

Possible hormonal activity of date pits and flesh fed to meat animals

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Awassi lambs fed different levels of date by-products (date pits and flesh) were observed to gain body weight faster, have higher back fat thickness and less shrinkage per cent than their corresponding control. The weight gain and back fat deposition increased with the increase of the date by-products in the animal diets. Based on these observations it was hypothesized that these by-products may contain natural anabolic agents. Therefore, date pits aqueous extract was prepared and added to a rat's uterus suspended in an organ bath containing De-jalon's solution at 37°C. The free end of the uterus was threaded to an isotonic transducer connected to a MD₂ Washington recorder. The extract induced uterus contraction and its effect was not blocked by atropine or cyproheptadine but partially by prostaglandin-synthesizing inhibitors, suggesting that the extract acts in a similar fashion to oestrogens.

INTRODUCTION

In the past few years there have been attempts to use agricultural by-products in the diet formulation of meat animals. Several researchers have investigated the effects of incorporating them in ruminant diets (Robinson & Pritchard, 1973; Al-Kinani & Alawash, 1975; Rashid & Alawash, 1976; Elgasim *et al.*, 1989; Alyousef *et al.*, 1993) or monogastric animals (Jumah *et al.*, 1973; Al-Hiti & Rous, 1978; Kamel *et al.*, 1981; Al-Yousef, 1985). Some of these studies have reported on several advantages accruing from incorporation of date by-products in the animal diets. Some of these include increased weight gain, improved feed efficiency and improved meat palatability. However, it should be emphasized that there was no general agreement among the findings of these studies. Also, none of the above-mentioned studies attempted to give a possible explanation for the observed effects of the date by-products on the animal performance.

Since the late 1940s anabolic agents such as steroids, steroid-like compounds and synthetic steroids have been used in the animal industry, particularly for meat production. These compounds have been administered to the animals orally, incorporated with feed, implant or by injection. Lambs fed clenbuterol were found to exhibit increased rate of weight gain and decreased feed to gain ratio (Baker *et al.*, 1984). These findings were later confirmed by Beermann *et al.* (1986) using cimaterol. In addition, cimaterol treatment leads to a significant improvement in the dressing percentage, and rib eye muscle area and leg conformation was reduced.

The objectives of the current study were to examine the effects of diets containing different levels of date by-products on the carcass characteristics of lambs and to determine whether the date pits contain any hormonal activity.

MATERIALS AND METHODS

Materials

The date by-products (mainly date flesh and date pits) were obtained from the date processing factories in the Al-Hassa area. The date pits were crushed to reduce their sizes to 1–3 mm. The flesh was chopped into small pieces. Twenty lambs were obtained from King Faisal University, Agricultural Experimental Station. The lambs were approximately 5 months old and with an average weight of 24 kg.

Methods

The study was divided into two phases. Phase 1 concerned the feeding trial and the carcass characteristics, while phase 2 dealt mainly with the possible hormonal activity of the date pits.

Feeding trial and carcass characteristics

Four diets were formulated to contain 0, 10, 20 and 30% date by-products. The lambs were weighed and divided into four similar groups on the basis of their

live weight. Each group was then housed in a separate pen and fed one of the four above-mentioned diets. The feeding trial continued for 60 days. At the end of the feeding trial the animals were slaughtered and their carcass characteristics were determined.

Hormonal activity study of the date pits

(a) Sample preparation and hormone extraction

Some of the date pits used in the feeding trial were ground finely into powder. Twenty grams of this powder were macerated in 100 ml water in a beaker with shaking every 10 min. After 1 h the solution was filtered and used.

(b) Effect of date pits extracts on rat uterus preparation

The rat uterus preparation was obtained according to the method of DeJalon (1945). Female Wister rats (180–200 g) were injected with oestradiol benzoate (2.5 mg/kg body weight) subcutaneously 48 h prior to the experiment. The animals were killed by a blow on the head and bled through the jugular veins. The abdomen was opened and the intestine was removed to expose the uterus. Fats and adventitia were dissected away from the uterine horns. One horn was transferred to a Petri dish containing DeJalon's solution. The horn was opened longitudinally and suspended in an organ bath containing DeJalon's solution set at 37°C. The free end of the uterus was threaded to isotonic transducer connected to a MD₂ Washington recorder. To the quiescent uterus, prostaglandin F₂ (PGF₂) and the date pits aqueous extract were added and left for 45 s. The blockers, atropine and cyproheptadine, were added 1 min before the extract. The enzyme-synthesizing inhibitors, indomethacin and hydrocortisone, were added 20 min before the extract.

(c) Influence of aqueous extract of date pits on immature rats

Twenty per cent water extract of date pits was freeze-dried to give 5 g of water-soluble substance(s). A 100 mg/ml solution of this was prepared in a sterile pyrogen-free normal saline and designated as the test solution. Immature female Wister rats, 4 weeks old (23–39 g), were divided randomly into three groups of six rats. The animals in group 1 were injected daily with the date pits solution (intraperitoneally, 500 mg/kg body weight) for 10 days. Animals in group 2 were injected subcutaneously with oestradiol benzoate diluted with olive oil in a dose of 2 mg/kg body weight for 10 days. Animals in group 3 were kept as controls and injected with sterile pyrogen-free normal saline in a dose equal in volume to the maximal dose administered to the rats, i.e. 0.2 ml. The rats in the three groups were observed daily during the experiment for the opening of the vaginal orifices. Rats with opened vaginal orifices were smeared for 5 days. On day 11 all rats were sacrificed and the uteri were removed cleaned from the adventitia and pressed gently between filter papers, and the wet weight determined. Then uteri were dried to a constant weight in an oven at 100°C and the dry weight was calculated.

