5
Barley grain	45	30	15	0	30	15	0
WBC[1]	0	15	30	45	0	0	0
Rejected dates[2]	0	0	0	0	15	30	45
Soybean meal	12	12	12	12	12	12	12
Vegetable oil	1.0	1.0	1.0	1.0	1.0	1.0	1.0
DCP[3]	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Molasses	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Vit-min. mix[4]	0.25	0.25	0.25	0.25	0.25	0.25	0.25

[1]Wasted bread crumbs characterized by the following composition: DM (88%), CP (13.5%), EE (2.1%), ash (3.5%) and CF (1.8%). [2]Rejected dates: characterized by the following composition; DM (90.2%), CP (5.9), EE (6.2), Ash (1.2) and CF (18.9). [3]Di-calcium phosphate: contain 20% P and 25% calcium. 4- Premix: Muvco premix (Mineral and vitamin premix) each 2.5 Kg contain the following: vitamin A 12000000 IU, vitamin D_3 200000 IU, vitamin E 10g, vitamin K_3 2.5 g, vitamin B_1 1 g, vitamin B_2 5 g, vitamin B_6 1.5 g, vitamin B_{12} 10 g, pantothenic acid 10 g, niacin 30 g, folic acid 1 g, choline chloride 500 g, biotin 50 mg, iron 30 mg, manganese 40 mg, zinc 45 mg, copper 3 g, cobalt 100 mg, iodine 300 mg, selenium 100 mg.

Table 3: Chemical composition of the used diets

Items	Experimental diets No. 1 (control)	2	3	4	5	6	7
DM%	92.8	92.6	92.4	92.7	91.2	89.1	87.6
CP%	17.4	17.5	17.4	17.3	16.9	16.4	16.1
EE%	2.7	2.8	2.8	2.9	3.1	3.5	3.8
CF%	12.7	11.3	10.4	9.6	13.5	14.3	14.6
ASH%	5.6	5.3	5.2	5.3	5.1	4.9	5.0
NFE[1]	54.4	55.8	56.6	57.6	52.6	50.0	48.1
DE (Kcal/kg)[2]	2594	2683	2768	2855	2648	2701	2753

[1]NFE calculated by difference = 100 – (moisture % + CP% + EE% + CF% + Ash %). [2]Calculated according to NRC (1977) and DE of WBC and RD were calculated according to the equation of Fekete and Gippert (1986) {DE Kcal/Kg = 4253-32.6 (%CF) -144.4 (%ash)}

RESULTS AND DISCUSSION

Body weight development: Effect of partial and complete replacement of barley grains by Wasted Bread Crumbs (WBC) or Rejected Dates (RD) on growing rabbits body weight development are presented in Table 4. It was clear that there was no significant differences ($p>0.05$) between rabbit Body Weight (BW) in different groups at the start of the experiment. WBC inclusion at 15 or 30% of rabbit diet decreased ($p>0.05$) BW by about 5.5 and 9.0% when compared with the control, while the higher inclusion levels of WBC (45%) significantly ($p<0.05$) reduced rabbit's BW by about 11.4% compared with the control. On the other hand, statistical analysis of the present data indicated that there was a non-significant ($p>0.05$) BW reduction due to increasing WBC levels from 15-45% in the rabbit diet. Moreover, Daily Body Gain (DBG) decreased ($p>0.05$) by about 8.7% with 15% WBC inclusion when compared with control while, reduced ($p<0.05$) by about 23 and 19.8% with 30 and 45% WBC inclusion levels. The present data are in contrast with those obtained by Zahraa Abo El-Ezz and Manal Z. El-Deen (1996) who reported that the highest weight were found in the rabbit group which fed on diet containing 30% food wastes compared with control. The differences would be due to the usage of different type's food wastes.

Rejected Dates (RD) inclusion at 15, 30 and 45% in rabbit diets reduced ($p<0.05$) BW and DBG by about (14.5, 11.7 and 17.6%) and (19, 28.6 and 42.1%), respectively when compared with control. The data are in agreement with those obtained by Al-Bowait and Al-Sultan (2007) who stated that there was a linear reduction in the broiler body weight gain with increasing the level of date pit in their diets.

Using of WBC at levels 15 or 45% instead of barley as an energy source in rabbit diet increased DBG by about 11.3% and 27.7% ($p<0.05$) when compared with the same replacement levels of barley by RD, while non significantly difference between both sources at 30% of inclusion rate, was detected.

