Date stones in broiler's feeding

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Summary

To evaluate date stones as dietary component for broilers, two trials were carried out. In the first trial, Tunisian Deglet date stones were used and in the second one, stones were the waste product of an Italian distillery. One-day-old Arbor Acres chickens were cage reared and fed for 6 weeks on 4 experimental diets, which were formulated to be isonitrogenous and isocaloric and differed in cereal component (maize or low tannin sorghum) and in inclusion level (0 or 10%) of ground date stones. Birds' performances were slightly different in the two trials, but overall results indicate that date stones are suitable for use in broiler's feeding under such conditions.

Résumé

Deux essais ont été effectués pour étudier la possibilité d'emploi des noyaux de dattes dans l'alimentation des poulets de chair. Lors du premier on a utilisé des noyaux de dattes Deglet provenant de Tunisie et lors du second les déchets de fabrication d'une distillerie italienne. On a préparé quatre aliments, théoriquement isoprotidiques et isoénergétiques, différents par la céréale employée (maïs ou sorgho pauvre en tanins) et le taux d'incorporation (0 ou 10%) de noyaux broyés. Ces aliments ont été distribués à volonté à des poulets Arbor Acres élevés en cage du premier jusqu'au quarante-deuxième jour d'âge, en enregistrant le poids vif individuel et les consommations par cage. Dans l'ensemble, les résultats des deux essais indiquent qu'il est possible d'utiliser les noyaux de dattes au taux d'incorporation de 10% sans influencer négativement les performances des poulets.

Introduction

Date stones are the waste product of date processing for human consumption or of the fermentation industry, making up approximately 15% of the total weight of processed dates. Their chemical composition is variable, depending on variety and processing of dates. However, in view of their nitrogen free extract and lipids content (whose sum can exceed 50% of the feed) date stones are considered a possible substitute energy source for the conventionally used cereals in animal feeding (5,6).

According to the results of feeding trials reviewed by Alwash and De Peters (1), date stones could be used up to 50-75% in diets for ruminants if such diets were balanced in available nitrogen. Under the same condition, but at lower levels (10-15%), date stones also appear to be suitable for use in broiler's feeding (5).

On the basis of these findings, two consecutive trials on broilers were conducted by using date stones of different origin.

Materials and methods

In the first trial, Deglet date stones purchased in a Tunisian market were studied. They may be the by-product of handling dates for human consumption or of molasses industry as well.

In the second trial, the stones were the waste product of an Italian distillery.

Chemical composition of both products, determined according to the A.O.A.C. (2) is shown in table 1.

In each trial, four diets were prepared, which were formulated to be isonitrogenous and isocaloric. They substantially differed in cereal used as the main energy source (maize or low tannin sorghum) and in inclusion level (0 or 10%) of ground date stones (Tables 2 and 3).

Diets were provided *ad libitum* to one-day-old Arbor Acres chickens of both sexes (120 in the first trial, 117 in the second one), cage reared for 6 weeks in a poultry house naturally ventilated and equipped with an adequate heating system. Average relative humidity was about 70% and temperature at the level of the birds ranged from 32°C during the first week to 20°C during the last three weeks.

Birds were allocated at random to 24 groups, males and females separately, obtaining 3 replicate groups per dietary treatment and per sex.

Neither chemoprophylactic nor therapeutic treatments were made during the trials.

TABLE 1

Proximate analysis, calcium and phosphorus content of date stones utilised in the two trials.

Trial	Moisture %	Crude protein %	Ether extract %	Crude fibre %	Ash %	N-free extract %	Ca %	P %
1*	12.90	4.53	6.18	19.23	0.96	56.20	0.57	0.31
2**	13.85	5.85	4.96	26.46	1.95	46.93	0.27	0.15

* Tunisian Deglet.
**Distillery by-product

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TABLE 2

First trial. Composition of feeds (M/O = maize-no stones; M/10 = maize-10% stones; S/0 = sorghum-no stones; S/10 = sorghum-10% stones).

