Egypt. J. Agric. Res. , 72 (1), 1994.

THE USE OF ACID PACK 4-WAY AS A GROWTH PROMOTER IN BARLEY CONTAINING DIETS FOR BROILERS

A.M.. ABBAS, Y.A. MADY AND H.M. FAYEK

Animal Production Research Institute, Agricultural Research Centre, Dokki, Giza Egypt.

(Manuscript received 6 June 1993)

Abstract

The effect of using Acid Pack 4-Way (AP4W) as a growth promoter and/or sieving process of ground barley on improving the utilization of local barley in broiler diets were studied.

Two hundred forty unsexed one-day old Arbor Acres broiler chicks were raised under the same management condition during 7 weeks experimental period. They were divided into ten triplicate groups. Ten starter-grower and ten finisher diets were formulated in which the control diets were composed mainly from yellow corn (YC) and soybean meal. Ground barley (GB) or sieved ground barley (SGB) were used on the expense of YC in the control diets in two substitution levels of 25 and 50%. The diets were assigned to be without or with the addition of a biological product named AP4W. The chicks were fed on the starter-grower diets up to 4 weeks of age, then, they were switched on finisher diets up to 7 weeks of age. A digestibility trial was conducted at the end of the starter period of the fattening experiment for measuring digestion coefficients and feeding value of the experimental diets. At 7 weeks of age, representative chicks were taken randomly from each treatment for measuring carcass characteristics. The results could be summarized in the following points:

1. The digestibility trial showed that sieving barley and supplementing barely with AP4W had an appreciable effect in improving the digestibility coefficients of nutrients and the calculated metabolizable energy value of the barley-containing diets.

2. Replacing YC with GB at 25 and 50% levels depressed growth performance as compared to that of the control group.
3. Replacing YC with SGB at 25 and 50% showed similar growth performance to that of control group.
4. Using AP4W in 25% GB-diet improved growth performance, whereas it did not have any effect on the other diets including the control.
5. Using GB and SGB without or with AP4W supplementation in broiler diets did not affect carcass characteristics.

It could be concluded generally that SGB could be used safely in broiler starter-grower and finisher diets up to 50% on the expense of YC, whereas, the whole GB could be used up to 25% when the diet was supplemented with AP4W.

INTRODUCTION

Recently, it has been almost impossible to prepare high quality poultry feeds without the use of chemical or biological additives because they became vital to modern feeds.

Lyons and Jacques (1987) demonstrated that, the use of digestive enzymes with microincapsulated bacteria, yeast culture and acidifiers could help to bring about natural birds. These biological products improve the performance of birds on different mechanisms of action. Enzymes, aid in situ digestion, bacteria (probiotic), yeast culture and acidifiers in controlling *E. Coli / Lactobacillus* form in the digestion tract for complete utilization of nutrients.

The objective of the present study was to evaluate the influence of using the biological preparation "Acid Pack 4-Way" in broiler fattening diets either containing ground barley or sieved ground barley on chick performance.

MATERIALS AND METHODS

The present study was carried out in the Barrage Poultry Farm, Animal Production Research Institute, ARC,Egypt.

Fattening experiment was conducted using two-hundred - forty unsexed one-

day old Arbor Acers broiler chicks. They were raised under the same management conditions in electrically heated batteries on wire screen floor and fed for one week on a commercial starter broiler diet (22% CP and 3100 Kcal/kg ME). Thereafter, chicks were divided according to their weights into 30 groups of eight chicks each (10 treatments x 3 replicates). Chick groups had an average body weight of 134.7 ± 1.89g. Ten starter-grower and ten finisher diets were formulated in which the control diets were composed mainly from yellow corn (YC) and soybean meal. Ground barley (GB) or sieved ground barley (SGB) were used on the expense of YC in the control diets in two substitution levels of 25 and 50%. The diets were assigned to be without or with the addition of biological product named Acid Pack 4-Way (AP4W) at the level of 4.5 kg/ton as recommended by the manufacturer*.

The product "Acid Pack 4-Way" used in the present study contains: citric and sorbic acid, sodium citrate, sodium chloride, ammonium chloride, zinc sulfate, magnesium sulfate, dextrose, vanillin, sodium saccharine, dried *Streptococcus faecium* fermentation product, dried *Lactobacillus acidophilus* fermentation product, dried *Asperagillus niger* fermentation extract, dried *Bacillus subtilis* fermentation extract and beta glucan (encapsulated agent).