Growth performance parameters: Daily Feed Intake (DFI) was reduced ($p>0.05$) by about 5.2% with 15% WBC addition in the rabbit diets when compared with control (Table 5), while significant DFI reduction ($p<0.05$) was noticed by about 17.3% and 25.5% with 30 and 45% WBC inclusion when compared with control. However, 15 and 30% WBC inclusion levels non significantly deteriorated ($p>0.05$) Feed Conversion Ratio (FCR) and Protein Efficiency Ratio (PER) by about (3.8 and 7.6%) and (4.5 and 9.0%), respectively when compared with control, while the higher (45%) inclusion level of WBC improved ($p>0.05$) FCR and PER by about 7 and 8.3%, compared with control.

Regarding Efficiency of Energy Utilization (EEU) and Performance Index (PI) it was noticed that WBC inclusion had no significant effect on that parameters compared with control except PI value that was reduced ($p<0.05$) with 30% WBC inclusion level by about 15.5% compared with control. The low fiber and ash components of WBC containing diets and its relatively high carbohydrate fraction explained its high digestible energy value may be related to lower DFI with higher levels of WBC inclusion levels. The present data are in agreement with those obtained by Manal Z.El-Din (1996)

Table 4: Effect of barley replacement by wasted bread crumbs or rejected dates on body weight development of growing rabbits

Items	Inclusion levels of tested feeds	Wasted bread crumbs		Rejected dates	
		Values	SE	Values	SE
Initial body weight (Kg/animal)	0	1.63	0.160^{ax}	1.63	0.120^{ax}
	15	1.58	0.124^{ax}	1.46	0.093^{ax}
	30	1.66	0.124^{ax}	1.66	0.093^{ax}
	45	1.55	0.124^{ax}	1.57	0.093^{ax}
Final body weight (kg/animal)	0	2.89	0.110^{ax}	2.89	0.160^{ax}
	15	2.73	0.085^{acx}	2.48	0.124^{bx}
	30	2.63	0.085^{acx}	2.56	0.124^{bx}
	45	2.56	0.085^{bcx}	2.39	0.124^{bx}
Total body gain (kg/animal)	0	1.26	0.087^{ax}	1.26	0.07^{ax}
	15	1.15	0.087^{bx}	1.02	0.07^{by}
	30	0.97	0.087^{cx}	0.90	0.07^{cx}
	45	1.01	0.087^{cx}	0.73	0.07^{dy}
Daily body gain (g/day/animal)	0	31.5	1.860^{ax}	31.5	1.30^{ax}
	15	28.75	0.968^{bx}	25.5	0.775^{by}
	30	24.25	0.968^{cx}	22.5	0.775^{cx}
	45	25.25	0.968^{cx}	18.25	0.775^{dy}

x-y different litters within raw between feed treatment are significant different ($p< 0.05$), a-d different litters between levels within feed treatment are significant different ($p< 0.05$).

Table 5: Effect of barley replacement by wasted bread crumbs or rejected dates on growth performance parameters of growing rabbits

Items	Inclusion levels of tested feeds	Wasted bread crumbs		Rejected dates	
		Values	SE	Values	SE
Daily feed intake (g/day/animal)	0	116.3	3.64^{ax}	116.3	2.3^{ax}
	15	110.2	2.819^{ax}	130.8	1.782^{by}
	30	96.2	2.819^{bx}	126.3	1.782^{by}
	45	86.6	2.819^{cx}	132.2	1.782^{by}
Feed conversion ratio	0	3.69	0.205^{ax}	3.69	0.034^{ax}
	15	3.83	0.229^{ax}	5.13	0.087^{by}
	30	3.97	0.279^{ax}	5.61	0.115^{by}
	45	3.43	0.246^{ax}	7.28	0.213^{cy}
Protein efficiency ratio	0	1.56	0.086^{ax}	1.56	0.015^{ax}
	15	1.49	0.089^{abx}	1.15	0.019^{by}
	30	1.42	0.099^{abx}	1.09	0.022^{by}
	45	1.69	0.121^{acx}	0.86	0.025^{cy}
Efficiency of energy utilization	0	9.58	0.531^{ax}	9.58	0.089^{ax}
	15	10.28	0.616^{ax}	13.58	0.229^{by}
	30	10.98	0.771^{ax}	15.16	0.311^{cy}
	45	9.79	0.703^{ax}	20.04	0.587^{dy}
Performance index	0	78.3	1.992^{ax}	78.3	4.081^{ax}
	15	71.3	1.994^{acx}	48.3	3.224^{by}
	30	66.2	2.439^{bcx}	45.6	3.132^{by}
	45	74.6	2.807^{ax}	33.1	2.664^{cy}

x-y different litters within raw between feed treatment are significant different ($p< 0.05$), a-d different litters between levels within feed treatment are significant different ($p< 0.05$).

