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MEAT QUALITY OF EGYPTIAN BUFFALO AND FRIESIAN MALES IMPLANTED WITH ANABOLIC AGENTS

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SUMMARY

Seventeen males [9 Friesian (FR) and 8 buffalo (BF)] were used in a fattening trial to test the effect of anabolic agents on some physical and chemical parameters of meat.

Calves of each breed were randomly divided into three groups, each of three animals. The first group included non-implanted animals (control). Animals were implanted with "Ralgro" in the second group and with "Synovex-s" in the third. Implantation was carried out at about 178 kg body weight and was repeated at 100 and 200 days from the first implantation.

The least squares means of moisture, fat, protein and ash percentage for FR meat were 75.37, 2.29, 21.07 and 1.27% being 75.27, 3.58, 20.09 and 1.06% for BF, respectively. Fat and ash percentages were significantly different between the two breeds.

The corresponding estimates were 76.02, 3.33, 19.40 and 1.25% for the control group, 75.06, 2.14, 21.64 and 1.16% for "Ralgro" group and 74.88, 3.34, 20.70 and 1.08% for "Synovex-s" group, respectively.

The least square means of pH, cooking loss and shear force value of the tested meat were 5.85, 47.44% and 8.27 Kg/cm core, respectively for buffalo samples. The samples of meat from Friesian were more tender than buffalo samples. The only significant difference was found in shear force values between the two breeds. Treatment with either anabolic preparation had no effect on the physical parameters, shear force value, pH, cooking loss, or fiber diameter.

Keywords: Buffalo, meat, anabolic agents

INTRODUCTION

Growth promoters implants are widely used in beef production to enhance daily weight gain and to improve feed conversion efficiency. Researches showed that hormonal treatment of young bulls could increase protein production and modify the pattern of fat deposition (Johnson *et al.*, 1986 and Kean and Drennan, 1990).

This study was designed to determine the effect of "Ralgro" and "Synovex-s" (non estraidiol anabolic agents with estrogenic activity) on the performance, carcass traits and meat characteristics of buffalo and Friesian calves.

MATERIALS AND METHODS

A total number of 17 male calves (9 Friesian and 8 buffaloes) were used. Animals of each breed were divided randomly into three groups of three animals each, except synovex-s group of buffaloes (n=2), where one out three was died during the experiment.

Ralgro and "Synovex-s" were administered subcutaneously at the base of the ear. First implant "Ralgro" (commercial name) pellets in which "Zeranol" is the active substance is produced by Pitman -More, Inc., USA. The other implant was "Synovex-s" (trade name) pellets in which progesterone and estradiol benzoate are the active substances. This is produced by Synovex Laboratories, Inc., Palo Alto, USA. Animals of the first group were not implanted (control) , the second group was implanted with "Ralgro" and the third group was implanted with "Synovex-s". The implantation was carried out at three times during the fattening period. First implantation was at the beginning of the experiment, with an average weight of 178±7 kg for FR and BF calves. The second was 100 days after the first implantation and the third was 100 days after the second. For "Ralgro" each animal was implanted with three pellets containing 36 mg of "Zeranol" (in each implantation), and in each "Synovex-s" implantation the animal received eight pellets, containing 200 mg progesterone and 20 mg estradiol benzoate.

Animals were kept individually under an open shed and were individually fed on concentrates according to their body weight and clover hay and rice straw were offered *ad lib.* and water was available twice a day. Calves were slaughtered 159 days after the last implantation. Mean of slaughter weight was 419.5± 8.5 kg. The left side of each carcass was chilled for 24 hr at 5°C, then the *Longissimus dorsi* muscle of the 9,10 and 11*th* ribs were taken for meat analysis.

Chemical composition

According to the A.O.A.C. (1990), moisture, ash and fat percentages were determined. Longissimus muscle protein percentage was calculated by difference as recommended by O'Mary *et al.* (1979) and Johnson *et al.* (1986).

Physical parameters

The pH value was determined after 24h from slaughter using Gallen- Kamp pH meter to the nearest 0.01. The meat samples were cut into cube of about 100 g (W1) and were boiled in water for 45 minutes, samples were put in a heat tolerant plastic bag prior to boiling. Samples were air dried, left at room temperature and weighed (W2). Cooking loss (CL) was calculated as follows:

$$CL\% = \frac{w1-w2}{w1} \times 100$$

Samples were determined by Warner-Brazler** shear force (capacity 50lb) Fiber diameter was measured according to the method described by Gravert (1995).