The control diets contained about 21% CP and 3000 Kcal/kg ME for the starter-grower diets and about 18% CP and 3050 Kcal/kg ME for the finisher diets. The other nutrients were adjusted to satisfy the requirements of broiler chicks (NRC 1984). However, no attempt was carried out to equalize diets in energy and protein content. Dietary composition and calculated analysis of the starter-grower and the finisher diets are shown in Tables 1 and 2, respectively. The chicks were fed on the experimental starter-grower diets from 1-4 weeks of age, then they were switched on the experimental finisher diets from 5-7 weeks of age. Feed and water were offered *ad. lib.* Artificial light was used to provide 24 hours photo-period daily. At 4 weeks and 7 weeks of age, body weight (BW) and feed consumption (FC) were recorded to be used for the calculation of body weight gain (BWG) and feed efficiency (FE) of the experimental treatments. Digestibility coefficients, on dry matter basis, for crude protein (CP), ether extract (EE), crude fiber (CF) and nitrogen free extract (NFE) of the ten experimental diets were determined according to the digestibility trial described by El-Sherbiny *et al.* (1986a) at the end of the starting period

* Alltech, Biotechnology Center, 3031 Catnip Hill Pike. Nicholasville, KY 40356, ALLTECH (U.K.) - Abenbury way, Wrexham Ind. Estate. Wrexham, Clwyd Great Britain LL 13 guz.

(4 weeks of age). At the end of fattening experiment (7 weeks of age) four representative chicks were taken at random from each treatment. They were slaughtered for determining carcass characteristics as described by El-Sherbiny *et al.* (1986b). Proximate analysis were determined in the experimental diets, ground barley grain, sieved ground barley grain, barley hulls and dried excreta according to the official methods (AOAC 1980). Statistical analysis was performed using analysis of variance (Steel and Torrie 1980). Significant differences among means were separated by using Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

Chemical Analysis:

Percentages of CP, EE, CF, NFE and ash, on dry matter (DM) basis, in samples of ground barley grain, sieved barley grain and barley hulls are presented in Table 3. It is clear that, the ground barley grain is higher in CP % and CF %, but lower in EE %, NFE % and Ash % than the sieved grains. The chemical composition of the ground barley and sieved ground barley in the present study is, however, close to that of the ground barley published by some investigators (Daghir and Rottensten 1966, and El-Sherbiny *et al.* 1986a). On the other hand, chemical composition of hulls resulting from sieving ground barley gave values which may suggest that such by-product can be used in animal and poultry diets as well as wheat bran.

The chemical composition was used for calculating metabolizable energy (ME) as described by Janssen and Carre (1989). Results showed that, the sieved ground barley grain is higher in ME/kg than ground barley grain and much higher than barley hulls. These results-share due to the high fiber content of barley hulls.

Table 1. Composition and calculated nutrient contents of starter-grower diets.

Ingredients	Control %	Control +AP4W %	25GB %	25GB +AP4W %	50GB %	50GB +AP4W %	25SGB %	25SGB +AP4W %	50SGB %	50SGB +AP4W %
Ground yellow corn	67.94	67.94	50.96	50.96	33.97	33.97	50.96	50.96	33.97	33.97
Ground barley grain	-	-	16.98	16.98	33.97	33.97	-	-	-	-
Sieved barley grain	-	-	-	-	-	-	16.98	16.98	33.97	33.97
Soybean meal (44%)	*22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Protein concentrate (50%)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Meat meal (60%)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
DL-Methionine	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Additives (AP4W) 4.5 kg/ton	-	+	-	+	-	+	-	+	-	+
Total	100	100	100	100	100	100	100	100	100	100
Calculated analysis:										
CP %	21.20	21.20	21.44	21.28	21.69	21.69	21.24	21.24	21.30	21.30
ME, Kcal/kg	2994	2994	2928	2998	2862	2862	2988	2988	2914	2914
Ca %	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
P %	0.75	0.75	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Lysin %	1.10	1.10	1.14	1.14	1.17	1.17	1.14	1.14	1.17	1.17
Methionine + Cystine %	0.78	0.78	0.73	0.78	0.79	0.79	0.73	0.73	0.79	0.79