who concluded that FI decreased with lowering crude fiber content from 12-8% of the rabbit's diets. FCR and PER in this study seemed to be good and superior to the 4.6 and 1.2 being reported by Onifade and Tewe (1993) when rabbits were fed maize grain diet. However, the FCR and PER of rabbits in this study were similar to those obtained by Gidenne and Jehl (1996) and Uko *et al*. (1999).

The poor EEU values in rabbit groups (2 and 3) which fed on 15 and 30% WBC are difficult to explain, it seemed that it would be due to lowering nutrient digestibility. The improvement of FCR, PER and EEU with higher levels of WBC may be attributed to the lower DFI and amino acid balance of that combination in the diet which reflected on the PI of rabbits.

Rejected Dates (RD) replacement at different levels (15, 30 and 45%) in rabbit diets increased ($p<0.05$) DFI by about 12.5, 8.6 and 13.7%, respectively when compared with control. The higher DFI associated with high fiber diets of RD have been attributed to maintenance of energy homeostasis (Spreadbury and Davidson, 1978). The present data are in agreement with Champe and Maurice (1983) and Manal Z. El-Din (1996) who stated that the DFI during the experimental period was more in

Table 6: Effect of barley replacement by wasted bread crumbs or rejected dates on some carcass traits of growing rabbits

Items	Inclusion levels of tested feeds	Wasted bread crumbs		Rejected dates	
		Values	SE	Values	SE
Starved slaughter weight (kg)	0	2.72	0.21^{ax}	2.72	0.26^{ax}
	15	2.58	0.163^{ax}	2.36	0.201^{ax}
	30	2.52	0.163^{acx}	2.45	0.201^{ax}
	45	2.05	0.16bc^{x}	2.39	0.201^{ax}
Eviscerated carcass weight (kg)	0	1.76	0.06^{ax}	1.76	0.08^{ax}
	15	1.55	0.046^{bx}	1.42	0.062^{bx}
	30	1.57	0.046^{bx}	1.52	0.062^{bx}
	45	1.21	0.046^{cx}	1.48	0.062^{by}
Dressing %	0	64.7	0.61^{ax}	64.7	0.54^{ax}
	15	60.2	0.473^{bx}	60.2	0.418^{bx}
	30	62.3	0.473^{cx}	62.0	0.418^{cx}
	45	58.9	0.473^{dx}	61.9	0.418^{cy}
Head relative weight	0	14.9	0.51^{ax}	14.9	0.58^{ax}
	15	15.4	0.395^{acx}	16.1	0.449^{ax}
	30	16.5	0.395^{bcx}	15.2	0.449^{ax}
	45	16.2	0.395^{bcx}	15.6	0.449^{ax}
Viscera relative weight	0	12.5	1.16^{ax}	12.5	1.09^{ax}
	15	13.4	0.899^{ax}	13.2	0.844^{ax}
	30	12.8	0.899^{ax}	12.9	0.844^{ax}
	45	13.2	0.899^{ax}	12.6	0.844^{ax}
Abdominal fat relative weight	0	2.5	0.24^{ax}	2.5	0.31^{ax}
	15	2.2	0.186^{ax}	2.8	0.240^{acy}
	30	2.3	0.186^{ax}	3.0	0.240^{acy}
	45	2.0	0.186^{ax}	3.2	0.240^{bcy}

x-y different litters within raw between feed treatment are significant different ($p < 0.05$), a-d different litters between levels within feed treatment are significant different ($p < 0.05$).

Table 7: Effect of barley replacement by wasted bread crumbs or rejected dates on meat chemical composition of growing rabbits