Statistical analysis

Data were analyzed by least squares analysis of variance using the general Linear Model procedure of the statistical analysis system (SAS, 1990). The statistical model included the main effects of genotype and treatments .

The results indicated that there was no significant effect of the interaction between the genotype and treatment, so, it was excluded from the analysis.

RESULTS AND DISCUSSION

Chemical composition of *Longissimis dorsi* muscle is presented as least squares means in Table 1, where there were no significant differences in the percentages of either moisture or protein between FR and BF breeds (Table 1). However, breed had a significant effect ($P<0.05$) on both fat and ash contents of meat. Buffalo meat contained more fat than Friesian (3.58 *vs.* 2.29%) and less ash (1.06 *vs.* 1.27). Salem *et al.* (1982) and Awadallah (1993) reported similar differences in fat and ash contents between buffalo and Friesian. However, fat percentage reported by both authors was lower than fat values recorded in this work.

It seems that "Ralgro" and "Synovex-s" tended to alter the chemical composition of the obtained meat. Comparing the average of control, anabolic agents significantly ($P<0.05$) reduced moisture (76.2 vs 74.97) slightly reduced fat percentage (2.74 vs 3.33%) and increased protein (21.17 vs 19.4, $P< 0.05$).

Considering the effect of "Ralgro" and "Synovex-s" on the chemical composition of meat, animals implanted with "Synovex-s" tended to deposit more fat (3.34 vs 2.14%) but gained less moisture (74.88 vs 75.06%), less protein (20.70 vs 21.64%), and less ash (1.08 vs 1.16%). However, all the mentioned differences were not significant. It seems that "Synovex-s" caused more fat deposition than "Ralgro". Difference between treatments and control were not significant. The obtained results agree with those reported by Johnson *et al.* (1986) and Kean and Drennan (1990) on bullock beef and steers implanted with "Ralgro" and "Synovex-s". On the other hand, *Turner et al.* (1995) reported that "Zeranol" had no effect on the percentage of water, protein and other extract in rib soft tissue (9, 10 and 11*th* rib cuts).

Physical characteristics

It is well known that consumer satisfaction primarily depends on the physical characteristics of meat. In Egypt, more attention is paid to the quantity more than the quality of meat. This work may enrich the information on meat quality. The least

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** Warner-Bratzler machine= is a motorized instrument with the force-measured in pounds weight-requried to shear through a cylindrical meat sample with a stainless steel cutting blade of special design, capacity 50 lb/cm)

squares means of physical characteristics (tenderness, pH and cooking loss percentage) as affected by the different applied treatments are shown in Table 2.

Meat tenderness

Meat samples from Friesian had significantly lower mean shear force values (8.27 Kg/cm) than buffaloes (10.81 Kg/cm), while means of meat from FR were more tender than those of buffaloes. El-Asheeri (1984) working on 3/4 FR male calves and El-Asheeri (1992) on male buffalo calves recorded similar differences in tenderness between meat of Friesian and buffalo.

Treatments studied had no significant effect on the shear force values of the studied meat samples. It has been reported that the administration of synthetic sex hormones to steers or bulls appears to have no effect on tenderness (Preston and Willis 1975, Johnson *et al.*, 1984, Calkins *et al.*, 1986 and Johnson *et al.* 1986).

pH value

Most of the physical properties of meat are directly or indirectly related to pH value. Hall *et al.* (1944) showed that lean tissues were bright at pH of 5.6 and dull, shady or dark at lower or lighter pH values. Table 2 shows that FR samples had higher pH values (5.85) than buffaloes (5.63). Salem *et al.* (1982) and El-Asheeri (1984) reported similar pH values for Friesian and buffalo meats.

On the other hand, "Ralgro" group had higher pH (5.98) than the control (5.66) and "Synovex-s" (5.59) groups. Also, the same treatments had no significant effect on the pH values of the tested meat cuts. Quali *et al.* (1988) found that there was no significant difference between pH value of *Longissimus dorsi* muscle of Charolais steers implanted with "Revalor" (20 mg estradiol and 140 mg trembolone acetate) being 5.64 and the control being 5.63 after 24h post mortem. These values are very close to the results obtained herein.