Ingredients (%)	STARTER (0-3 weeks)				GROWER (3-6 weeks)			
	M/0	M/10	S/0	S/10	M/0	M/10	S/0	S/10
Maize meal	52.00	44.00	—	—	61.50	54.00	—	—
Sorghum meal*	—	—	55.45	48.45	—	—	62.00	56.00
Soybean meal (solv.)	34.00	37.70	31.00	35.00	29.50	30.45	26.00	28.20
Dehy. lucerne meal	4.00	—	4.00	—	4.45	—	4.45	—
Barley meal	5.00	1.00	5.00	—	—	—	3.00	—
Date stones meal	—	10.00	—	10.00	—	10.00	—	10.00
Soybean oil	1.45	3.75	1.00	3.00	1.00	2.00	1.00	2.25
Calcium carbonate	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Dicalcium phosphate	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Sodium chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix**	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DL-methionine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Proximate analysis (%)								
moisture	11.85	11.05	11.70	10.65	11.90	11.00	11.50	10.35
crude protein	19.96	20.70	19.60	20.68	18.90	18.38	18.58	18.69
ether extract	3.44	5.11	2.47	4.24	3.96	5.43	5.13	5.59
crude fibre	3.83	3.96	4.02	4.51	3.88	4.45	3.89	4.03
ash	6.17	6.23	6.05	5.81	5.64	5.52	5.62	5.38
N-free extract	54.75	52.95	56.16	54.11	55.72	55.22	55.28	57.96
Ca	0.92	0.90	0.93	0.79	0.86	0.84	0.88	0.88
P	0.82	0.90	0.84	0.78	0.80	0.74	0.74	0.80
Calculated ME (Kcal/Kg)	2822	2830	2798	2800	2892	2826	2864	2832

* cv Aralba, .2% tannin content, determined by the Daiber method (3).

** Premix composition (per Kg): Vit. A 2,600,000 IU; Vit. D3 600,000 IU; Vit. E 2,000 mg; Vit. B1 400 mg; Vit. B2 1,000 mg; Vit. B6 260 mg; Vit. B12 3 mg; Vit. C 6,000 mg; Vit. K 400 mg; Vit. PP 5,000 mg; d-pantothenic acid 2,500 mg; folic acid 50 mg; choline 100,000 mg; cobalt 40 mg; iron 6,000 mg; iodine 300 mg; manganese 18,000 mg; copper 500 mg; zinc 9,000 mg, BHT 100 mg.

TABLE 3

Second trial. Composition of feeds (M/0 = maize-no stones; M/10 = maize-10% stones; S/0 = sorghum-no stones; S/10 = sorghum-10% stones).

Ingredients (%)	STARTER (0-3 weeks)				GROWER (3-6 weeks)			
	M/0	M/10	S/0	S/10	M/0	M/10	S/0	S/10
Maize meal	56.00	46.45	—	—	61.50	54.00	—	—
Sorghum meal*	—	—	59.50	49.00	—	—	65.00	56.00
Soybean meal (solv.)	35.45	37.00	32.95	34.45	29.50	30.45	26.00	28.20
Dehy. lucerne meal	—	—	2.50	—	4.45	—	4.45	—
Date stones meal	—	10.00	—	10.00	—	10.00	—	10.00
Soybean oil	1.00	3.00	1.00	3.00	1.00	2.00	1.00	2.25
Calcium carbonate	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Dicalcium phosphate	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Sodium chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix**	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DL-methionine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Proximate analysis (%)								
moisture	10.10	9.35	10.65	9.60	10.20	9.50	10.40	9.65
crude protein	20.20	20.20	20.45	20.90	18.30	17.84	18.19	18.00
ether extract	4.15	5.95	3.30	5.35	3.43	4.64	3.15	4.61
crude fibre	3.65	5.85	3.35	6.00	4.29	5.94	3.84	5.59
ash	7.50	6.70	6.30	6.25	6.18	6.33	5.80	5.59
N-free extract	54.40	51.95	55.95	51.90	57.60	55.75	58.62	56.56
Ca	1.12	1.04	0.95	1.06	0.91	0.92	0.88	0.87
P	0.85	0.80	0.83	0.79	0.72	0.74	0.78	0.80
Calculated ME (Kcal/Kg)	2767	2807	2835	2806	2892	2826	2893	2832

* cv Aralba, .2% tannin content, determined by the Daiber method (3).

