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EFFECT OF DATE PALM FRUITS ON REPRODUCTIVE EFFICIENCY IN THE DOE AT TWO PREGNANCY PERIOD IN COMPARISON TO CELERY

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Abstract

This work aimed to evaluate the effect of rutab date fruits compared to celery on some sexual hormones and parameters of the reproductive performance of rabbit females (does). Animals were divided into three groups based on dietary type: rutab date fruit, celery plant, and pellet. The results exhibited a significant increase in the LH levels in the blood serum of the doe group, which dieted on the date fruit, reaching an average (1.3 ± 0.34 mlU/mL) compared with the celery group and the control group in the second pregnancy. In contrast, a significant decrease in all groups during the first pregnancy compared with the second pregnancy. Also, a significant elevation in the FSH levels in blood serum of the doe group, which be diet on the date fruit of both pregnancies, in addition to the control group in the first pregnancy compared with both celery groups and control group in the first pregnancy was reached (1.30 ± 0.33, 1.23 ± 0.38 mlU/mL) respectively. Neither significantly raised progesterone levels in all groups except the date fruit group compared with the control group. There was a non-significant height in litter size just in the control and celery groups in the first pregnancy. Furthermore, both treatments did not succeed in decreasing the first or second gestation period in the case of Offspring weight, a significantly augmented first pregnancy from second pregnancy in all treatments.

Conclusion: Although date palm fruit and celery had no discernible impact on a rabbit doe's reproductive performance, The effects of palm fruit are notable on some hormone levels, including progesterone, LH, and FSH.

Keywords: Rutab date fruits, celery, nutrition, rabbits, pregnancy period.

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الخلاصة

يهدف هذا العمل إلى تقييم تأثير ثمار رطب التمر مقارنة بالكرفس على بعض الهرمونات الجنسية ومعايير الأداء التناسلي لإناث الأرانب. تم تقسيم الحيوانات إلى ثلاث مجموعات حسب النوع الغذائي: ثمار الرطب ، ونبات الكرفس ، والحبيبات. أظهرت النتائج زيادة معنوية في مستويات الهرمون اللوتيني في مصل الدم لمجموعة الظبية التي اتبعت حمية على ثمار التمر ، حيث وصلت إلى متوسط (1.3 ± 0.34 ملل / مل) مقارنة بمجموعة الكرفس والمجموعة الضابطة في الحمل الثاني. بالمقابل ، هناك انخفاض معنوي في جميع الفئات أثناء الحمل الأول مقارنة بالحمل الثاني. أيضا ارتفاع معنوي في مستويات هرمون FSH في مصل الدم من فصيلة الظبية ، والتي يتم اتباع نظام غذائي على ثمار التمر لكلا الحملتين ، بالإضافة إلى المجموعة الضابطة في الحمل الأول مقارنة مع كل من مجموعتي الكرفس ومجموعة الضابطة في الحمل الأول تم الوصول إلى (1.30 ± 0.33 ، 1.23 ± 0.38 ملل / مل) على التوالي.

لم يرفع أي منهما مستويات البروجسترون بشكل معنوي في جميع المجموعات باستثناء مجموعة فاكهة التمر مقارنة بمجموعة التحكم. كان هناك ارتفاع غير معنوي في حجم القمامة فقط في مجموعتي التحكم والكرفس في الحمل الأول. علاوة على ذلك ، فإن كلا العلاجين لم ينجحا في إنقاص فترة الحمل الأولى أو الثانية في حالة وزن النسل ، وهي زيادة ملحوظة في الحمل الأول من الحمل الثاني في جميع العلاجات.

الاستنتاج: على الرغم من أن ثمار نخيل التمر والكرفس لم يكن لهما تأثير واضح على الأداء التناسلي لأرنب الأرانب ، إلا أن تأثيرات ثمار النخيل ملحوظة على بعض مستويات الهرمونات ، بما في ذلك البروجسترون ، FSH ، و LH.

الكلمات المفتاحية: ثمار الرطب ، الكرفس ، التغذية ، الأرانب ، فترة الحمل.