Items	Inclusion levels of tested feeds	Wasted bread crumbs		Rejected dates	
		Values	SE	Values	SE
Moisture%	0	68.6	2.48^{ax}	68.6	2.61^{ax}
	15	67.8	1.921^{ax}	70.3	2.022^{ax}
	30	70.6	1.921^{ax}	67.8	2.022^{ax}
	45	72.8	1.921^{ax}	70.6	2.022^{ax}
Crude protein%	0	19.3	0.85^{ax}	19.3	0.93^{ax}
	15	19.5	0.659^{ax}	19.6	0.721^{ax}
	30	18.9	0.659^{ax}	19.1	0.721^{ax}
	45	19.1	0.659^{ax}	18.8	0.721^{ax}
Ether extract%	0	6.6	1.56^{ax}	6.6	1.64^{ax}
	15	6.7	1.208^{ax}	7.2	1.270^{ax}
	30	7.6	1.208^{ax}	8.1	1.270^{ax}
	45	7.5	1.208^{ax}	7.9	1.270^{ax}

x-y different litters within raw between feed treatment are significant different ($p < 0.05$), a-d different litters between levels within feed treatment are significant different ($p < 0.05$).

the rabbits fed 12% fiber and the lowest was for diets containing 8% fiber. Moreover, RD addition (15, 30 or 45%) deteriorated ($p<0.05$) FCR, PER, EEU and PI by about (39, 52 and 97.3%), (26.3, 30.1 and 44.9%), (41.8, 58.3 and 109.2%) and (38.3, 41.8 and 57.7%) for the mentioned parameters, respectively when compared with the control. The lowering feed, protein and energy efficiency with RD inclusion in the rabbit's diet may be related to the higher DFI with reduction of DBG and unsuitable carbohydrate source for cecal fermentation that may adversely affect nutrient digestibility and absorption. The data are in harmony with those obtained by Al-Bowait and Al-Sultan (2007) who found that date pits inclusion in broiler diet increased feed intake and decreased FCR when compared with control group.

Evaluation of WBC and RD as alternative energy feeds for rabbit, the data clarified that WBC was more suitable and improved ($p<0.05$) FCR, PER, EEU and PI when compared with rabbit groups fed on RD containing diet.

Carcass traits: WBC inclusion (15, 30 and 45% levels) in rabbit diets reduced ($p<0.05$) dressing % (Table 6) by about 7.0, 3.7 and 9.0%, respectively when compared with control group, however WBC inclusion increased head relative weight and viscera relative weight by about (3.4, 10.7 and 8.7%) and (7.2, 2.4 and 5.6%),

respectively. On the other hand WBC inclusion (15, 30 and 45% levels) increased ($p>0.05$) abdominal fat relative weight by about 12, 8 and 20%, respectively when compared with the control. The present data disagree with those obtained by Uko *et al.* (1999) who found that cereal offal had no significant effect on carcass yield percentage when compared with the control.

Rejected Dates (RD) inclusion (15, 30 or 45%) reduced ($p<0.05$) dressing percentage of rabbit's carcass by about 7.0, 4.2 and 4.3%, respectively when compared with the control while, non significantly ($p>0.05$) increased head and viscera relative weights by about (8.1, 2 and 4.7%) and (5.6, 3.2 and 0.8%), respectively. However, RD inclusion (15 and 30% levels) increased ($p>0.05$) abdominal fat relative weight by about 12% and 20% but significantly increased ($p<0.05$) when RD was included at 45% level by about 28% when compared with the control. The higher abdominal fat relative weight may be related to the lower utilization of different nutrient in the rabbits fed on diets containing different levels of RD.

Meat composition: Effect of WBC or RD inclusion in rabbit's diets on meat chemical composition is presented in Table 7. Analysis of variance of the obtained data revealed that both WBC and RD had no effect ($p>0.05$) on moisture percentage, crude protein percentage and ether extract percentage of the meat when compared with the control. However, the fat percentage of the rabbit's meat fed on diets containing different levels of WBC or RD had a higher ($p>0.05$) fat content when compared with the control. The data are in agreement with Manal Z El-Din (1996) who concluded that no effect were observed on dressing %, total body solids, total body weight, protein, fat and ash in the carcass of the tested rabbits fed on different fiber levels.

Conclusion: The study has shown that WBC posses good feeding values as energy source in the rabbit's diet. The use of wasted bread in commercial quantity when compounding diets for rabbits could, therefore, reduce cost of feeds and make rabbit products available at cheaper prices in the developing countries where the wastes are readily available. While RD at raw condition posses unfit energy source for rabbits and require further investigation with chemical modifications to reduce the adverse effect on rabbit performance.

REFERENCES

A.O.A.C., 1990. Official Methods of Analysis. Association of Analytical Chemists. Washington, D.C.

Al-Bowait, M. and S. Al-Sultan, 2007. The effect of partial replacement of maize by alkali-treated date pits on broiler growth, survival rate and economic returns. Livestock Research and Rural development, 19: 950-962.