* Each kg of protein concentrate contains:

Protein	500g	Calcium	70g	Av. Phosphorus	50 g
Lysine	27g	Methionine	16g	Methionine + Cystine	22 g
ME (k Cal/kg)	2100				
Vit. A	240000 IU	Nicotinic acid	440 mg	Cu	200 mg
Vit. B3	60000 IU	Pantothenic acid	200 mg	Mn	1000 mg
Vit. E	200 IU	Folic acid	20 mg	Zn	1000 mg
Vit. K	40 mg	Biotin	1500 mg	Fe	600 mg
Vit. B1	20 mg	Choline chloride	20000 mg	Se	2 mg
Vit. B2	100 mg	Zinc bacitracin	400 mg	I	10 mg
Vit. B6	30 mg	Antioxodant	1250 mg		
Vit. B12	200 mg				

Table 2. Composition and calculated nutrient contents of finisher diets.

Ingredients	Control %	Control +AP4W %	25GB %	25GB +AP4W %	50GB %	50GB +AP4W %	25SGB %	25SGB +AP4W %	50SGB %	50SGB +AP4W %
Ground yellow corn	73.50	73.50	55.12	55.12	36.75	36.75	55.12	55.12	36.75	36.75
Ground barley grain	-	-	18.38	18.38	36.38	36.38	-	-	-	-
Sieved barley grain	-	-	-	-	-	-	18.38	18.38	36.75	36.75
Soybean meal (44%)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Protein concentrate (50%)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Meat meal (60%)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Lime stone	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Additives (AP4W) 4.5 kg/ton	-	+	-	+	-	+	-	+	-	+
Total	100	100	100	100	100	100	100	100	100	100
Calculated analysis:										
CP %	18.69	18.69	18.92	18.92	19.22	19.22	18.74	18.74	18.79	18.79
ME, Kcal/kg	3041	3041	2969	2969	2898	2898	2997	2997	2954	2954
Ca %	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
P %	0.67	0.67	0.68	0.68	0.69	0.69	0.68	0.68	0.69	0.69
Lysin %	0.93	0.93	0.97	0.97	1.01	1.01	0.97	0.97	1.01	1.01
Methionine + Cystine %	0.65	0.65	0.66	0.66	0.67	0.67	0.66	0.66	0.67	0.67

* As in Table 1.

Table 3. Chemical compoisition of ground sieved and hulls of barley.

Item	DM	CP	EE	CF	Ash	NFE	ME*
Gound barley grain	91.78	11.18	3.13	6.44	4.11	75.14	2961
Sieved ground barley grain	91.98	9.88	3.67	5.10	6.66	77.69	3115
Hulls of barley grain	92.42	10.20	2.04	14.20	3.95	69.61	2093

* ME calculated according to Janssen and Carre' (1989).

Digestibility and feeding value:

The effect of using ground barley and sieved barley grains without or with AP4W supplementation on digestibility of dietary nutrients and feeding value in term of ME are shown in Table 4. It is obvious that, using ground barley or sieved ground barley each at either 25 or 50% on the expense of yellow corn decreased the ME by about 4.63% and 2.58%, respectively. Diets in which sieved ground barley was used showed some improvement in digestibility coefficients of nutrients and ME values than those containing the ground barley grains. On the other hand, supplementation of these diets with AP4W showed also similar improvement.

The supplemented control diet with AP4W showed higher ME value (3553 kcal) than the other supplemented diets. It seems likely to find out that supplementation of GB-diet with AP4W could improve ME value to be close to that of the control, corn-diet. Supplementation of SGB-diet with AP4W showed similar ME values to that of the supplemented control diet. This could be an indication that both AP4W supplementation and sieving treatments had appreciable effects on digestibility coefficient and feeding value of barley-containing diets.

The performance of chicks:

Growth performance of chicks in terms of BW, BWG, FC and FE in the starter-grower (1-4 wks), finisher (5-7 wks) and the overall experimental period (1-7 wks) are summarized in Table 5.