Introduction

A healthy diet helps prevent all malnutrition forms. An Unhealthy diet and lack of physical activity are among the most prominent global threats to health (Bull et al., 2020). Nutrient-rich foods such as fruits and vegetables, which contain various essential nutrients and health-promoting substances such as fibre, should form the basis of a healthy diet for all people(Calabrò et al., 2021; Comerford, Ayoob, Murray, & Atkinson, 2016). Several animal experiments and human observational studies have shown a U-shaped relationship between maternal nutritional intake and offspring phenotypic adaptations. They also found that in-utero nutritional deprivation and excess change normal growth patterns in offspring, increasing their risk of obesity, type II diabetes mellitus, and metabolic diseases(Organization, 2016). Plants are a rich source of various biologically active nutrients that have preventive and therapeutic properties for many illnesses, especially for pregnant and lactating women(Arquitectura et al., 2015; Meng et al., 2021). Celery (named in Latin *Apium graveolens*) is a herbal branched stem plant belonging to the family of Umbelliferon. Leaves and stalks of celery are edible and can be eaten fresh or intrude on cooking. Celery has many benefits due to its rich content with vitamins (e.g. A, B, and C), antioxidants, minerals (e.g. iron, iodine, copper, magnesium, potassium, calcium, phosphorus), and other essential nutritional elements(Khairullah et al., 2021). Celery is recommended for those who suffer from obesity, diabetes, arthritis, rheumatism

and nephritis. It is also used in general body cell fortification, moisturizer, urine and blood runoff, and anti-indigestion (Boonruamkaew, Sukketsiri, & Chonpathompikunlert, 2020; Khairullah et al., 2021).

Date palm (Phoenix dactylifera L.) is a one of the Arecaceae plant family, mainly cultivated for its edible sugary fruits. Date palm fruits are classified based on their stages of maturity into four stages Kimri, Khalaal, Rutab, and Tamr8. Date palm fruits are a valuable source of dietary fibres, carbohydrates, antioxidants such as flavonoids, carotenoids, phenolic acid, minerals like potassium, iron, magnesium, selenium, fluorine, and vitamins (e.g., B, pantothenic acid, and Folate) (Al-alawi, Al-mashiqri, Al-nadabi, & Al-shihi, 2017; Niazi, Khan, Pasha, Rasheed, & Ahmad, 2017; Qadir, Shakeel, Ali, & Faiyazuddin, 2020). Date palm fruits have many therapeutic effects due to their content of various bioactive substances, which exhibit high antioxidant, antimicrobial and anticancer properties. These antioxidant properties confer date palm fruits a vital role in preventing oxidative stress damage in the human body (al-MSSalleM, 2020; Qadir et al., 2020).

Also, because of their high multivitamins, studies showed that the supply of multivitamins during the pregnancy could enhance the growth and development of the foetus avoiding prematurity (Szeto, Das, Aziz, & Anderson, 2009). The high calcium level in date fruits can support fetal growth and reduce the risk of bone density and strength. Date palm fruits are known to facilitate childbirth and reduce labour duration (Karimi, Elmi, Mirghafourvand, & Navid, 2020). The fibre content in Rutab may prevent constipation that may accompany pregnancy and postpartum and developing pregnancy diabetes because these fibres contribute to blood sugar regulation (Mia, Mosaib, Khalil, Islam, & Gan, 2020).

Because there were few or no previous studies on the effect of palm fruits on the pregnancy duration in animals, this work aimed to evaluate the impact of rutab date fruits compared to celery on some sexual hormones and the parameters of reproductive performance of rabbit females (does).