Alicata, M.L., A. Bonanno, P. Giococone, G. Ieto and N. Battaglia, 1988. Use of tomato skin and seeds in the feeding of meat rabbits. Rivista di coniglicotura, 25: 23-31.

Blasco, A., J. Ouhayoun and G. Masoero, 1992. Status of rabbit meat and carcass: Criteria and terminology. Options Mediterranean's serial seminaries, 17: 105 -120.

Bligh, E.G. and W.J. Dyer, 1959. Fat extraction (Cited by Pearson's chemical analysis of foods). 8th Ed. (1963).

Champe, K.A. and D.V. Maurice, 1983. Response of early weaned rabbits to source and level of dietary fiber. J. Anim. Sci., 56: 1105-1112.

Fekete, S. and T. Gippert, 1986. Digestibility and nutritive value of nineteen important rabbit feedstuffs. J. Appl. Rabbit Res., 9: 103-108.

Gidenne, T. and N. Jehl, 1996. Replacement of starch by digestible fiber in the feed for the growing rabbit. 1. consequence for digestibility and rate of passage. Anim. Feed Sci. Technol., 61: 183-192.

Hanson, S.W.F. and J. Olly, 1963. Fat extraction. (Cited by Pearson's chemical analysis of foods). 8th Ed. (1963).

Janieri, A., 1987. Nutritional quality of rabbit meat. Italian R.V. Agriculture, 24: 275.

Kamel, B.S., M.F. Diab, A.A. Alian and A.J. Salman, 1981. Nutritional value of whole dates and dates pit in broiler ration. Poult. Sci., 60: 1005-1011.

Lambert, W.V., N.R. Ellis, W.H. Block and H.W. Titus, 1936. The role of nutrition in genetics. Mer. Res. Soc. Animal Production. Proc., 29: 236.

Leto, G., M.L. Alicata, A. Bonanna and M. Bacchi, 1984. Trials on the use of dried orange and lemon pulp for feeding meat rabbits. Rivista di coniglicotura, 21: 53-59.

Manal, Z. El-Din, 1996. Effects of source and level of dietary fiber on growth rate, nutrient digestibility and carcass characteristics of rabbits. Egypt. Poult. Sci., 16: 221-238.

McDonald, P., R.A. Edwards and J.F.D. Greenhalgh, 1987. Animal nutrition text book. English Language Book Socity/Longman.

North, M.O., 1981. Commercial Chicken Production. Annual 2nd Edn, AV., publication Company I.N.C., Westpost Connecticut, USA.

NRC, 1977. Nutrient requirements of domestic animals, N0. 9 Nutrient requirements of rabbits. Second revised Ed. National Academy of Science-National Research Council, Washington, DC, USA.

Obese, F.Y., E.L. Osafo and D.B. Okai, 2001. Evaluation of palm press fiber using *in vitro* digestibility techniques. Trop. Anim. Health Prod., 33: 165-172.

Onifade, A.A. and O.O. Tewe, 1993. Effect of palm oil on the use of cassava peel meal by rabbits. Trop. Anim. Prod., 8: 27-32.

Randhir, S. and K. Pradhan, 1981. Forage evaluation. First published, 1981 printox, New Delhi, Dhawan Printing works.

Snedecor, G.W. and W.G. Cochran, 1967. Statistical Methods. 6th Edn. The Iowa State University Press. Ames, Iowa, U.S.A.

Spreadbury, D. and J. Davidson, 1978. A study of the need of fiber by the growing New Zealand White Rabbit. J. Sci. Feed Agr., 29: 640 (abstract).

Taiwo, A.A., A.D. Adejuyigbe, E.A. Adebowale, J.S. Oshotan and O.O. David, 2004. Effect of tridax procumbens, panicum maximum and pawpaw leaves (Carica papaya) supplemented with concentrate on the performance and nutrient digestibility of weaned rabbits. Proc. 29th march, 20 -25, Usmanu Danfodia University Sokoto Nigeria.

Uko, O.J., A.M. Ataja and H.B. Tanto, 1999. Response of rabbits to cereal by-products as energy sources in diets. Arch. Zootic, 48: 285-294.

USDA, 1973. The ABCs of Domestic farm raised rabbit meat. Circular No. 549, Washington D.C., pp: 44-49.

Zahraa Abo El-Ezz and Manal Z. El-Deen, 1996. Effect of feeding food wastes on the age and weight at puberty and reproductive characteristics of male rabbits. Egypt. Poult. Sci., 16: 329-345.