** Premix composition (per Kg): Vit. A 2,600,000 IU; Vit. D3 600,000 IU; Vit. E 2,000 mg; Vit. B1 400 mg; Vit. B2 1,000 mg; Vit. B6 260 mg; Vit. B12 3 mg; Vit. C 6,000 mg; Vit. K 400 mg; Vit. PP 5,000 mg; d-pantothenic acid 2,500 mg; folic acid 50 mg; choline 100,000 mg; cobalt 40 mg; iron 6,000 mg; iodine 300 mg; manganese 18,000 mg; copper 500 mg; zinc 9,000 mg, BHT 100 mg.

Individual liveweight and feed intake per cage at 3 and 6 weeks of age were measured, mortality and culls also were recorded.

Liveweight, feed intake and efficiency ration data were subjec-ted to variance analysis by using a mixed model least-squares and maximum likelihood computer program by Harvey (4).

Results and discussion

Results of trials are shown for males and females and each dietary treatment separately.

Recorded data of the first trial (table 4) may be described as follows. Liveweight of males was not significantly different from one diet to another. In females fed on M/0 diet it was

TABLE 4

First trial. Performance data of 6 weeks old chickens. Estimated means

	MALES				FEMALES				M.S.E.
	(M/0) A	(M/10) B	(S/0) C	(S/10) D	(M/0) E	(M/10) F	(S/0) G	(S/10) H	(df)
Animals no.	14 Efg	14	15 Efg	14 e	14 h	15	14	15	(107)
Liveweight g	1725.36	1555.71	1732.00	1661.43	1468.57	1528.67	1529.64	1688.00	62227.9016
Replications no.	3	3	3	3	3	3	3	3	(16)
Feed intake g	3570.00	3360.00	3640.00	3388.00 fg	3374.00	3402.00	3374.00	3514.00	99813.0000
F.C.R.	2.22	2.20	2.16	2.12	2.24	2.28	2.27	2.18	0.0059

Significance of comparison between means is expressed by means of either capital letters or small letters ($P < .01$, $P < .05$) which correspond to groups indicated with letters on top of columns.

TABLE 5

Second trial. Performance data of 6 weeks old chickens. Estimated means.

	MALES				FEMALES				M.S.E.
	(M/0) A	(M/10) B	(S/0) C	(S/10) D	(M/0) E	(M/10) F	(S/0) G	(S/10) H	(df)
Animals no.	9 FG	12 dfg	13 eFGh	12 eFGH	15	13	14	14	(94)
Liveweight g	1693.89	1649.17	1743.08	1806.25	1585.00	1496.15	1488.21	1587.50	26374.8859
Replications no.	3 bCDh	3 d	3 fg	3 EFGh	3	3	3	3	(16)
Feed intake g	2969.33 bf	3365.00 ce	3437.33	3729.00	3223.00	3101.67	3080.33	3324.33	37699.2083
F.C.R.	2.04	2.27	2.06	2.13	2.10	2.23	2.17	2.15	0.0446

Significance of comparison between means is expressed by means of either capital letters or small letters ($P < .01$, $P < .05$) which correspond to groups indicated with letters on top of columns.

significantly ($p < .05$) lower than those fed on S/10. Comparing males with females it was found that males fed on M/0 and S/0 diets were heavier than females fed on M/0 ($P < .01$) and on M/10 and S/0 ($P < .05$).

Differences in feed intake were not significant at the considered probability levels.

Feed conversion efficiency was not different for males or females. In males fed on S/10, it was better ($P < .05$) than females fed on M/10 and S/0.

In the second trial (table 5), results were slightly different. For females, liveweight was not statistically different, while in males fed on M/10 it was lower ($P < .05$) than those fed on S/10. Comparing males with females, various significant differences were found. All males were different ($P < .05$ or $P < .01$) from females fed on M/10 and S/0 and males fed on S/0 and S/10 were different ($P < .05$ or $P < .01$) from females fed on M/0 and S/10.