Mortality was distributed normally along with the experimental treatments without clear trend either during starter-grower, finisher or the overall experimental period. Therefore, death of chicks could be attributed to reasons other than the dietary treatments.

The statistical analysis of results revealed noticeable discrepancies between the starting-growing period and the finishing period in each of the utilized growth parameters as treatment effect. Therefore, results of the overall fattening period (1-7 week of age) was undertaken for the nutritional evaluation of the experimental treatments. The results indicated that chicks consumed similar amounts of feed from different treatments except those of 50% GB, showing significantly ($P < 0.05$) lower FC. Consequently BW, BWG and FE decreased significantly ($P < 0.05$) as compared to other treatments. Significant lower feed efficiency was also obtained with 25% GB, however, feed consumption did not vary significantly. The use of SGB (25, 50%) showed significantly better growth performance than the use of GB without sieving (25 and 50%). It is also noticed that increasing the level of GB in the diet

Table 4. Digestion coefficients and feeding value (ME) of the experimental diets.

Item	Control	Control +AP4W	25GB	25GB +AP4W	50GB	50GB +AP4W	25SGB	25SGB +AP4W	50SGB	50SGB +AP4W
OM %	82.25	84.51	80.94	83.08	72.04	81.32	81.26	83.20	80.65	83.32
CP %	87.79	90.01	87.09	90.67	86.29	87.95	87.73	89.64	88.43	88.53
EE %	73.37	72.90	65.01	59.93	63.11	71.51	73.64	72.25	68.57	81.93
CF %	28.53	38.52	46.51	50.21	27.62	30.11	24.06	40.68	51.10	48.94
NFE %	84.58	86.55	82.68	84.57	81.67	83.78	83.53	84.53	80.97	84.28
ME Kcal/kg*	3445	3553	3308	3383	3263	3374	3384	3471	3328	3462

* ME calculated as (TDN x 4.18) according to Fraps (1946).

Table 5. Effect of the experimenal diets on the performance of Arbor Acers broiler chicks.

Item	Control	Control +AP4W	25GB	25GB +AP4W	50GB	50GB +AP4W	25SGB	25SGB +AP4W	50SGB	50SGB +AP4W
Live body weight (g)										
At one week	133.9 a	135.0 a	134.0 a	136.5 a	134.6 a	134.8 a	135.0 a	135.6 a	132.9 a	134.6 a
At 4 weeks	788.0 a	766.1 ab	741.4 bcd	774.8 a	865.1 e	733.8 cd	759.0 abc	778.5 a	727.1 d	72.1 a
At 7 weeks	1853.8 ab	1886.2 a	1727.1 c	1834.2 ab	1584.6 d	1674.6 c	1808.9 ab	1835.0 ab	1800.5 b	1838.1 ab
Body weight gain (g)										
From 1-4 weeks	654.1 a	631.1 ab	607.4 bcd	638.3 ab	550.5 e	599.0 cd	624.0 abc	642.9 a	594.2 d	637.5 a
From 4-7 weeks	1065.8 a	1120.1 a	985.7 b	1059.4 a	899.5 c	940.8 bc	1049.9 a	1056.5 a	1073.4 a	1066.0 a
From 1-7 weeks	1719.9 a	1751.2 a	1593.1 c	1697.7 ab	1450.0 d	1539.8 c	1673.9 ab	1699.4 ab	1667.6 b	1703.5 ab
Feed consumption (g)										
From 1-4 weeks	1249.0 a	1193.8 bc	1139.5 d	1209.9 ab	1148.9 cd	1177.0 bcd	1177.8 bcd	1222.2 ab	1186.1 bcd	1214.6 ab
From 4-7 weeks	2732.7 ab	2715.5 ab	2829.6 a	2664.5 bc	2555.3 c	2774.3 ab	2653.4 bc	2653.5 bc	2749.4 ab	2721.9 ab
From 1-7 weeks	3981.7 a	3909.3 ab	3969.1 a	3874.4 ab	3704.6 c	3951.3 ab	3831.2 b	3875.7 ab	3935.5 ab	3936.5 ab
Feed efficiency*										
From 1-4 weeks	0.5 a	0.5 a	0.5 a	0.5 a	0.5 c	0.5 b	0.5 a	0.5 a	0.5 b	0.5 a
From 4-7 weeks	0.4 ab	0.4 a	0.3 cd	0.4 ab	0.4 c	0.3 d	0.4 ab	0.4 ab	0.4 b	0.4 ab
From 1-7 weeks	0.4 a	0.4 a	0.4 bc	0.4 a	0.4 c	0.390 c	0.4 a	0.4 a	0.4 ab	0.4 a

* Feed effieiency calculated as body weight gain (g)/feed consumption (g).
Means within the same raw with different superscripts are significantly different ($P < 0.05$).

from 25 to 50% significantly depressed growth performance, whereas such increase using SGB maintained growth performance as that of the control diet.