Cooking loss

The loss in meat weight due to cooking by any method depends on the content of moisture and fat in meat. Cooking loss was found to increase as the moisture percentage increased in the muscle (El-Asheeri, 1992). The least squares means of cooking loss percentage and their analysis of variance in this investigation are illustrated in Table 2, where there was no significant difference between the two breeds, yet buffalo bulls exceeded that (48.40%) in the Friesian bulls (47.44%). Similar estimates were recorded by Salem *et al.* (1982) 45.13% for FR and 46.42% for BF. Nigm *et al.* (1985) reported close results, i.e 45.13% for pure Baladi and 38.4% for 3/4 FR breeds. Lower estimates were recorded by El-Asheeri (1992) in buffalo meat (41.66%).

Table 1. Least squares means* (±SE) of meat chemical composition (%)

Classification	overall	Breed		Treatment			Pr > F	
Traits	mean	Friesian	Buffaloes	Control	"Ralgro"	"Synovex-s"	Breed	T
No.	17	9	8+	6	6	5		
Moisture	75.32±0.18	75.37[a]±0.25	75.27[a]±0.27	76.02[a]±0.30	75.06[b]±0.30	74.88[b]±0.34	NS	0.049
Fat	2.93±0.29	2.29[a]±0.40	3.58[b]±0.43	3.33[a]±0.49	2.14[a]±0.49	3.34[a]±0.54	0.047	NS
Protein	20.58±0.35	21.07[a]±0.48	20.09[a]±0.52	19.40[a]±0.59	21.64[b]±059	20.70[a]±0.09	NS	NS
Ash	1.17±0.05	1.27[a]±0.07	1.06[b]±0.07	1.25[a]±0.85	1.16[a]±0.08	1.08[a]±0.09	0.053	NS

Means with different letter in same row differ significantly at 5 % level.
+ One buffalo calf implanted with "Synovex-s" died at the end of the experiment. NS: Not significant

Table 2. Least square means* (±SE) of physical and histological (fiber diameter) characteristics of meat

Classification	Overall	Breed		Treatment			Pr > F	
Traits	mean	Friesian	Buffaloes	Control	"Ralgro"	"Synovex-s"	Breed	T
No.	17	9	8+	6	6	5		
Shear force value (Kg/cm)	9.54±0.37	8.27[a]±0.51	10.81[b]±0.54	9.68[a]±0.62	9.70[a]±0.62	9.24[a]±0.68	0.005	NS
PH value	5.74±0.13	5.85[a]±0.18	5.63[a]±0.19	5.66[a]±0.22	5.98[a]±0.22	5.59[a]±0.24	NS	NS
Cooking lose (%)	47.92±0.47	47.44[a]±0.64	48.40[a]±0.69	47.93[a]±0.78	47.54[a]±0.79	48.29[a]±0.87	NS	NS
Fiber diameter (µm)	38.19±13.5	35.52[a]±1.86	40.86±1.98	39.12[a]±2.27	36.71[a]±2.27	38.74[a]±2.50	NS	NS

- Means with different latter in the row differ significantly at 5 % level.
- + One buffalo calf implanted with "Synovex-s" was died at the end of the experiment. NS: Not significant

The "Synovex-s" group was found to lose more due to cooking (48.29%) than the control (47.93%) and "Ralgro" (47.54%) groups, but the differences among the three treatment groups were not significant. Johnson *et al.* (1986) reported lower cooking loss percentages (28.57%, 27.28% and 27.91% for control, "Ralgro" and "Synovexs" groups, respectively, and the differences were still not significant. Similar results were found by Greathouse *et al.* (1983).

Fiber diameter

There is an inverse relationship between fiber diameter and tenderness. Table 2 shows that *Longissimes dorsi* muscle of buffaloes had thicker fiber diameter (40.86 μm) than in case of Friesian (35.52μm). The inverse relationship between muscle fiber diameter and meat tenderness is well established (Table 2). Salem *et al.* (1982) reported that fiber diameter was 33.9 μm for Friesian, slaughtered at 18 months, and 36.8 μm for buffaloes slaughtered at 21 months. Nigm *et al.* (1985) found that 3/4 FR meat had higher fiber diameter (37.86 μm) than fiber diameter in pure Friesian. El-Asheeri (1992) recorded fiber diameter of 39.23μm in meat from buffalo calves slaughtered at 24 months. However, meat of the control group had higher fiber diameter (39.12 μm) than meat treated with either "Ralgro" (36.71 μm) or "Synovex-s" (38.74 μm) groups. However, there were no significant differences among the three groups.