RESULTS AND DISCUSSION

The average daily gain (ADG) and carcass characteristics of Awassi lambs fed diets containing different levels of date by-products are presented in Table 1. The ADG increased with the increase of the percentage of the date by-products in the ration. This finding is in agreement with those of Al-Yousef (1985) and Al-Hiti and Rous (1978). The results of the carcass characteristics (Table 1) indicate that the dressing percentage (on FBW basis) of all the treatments is similar ($P > 0.05$); however, numerically the lambs that received 30% date by-products had the highest dressing percentage. The treatment had no effect on the rib eye area. Zeranol implant had no effects on dressing percentage, slaughter and carcass weights (Unruh *et al.*, 1986). However, Lough *et al.* (1993) showed that, numerically, the dressing percentage, slaughter weight and subcutaneous fat thickness of growing rams and ewe lambs implanted with Trenbolone acetate were higher than the control but insignificantly so. Also, the rib eye muscle area was significantly less than the control. The lambs that received date by-products in their ration tended to deposit fat. Such a tendency could explain the reduced shrinkage percentage and the lower pH (at 8 h postmortem) for the lamb groups that received date by-products in their ration.

The percentage of muscle and fat in the loin wholesale cut is presented in Table 2. The treatment groups (I, II and III) contained more muscle and fat in the loin than their corresponding control (alfalfa hay). Within

Table 1. Average daily gain (ADG) and carcass characteristics of Awassi lamb fed diets containing different levels of date by-products

Item	Alfalfa hay	Ration I	Ration II	Ration III
ADG (g)	123.3	125.0	126.7	145.0
Postmortem pH				
pH ₀	6.7	6.8	6.6	6.8
pH ₈	6.5	6.4	6.2	6.1
pH ₄₈	5.8	5.7	5.7	5.6
Dressing % (FBW basis)	45.0	44.0	43.0	47.0
REA (cm ²)	14.8	14.6	14.3	14.7
Back fat thickness (cm)	Trace	Trace	0.2	0.3
Shrink %	4.6	4.2	3.7	3.1
Lean colour	6.5	6.3	6.6	7.0

Rations I, II and III contain 10, 20 and 30% date by-products, respectively.

Table 2. Percentage of muscle and fat in the loin wholesale cut of Awassi lamb fed different levels of date by-products

Ration	% Muscle	% Fat
Alfalfa hay	40.3	14.6
Ration I	55.0	21.0
Ration II	59.4	24.3
Ration III	52.2	31.1

Rations I, II and III contain 10, 20 and 30% date by-products, respectively.

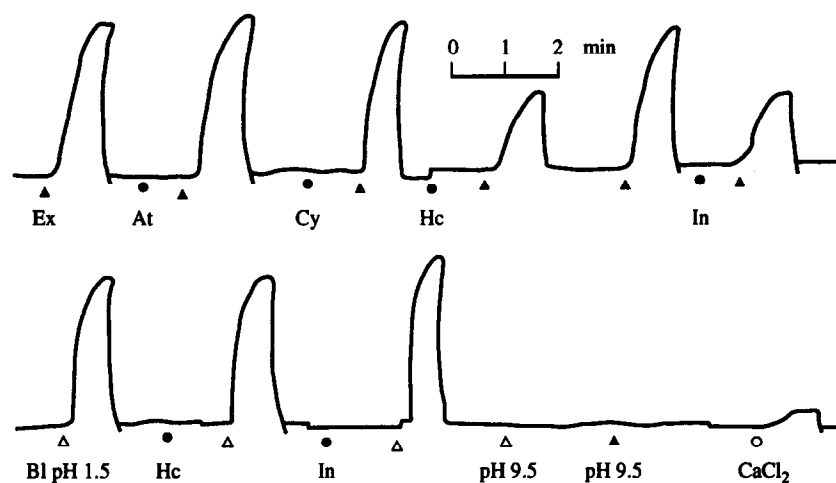


Fig. 1. The effect of date pits extract on rat uterus.

the treatment groups, the per cent of muscle increased with the increase of the date by-products in the ration up to 20%, then the increase declined at 30% date by-products in the ration (treatment III). However, the percentage of fat in the loin increased progressively with the increase of the date by-products in the ration. Obviously, the treatment leads to a clear effect on the lamb carcass composition as exemplified by the loin wholesale cut. Hancock *et al.* (1991) concluded that Trenbolone acetate compared with oestrogenic compounds may have a greater effect on carcass composition by stimulating lean tissue deposition and reducing carcass fat. Anabolic steroids are known to increase muscle protein accretion (Hayden *et al.*, 1992). However, variation in the responses of lamb to the anabolic agent is greater than in cattle (Roche & Quirke, 1986).

The effect of date pits extract on rat uterus is shown in Fig. 1. Date pits extract induced contraction of the uterus. This effect was not blocked by atropine (At) or cyproheptadine (Cy) but partially by indomethacin (In) and hydrocortisone (Hc); both are prostaglandin-synthesizing inhibitors, suggesting that the extract acts in a similar fashion to oestrogens. The effect of pH was ruled out since the pH of the extract is always alkaline. As shown in Table 3, date pits significantly ($P < 0.01$) stimulated vaginal orifice opening and oestrus and increased uterine weight similar to oestradiol.

The findings of the hormonal activity study could partially explain some of the findings of the carcass characteristics study.

Table 3. Influence of date pits aqueous extract on immature female rats

Group	Uterine weight	Rate of opened vaginal orifices	Ratio of rats in oestrus
Group (control) ($n = 6$)	11.4 ± 2.0	0/6	0/6
Date pits ($n = 6$)	38.2 ± 3.4*	6/6	4/6
Oestradiol ($n = 6$)	68.1 ± 6.2*	6/6	6/6

* $P < 0.001$.

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