Supplementation of 25% GB with AP4W significantly increased ($P < 0.05$) BW, BWG and FE to be insignificantly different from those of the control. However, such supplementation increased significantly BW and BWG of chicks fed on 50% GB, while no improvement was obtained in FE. No significantly improvement in FE was achieved as a result of AP4W supplementation either to 25% SGB or 50% SGB. Such treatments exhibited significantly FE value to those of control treatments.

As a result of replacing YC by GB or SGB, slight differences in ME and CP content are found between different treatments except that of 50% GB-diet which showed markedly lower ME value (by calculation). The ME values obtained from the digestibility trial showed the same trend. This finding may explain the non-favorable effect of incorporating GB at 50% on the expense of YC to obtain comparable growth performance. In addition, it was surprising to find out that chicks tended to decrease FC instead of increasing it to compensate energy shortage. The unpalatability of this diet may be the reason. The chicks fed on 25% barley diets showed the similar feed consumption and ME intake. Therefore, the deteriorated growth performance may be due to unrecognized antigrowth factors in the utilized GB.

The ineffectiveness of AP4W in 50% barley diet seemed to be related to that the inclusion rate was not enough to exhibit the beneficial effect. This could be explained on the basis that such inclusion rate was effective in 25% barley diet.

Sieving barley obviously increased ME either calculated or determined which had been reflected on the overall dietary ME value, resulting in the similar chick growth performance as that of the control. The unachievable improvement in growth by AP4W supplementation to SGB diet may be indicated that the site of action is in barley hulls which have been separated.

Information about the use of GB in broiler diets was concerned with high energy diets. Ewing (1963) indicated that barley can replace up to 50% of corn with almost comparable growth performance but with less feed efficiency. Results of some investigators reviewed by Ewing (1963) have shown that the use of fat or oils may serve as an aid factor in improving the feed efficiency of barley diets. The use of barley up to 25% on the expense of YC (13 to 15.25% of the diet) in high energy broiler diets excepted no significant adverse effect on growth of chicks, while growth depression was obtained when 50 and 100% was included in the ration (Ewing 1963). On the other hand, Arscott *et al.* (1955) found that without the addition of

animal fat, only 1/2 of the ground corn could be replaced by barley. Generally, Patrick and Schiable (1980) have shown that 10% ground barley in the grower and finisher diets for broilers are recommended as the maximum inclusion rate, and the use of GB in the starter diets is not recommended. This may explain results obtained in the present study that 16.8% and 18.38% GB (25% of YC) in the starter-grower and finisher diets, respectively, gave an adverse effect on growth and feed efficiency. However, Feltwell and Fox (1980) cited a rate of barley inclusion in poultry young stock diets ranging from 5-20%, Gohl (1977) limited its use in broiler diets to be 20-25%. The substitution of YC with GB in broiler finisher diets ranged from 25-30% without any adverse effect on growth performance as recommended by some workers (Isshiki *et al.* 1980, Masanowiski *et al.* 1982 and Ozkan and Peker 1982).

Fraps (1946) cited that dehulling barley increases the productive energy of barley from 70 to 85%. From a series of experiments with chicks, it was found that the removal of 17% of outer portion of GB slightly improved the feeding value. From our results the removal of about 70% of barley hulls increased the calculated ME value of barley by about 5.20%. Consequently, the dehulled barley (SGB) served more in the fattening diets as compared to barley itself.