Feed intake was not different for females, while in males fed on M/0 it was lower ($P < .05$ or $P < .01$) than the other male groups and in those fed on M/10 was lower ($P < .05$) than those fed on S/10. Comparing males and females it is clear that the intake of males fed on M/0 is different from that of females fed on S/10, that of males fed on S/0 is different from that of females fed on M/10 and S/0 and that of males fed on S/10 is different from that of all groups of females ($P < .05$ or $P < .01$).

Feed conversion efficiency was not different for females. In males fed on M/10 it was higher ($P < .05$) than those fed on M/0 and S/0. Between males and females two differences ($P < .05$) were found: the feed conversion efficiency of males fed on M/0 was lower than that of females fed on M/10 and males fed on M/10 had a feed conversion efficiency higher than females fed on M/0.

These results show that in these trials the inclusion of 10%of date stones in broiler's diets did not greatly affect the performance of the experimental groups. However, as regards males in the second trial, the inclusion of stones in the maize based diet (M/10) gave worse performance results than the corresponding control diet (M/0). This suggests possible differences in associative effects between the diet ingredients, that should be better studied by means of other experiences.

During the trials, at the time of the first recording of liveweight (21d), birds showing signs of suffering due to their poor adaptation to cage rearing and their reduced weight gain were culled, in order to avoid chemoprophylactic treatments and their possible influence on dietary treatment (table 6).

TABLE 6

Culls and mortality data of two trials.

Trial	Feed	Culled no.	Dead no.	Total no.	Total %
1	M/0	1	1	2	6.7
	M/10		1	1	3.3
	S/0	-	-		
	S/10		2	2	6.7
Total				5	4.2
2	M/0	5	1	6	20.0
	M/10	3	2	5	16.7
	S/0	1	-	1	3.4
	S/10		2	2	7.1
Total				14	12.0

Conclusions

Results of these trials substantially agree with literature (5) as the main differences between experimental groups are due to sex rather than dietary treatment.

Therefore, the utilisation of date stones as a substitute energy source for cereals can gain importance, particularly in palm growing countries, and in intensive rearing as well.

Even though some limits in non-ruminant feeding have to be considered, date stones and other indigenous products can help to lower feed energy cost and save some imported cereals, reserving them principally for human consumption.

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Samenvatting: Twee experimenten werden opgesteld om de mogelijkheid te bestuderen dadelpitten in de voeding van vleeskippen te incorporeren. In de eerste proef werden pitten van Degletdadels uit Tunesië gebruikt en, in de tweede, afval van een Italiaanse stokerij.
Vier voeders werden voorbereid die theoretisch isoënergetisch en isoproteïnisch waren en onder elkaar verschilden door de gebruikte graansoort (looïzuurarme maïs of sorgho) en door het percentage toegevoegde gemalen pitten (0 of 10%).
Deze voeders werden ad libidum verstrekt aan Arbor Acres vleeskippen in kooien ondergebracht van de eerste tot de tweeënveertigste dag van hun leven. Het levend gewicht werd voor elke kip afzonderlijk bepaald alsook het voedergebruik per kooi.
Globaal gezien, wijzen de resultaten van de twee experimenten op de mogelijkheid voeders met 10% dadelpitten te gebruiken zonder negatieve invloed op de prestaties van vleeskippen.

Resumen: Los huesos de dátil en la alimentación de los pollos.
Se ha estudiado la posibilidad de utilización de los carozos de dátil en la alimentación de los pollos a través de dos pruebas. Para la primera, se adquirieron los carozos en un mercado tunecino; para la segunda, en una destilería italiana. Para cada prueba se prepararon cuatro tipos de pienso con el mismo contenido de proteína y de energía metabilizable calculada: los piensos se diferenciaban por el cereal empleado (maíz o sorgo con bajo contenido de tanino) y por su contenido de carozos de dátil (0 o 10%). Con estos piensos se han alimentado a discreción pollos Arbor Acres criados en jaulas desde el primer día hasta los cuarenta y dos días de edad, controlando el crecimiento de cada ave y el consumo de pienso en cada jaula después de 21 y 42 días de prueba. Los resultados obtenidos muestran que el porcentaje del 10% de carozos de dátil no influye negativamente sobre la productividad de los pollos.

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