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تأثير إستخدام منشطات النمو على خصائص اللحـــوم فـــى ذكـــور الجـــاموس و الفريزيان

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أجريت هذه الدراسة فى مزرعة كلية الزراعة ـ جامعة القاهرة على ١٨ عجل (٨ جاموس و٩ فريزيان) لتحديد مدى فاعلية كلاً من الرالجرو (٣٦ مليجرام زيرانول) والسينوفكس-أس (٢٠٠مليجرام بروجســـترون و٢٠ مليجرام استرديول بنزوات) كمنشطات نمو على الصفات المرتبطة بجودة اللحم (المكونات الكيماويـــة والخواص الطبيعية)

قسمت الحيوانات الى ثلاثة مجاميع (وزن البداية ١٧٨كجم) وهى مجموعة المقارنـــة (غـــير المعاملـــة) ومجموعة الرالجرو ومجموعة السينوفكس_اس، وكانت المعاملة من خلال زرع منشطات النمو تحت جلـــد الأذن وقد تمت المعاملة ٣ مرات بين كل مرة والأخرى ١٠٠ يوم. و ذبحت الحيوانات بعد مرور ١٥٩ يـــوم من المعاملة الثالثة. فصل النصف الأيسر المبرد (٥°م لمدة ٢٤ ساعة) ثم أخذت عينة من العضلة العينيـــة للضلوع ٩ ،١٠ ، ١١ لإجراء تحاليل جودة اللحم.

١- كانت متوسطات المكونات الكيماوية للحم (الرطوبـــة والدهـــن والـــبروتين والرمـــاد) ٧٥,٣٧، ٢,٢٩، ٢١,٠٧، ١,٢٧ % على التوالى للفريزيان بينمـــا كـــانت ٥٧,٢٧ ،٣,٥٨، ٢٠,٠٩، ١,٠٦ % علـــى التوالى فى الجاموس وكانت الفروق معنوية على مستوى ٥% بين النوعين فى نسبة الدهـــن والرمـــاد وكانت التقديرات المماثلة بالنسبة لمجموعة المقارنة وهـــى ٧٦,٠٢، ٣,٣٣، ١٩,٤٠، ١,٢٥% علـــى التوالى و كانت ٧٥,٠٦ ، ٢,١٤ ، ٢١,٦٤ ، ١,١٦% على التوالى بالنسبة لمجموعة الرالجرو وبلغـت ٧٤,٨٨ ، ٣,٣٤ ، ٢٠,٧٠ ، ١,٠٨ على التوالى لمجموعة السينوفكس-اس

٢- كانت متوسطات درجة الحموضة ونسبه الفقد بالطبخ والقوة اللازمة للقطع (كمقيـــاس لطـــراوة اللحـــم) كخواص طبيعية للحم هى ٥,٨٥ ، ٤٧,٤٤% ، ٨.٢٧ (رطل/سم) على التوالى لعينات الفريزيان وكانت ٥,٦٣ ، ٤٨,٤٠% ، ١٠,٨١ (رطل/سم) على التوالى لعينات الجاموس ومن القيم الســـابّقة يتضـــح أن عينات لحم الفريزيان كانت أكثر طراوه وكان الفرق معنوياً على مستوى ٥% بينهما فى القوة اللازمـــة للقطع فقط وبلغت قيم الخواص السابقة ٥,٦٦ ، ٤٧,٩٣% ، ٩,٦٨ (رطل/ســـم) لمجموعـــة المقارنـــة وكانت ٥,٩٨ ، ٤٧,٥٤% ، ٩,٧٠ (رطل/سم) لمجموعة الرالجرو أما بالنسبة لمجموعة الســـينوفيكس-أس فكانت ٥,٥٩ ، ٤٨,٢٩% ، ٩,٢٤ (رطل/١سم) على التوالى.

٣- كان متوسط قطر الليفـــة العضليـــة ٣٥,٥٢، ٤٠,٦٨، ٣٩,١٢ ، ٣٦,٧١، ٣٨,٧٤ ميكـــرون لعينـــات الفريزيان والجاموس ومجموعة المقارنة الرالجرو والسينوفيكس-أس على التوالى .