In the literature little informations are found about the use of dehulled or pearled barley in broiler diets. An early study conducted by Fry *et al.* (1958) showed that pearled barley may substitute half of the grain component without determinant to growth and feed utilization. However, it was reported that rations based on hulless barley were superior to those on regular barley. This finding had been attributed to the unavailability of carbohydrates other than crude fiber (Fry 1958). Furthermore, the study conducted by Aleksandrov (1980) showed lower growth performance of chickens fed on pearled barley compared to barley. Therefore, it was promising to find out in the present study that, the diet of 50% pearled barley surpassed that of 50% barley. This could indicate that the presence of YC in the grain mixture with pearled barley are favorable (Arscott 1963).

In respect to AP4W supplementation, studies carried out by Tortuero (1973), Dilworth and Day (1978) and Grawford (1979) with chicks have proved the successful use of such biological product in improving growth. Results obtained herein are in general agreement with those studies, though the effect is limited with the type of diets (starter-grower and finisher) containing 25% GB or SGB on the expense of yellow corn.

Carcass characteristics:

The effect of feeding GB and SGB diets with or without AP4W supplementation to broiler chicks on its carcass characteristics is shown in Table 6. Statistical analysis of difference in live body weight between chicks showed the same trend found along with fattening experiment. Dressing, giblets and abdominal fat relative to LBW ranged from 67.25 to 69.82%, from 4.57 to 5.33% and from 1.6 to 3.0%, respectively. However statistical analysis showed insignificant differences between treatments in all parameters of carcass characteristics. Generally, the use of GB or SGB either without or with AP4W supplementation did not show positive or negative effect on characteristic traits as compared to corn diet. Particularly, the use of 25% GB diets with AP4W supplementation and 50% SGB gave similar carcass characteristics as those obtained with the control. Generally, studies carried out by El-Kotoury (1959), El-Helaly (1983) and El-Sherbiny *et al.* (1986), concluded that, since diets are equalized and balanced to satisfy chick requirements, no dietary effect could be reflected on carcass characteristics. Concerning the use of AP4W as a growth promoter, little informations are available in the literature about its effect on carcass characteristics. However, the present results could indicate that the addition of AP4W to barley diets has no appreciable affect on carcass characteristics. Similar observation was previously obtained by Feyek *et al.* (1990) where they concluded that utilized growth promoters (enzymes, antibiotics, probiotics) have no considerable effects on carcass characteristics.

Table 6. Effect of the experimental diets on carcass characteristics of broiler.

Item	Control	Control +AP4W	25GB	25GB +AP4W	50GB	50GB +AP4W	25SGB	25SGB +AP4W	50SGB	50SGB +AP4W
Live body weight	1869ab	1883a	1764c	1876ab	1596d	1690c	1823ab	1816ab	1825b	1843ab
Dressing weight %	69.05a	67.81a	69.82a	69.56a	68.94a	68.71a	67.25a	69.08a	67.48a	69.59a
Giblets %	4.93a	4.57a	5.13a	4.98a	5.33a	4.75a	4.95a	4.58a	4.84a	4.84a
Abdominal fat %	2.70a	2.10a	2.46a	3.00a	2.24a	1.94a	2.40a	1.99a	1.88a	1.60a

Means within the same row with different superscripts are significantly different ($P < 0.05$).

REFERENCES

1 . Aleksandrov, V.A. 1980. Barley as a replacer for maize for broiler chickens. Doklady Vsesoyuznoi Ordena Lenina Akademii Sel'skokhozyaistvennykh Nouk, 1980, No. 3, 26-27 (C.F. Nut. Abst. & Rev., 1980, 50(12), 6717).

2 . Arscott, G.H. 1963. Use of barley in high-efficiency broiler rations. 6. Influence of small amounts of corn on improvement of barley. Poul. Sci., 42: 301.

3 . Arscott, G.H. and J.E. Parker. 1955. Use of barley in high-efficiency broiler rations. 1. The influence of methionine, grit and stabilized animal fat on efficiency of utilization. Poul. Sci., 34: 655.

4 . Association of Official Analatical Chemists, A.O.A.C. 1980. Official methods of analysis, 13th Ed. AOAC, Benjamin Franklin Station, Washington, D.C.

5 . Daghir, N.J. and K. Rottensten 1966. The influence of variety and enzyme supplementation on the nutritional value of barley for chicks. Br. Poul. Sci., 7: 195-163.

6 . Dilworth, B.C. and E.G. Day. 1978. Lactobacillus cultures in broiler diets. Poul. Sci., 57: 1101.

7 . Duncan, D.B. 1955. Multiple range and multiple F tests. Biometric, 11: 1-42.

8 . El-Helaly, N.A.H. 1983. The effect of various dietary fat source and levels on the performance of broiler chicks. M.Sc. Thesis Fac. Agric., Cairo Univ.

9. El-Kotoury, M.I. 1959. Economic of feeding for egg and meat production in poultry. Ph.D. Thesis. Fac. Agric., Cairo Univ.

10. El-Sherbiny, A.E., M.I. El-Kotoury, M.H. Radwan and A.M. Abbas. 1986a. Cassava root meal as poultry feed: 1. Feeding value and metabolizable energy of cassava root meal compared with some other energy sources. 7th International conference on Animal Production. Cairo, Sept. 1986.

11. El-Sherbiny, A.E., M.H. Radwan, M.I. El-Kotoury and A.M. Abbas.1986b. Cassava root meal as poultry feed: 4. Effect of replacing yellow corn with graded levels of cassava root meal in broiler rations on carcass characteristics with references to economical aspects. 7th International conference on Animal production. Cairo, Sept. 1986.

12. Ewing, W.R. 1963. Poultry Nutrition. 5th Ed. Hoffman La Roche Inc. Nutley, New Jersey, USA.

13. Fayek, H.M., Y.A. Mady, A.S. Darwish and M.T. Shulkamy. 1990. Evaluation of some antibiotics, probiotics and enzymes in broiler feeds as growth promoters. J. Agric. Sci., Mansoura Univ. 15(8): 1203-1213.

14. Feltwell, R. and S. Fox. 1980. Practical Poultry Feeding. Ed. E.L.S.B., Faber and Faber Limited. Great Britain, P. 255..

15. Fraps, G. 1946. Relation of the protein, fat and energy of ration to the composition of chickens. Poul. Sci., 22: 421-424.

16. Fry, R.E., J.B. Allred, L.S. Jensen and J. McGinnis. 1958. Influence of energy

supplementation and water treatment on the nutritional value of different grains for poults. Poul. Sci., 37: 372-375.

17. Gohl, B. 1977. Effects of hydrocolloids on productive value and feeding characteristics of barley. Thesis Ph.D. Swedish Univ. of Agric. Sci., Uppsala, Sweden (C.F. Gohl *et al.* 1978).
18. Gohle, B., S.A. Alden, K. Elwinger and S. Thomke. 1978. Influence of ß-glucanase on feeding value of barley for poultry and moisture content of excreta. Br. Poul. Sci., 19: 41-47.
19. Grawford, J.S. 1979. Probiotics in animal nutrition. Proceeding of Arkansas Nutrition Conference, 1979, P. 45-55.
20. Isshiki, Y., H. Shin, K. Ohmatsu and H. Ueds. 1980. The use of broiler rations. Kagawa Daigaku Nogakubu Hokuzyutu Hokoku. 32: 13-16 (C.F. Nut. Abst. & Rev. 1981, 51, 10).
21. Janssen, W.M.M.A. and B. Carre. 1989. Influence of fiber on digestibility of poultry feeds. Recent Development in poultry Nutrition. 1st Ed. Col-Haresign. London. 1989.
22. Lyons, T.P. and K. Jacques. 1987. Biological tools improve poultry performance. Misset International Poultry, An. Intern. Mag. Poul., 3(4), 1987.
23. Masanowski, A., W. Doruchowski and A. Faruga. 1982. An attempt to replace maize in concentrate mixture for broiler chickens by ground barley. Zootechnika. 1981. 23: 121-133. (C.F. Nut. Abst. & Rev., 1981, 52, 4).
24. National Research Council, NRC. 1984. Nutritive requirements of domestic animals. Nutrient requirement of poultry 8th Revised Ed., Nat. Acad. Press. Washington, DC.
25. Ozkan, K. and S. Peker. 1982. Replacement of maize by barley in feeds for fattening chickens. Ege Universities Ziraat Fakultesi Dergisi, 19(3): 59-65. (C.F. Nut. Abst. & Rev., 1983, 52, 4861).
26. Patrick, H. and P.J. Schaible. 1980. Poultry Feeds and Nutrition. 2nd Ed. AVT Publishing Co., Inc., Westport, USA.
27. Steel, R.G.D. and J.H. Torrie. 1980. Principles and procedures of statistics. 2nd. Ed. McGraw Hill Book Co. Inc. New York.
28. Tortuero, F. 1973. Influence of implantation of Lactobacillus in chicks on the growth, feed conversion, malabsorption of fats syndrome and intestinal flora. Poul. Sci., 52: 197.

استخدام المنتج الحيوى ACID PAK 4-WAY كمنشط للنمو فى علائق كتاكيت التسمين المحتوية على الشعير

أحمد محمود عباس ، يحيى على ماضى ، حمدى محمد فائق

١ معهد بحوث الانتاج الحيوانى - مركز البحوث الزراعية - وزارة الزراعة - الجيزة - مصر

يهدف هذا البحث الى دراسة تأثير استخدام المنتج الحيوى ACID PAK 4-WAY وعملية نخل الشعير المطحون على تحسين الاستفادة من الشعير المحلى المستخدم فى علائق كتاكيت اللحم.

استخدم فى هذا البحث ٢٤٠ كتكوت تسمين (أربر إكرز) عمر يوم واحد تمتقسيمها الى ثلاثين مجموعة مقارنه فى الوزن فى بطاريتان للتسمين. وقد أعطيت الكتاكيت عليقة تسمين تجارية من عمر يوم حتى أسبوع ثم تم تغذيتها على العلائق التجريبية: ١٠ علائق بادىء / نامى تسمين من عمر أسبوع حتى الاسبوع الرابع ثم ١٠ علائق ناهى تسمين من الاسبوع الخامس حتى الاسبوع السابع. وقد ركبت هذه العلائق بحيث تحتوى العليقو الضابط على الذرة الصفراء كمصدر رئيسى للطاقة بالاضافة الى كسب فول الصويا كمصدر رئيسى للبتروتين. أما بقية العلائق فقد تم فيها استبدال الذرة الصفراء بالشعير أو الشعير المنخول على مستويين للاستبدال ٢٥ ، ٥٠٪ باضافة أو بدون اضافة المنتج الحيوى المختبر ACID PAK 4-WAY

فى نهاية الاسبوع الرابع تم اجراء تجربة هضم لعلائق البادىء لتقدير معامل الهضم للمركبات الغذائية وحساب الطاقة الممثلة بها. وفى نهاية الاسبوع السابع تم أخذ القياسات الخاصة بالنمو لتقييم الاداء الانتاجى كما تم اجراء تجربة ذبح لاخذ القياسات الخاصة بمواصفات الذبيحة.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

١ - بينت تجربة الهضم أن نخل الشعير واضافة المنتج الحيوى المختبر يحسن بوضوح معامل هضم المركبات الغذائية والطاقة الممثلة المحسوبة للعلائق المحتوية على الشعير.

٢ - استبدال الذرة الصفراء بالشعير بنسبة ٢٥ ، ٥٠٪ يخفض الاداء الانتاجى للكتاكيت عن المجموعة المغذاة على عليقة الظابط.

٣ - استبدال الذرة الصفراء بالشعير المنخول بنسبة ٢٥ ، ٥٠٪ أعطت نفس الاداء الانتاجى الذى أعطته الكتاكيت المغذاه على عليقة الظابط.

٤ – استخدام المنتج الحيوى المختبر فى العليقة المحتوية على الشعير بنسبة استبدال ٢٥٪ من الذرة الصفراء يحسن الاداء الانتاجى ، بينما استخدامه فى العلائق الاخرى بما فيها الظابط لم يظهر أى تأثير.

٥ – استخدام الشعير والشعير المنخول بدون اضافة أو اضافة المنتج الحيوى المختبر لا يؤثر على مواصفات الذبيحة.

وعموما يمكن أن يستنتج من هذه الدراسة أن الشعير المنخول يمكن أن يستخدم فى علائق البادئ / الناس وعلائق الناهى بنسبة ٥٠٪ من الذرة الصفراء بينما يمكن استخدام الشعير بنسبة ٢٥٪ من الذرة الصفراء عندما يضاف للعليقة المنتج الحيوى المختبر.