Materials and Methods

Animals and experiment design

The experiments were conducted on twenty-four mature New Zealand White female rabbits (does). The females' weight was 2.4 ±0.2 kg/body weight at 5-6 months old. The study was conducted in the animal house at Biotechnology Research Center/Al-Nahrain University. Doe animals were divided into three groups. Each group consisted of eight females plus one male. The groups were fed as follows:

- Group 1 was fed 100 gm (80 gm pellets consisting of proteins, carbohydrates, casein, and antibiotics) with 20 gm Rutab date fruits for 120 days before and during the first and second pregnancy.
- Group 2 was fed 100 gm (80 gm pellets consisting of proteins, carbohydrates, casein, and antibiotics) with 20 gm celery plant (stalks and leaves) for 120 days before and during the first and second pregnancy.
- Group 3 was fed with 100 gm pellets consisting of proteins, carbohydrates, casein, and antibiotics for 120 days before and during the first and second pregnancy and used as a control group.

The study was conducted under the ethical guidelines for using care laboratory animals in the university.

Blood samples and hormonal assay

The three hormones in blood samples collected from the rabbits were estimated. These hormones included Luteinizing hormone (LH), Follicle-stimulating hormone (FSH), and
Progesterone. The blood samples (5 ml) were collected via heart puncture. The serum was collected after centrifugation of the blood at 2500 rpm for 15 min, then put in an Eppendorf tube and stored at -20 °C until analyzed. The hormones were measured using AccuBind® ELISA and AccuLite® CLIA kit and qualitative using AFIAS-6 (AFIAS-automated fluorescent immunoassay system).

Morphological Reproductive parameters

Other parameters included in this study were litter size, length of the gestation period, and offspring weight.

Statistical analysis

Complete randomized design (CRD) was used to assess the experiment results statistically. The data were subjected to variance analysis using IBM SPSS Statistics V23.0 (ANOVA). The differences among the mean values were compared using the least Significance Differences Test (p0.05), and the findings were shown as bars of mean + SD.

Results

Fig.1 shows a significant difference $P<0.05$, an increase in LH level in the second pregnancy period analogized with the first. Also, date fruits had a significant difference from both celery and control groups for the same period: 1.3,1.0, 0.81

(mlU/mL), respectively. All treatments were reduced from 0.5 mlU/mL during the first pregnancy.

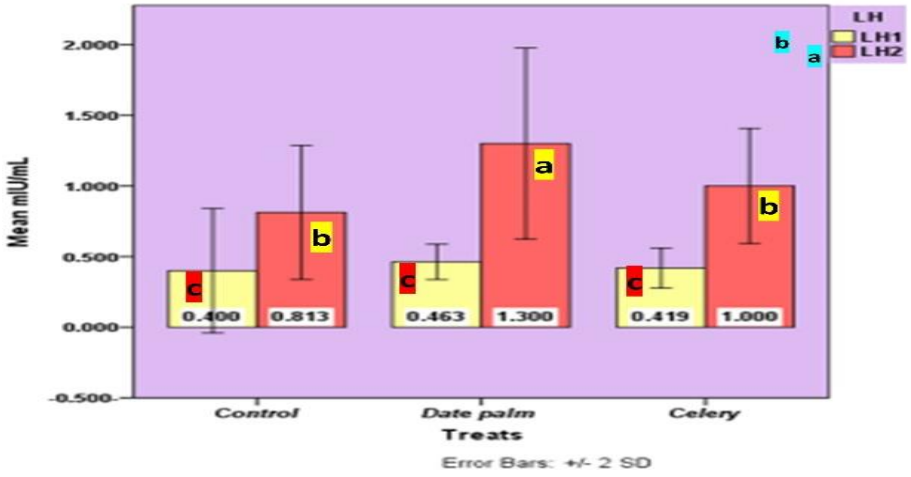

Fig.1: The effect of rutab and celery on LH hormone levels in the serum at the first and second pregnancy (MEAN ± SD).

* The averages with the same small letter are not significantly different from some (P<0.05**).**

Regarding FSH levels, There is no significant difference between the first period of pregnancy and the second, Except, for a significant difference, in the date fruit treatment compared to other treatments at P<0.05. It reached 1.30 mlU/mL (Fig.2). In contrast, there was a slight superiority in their FSH level for date fruit with control treatment during the first pregnancy. FSH levels remained stable when applied date fruit and celery were in both pregnancy stages.

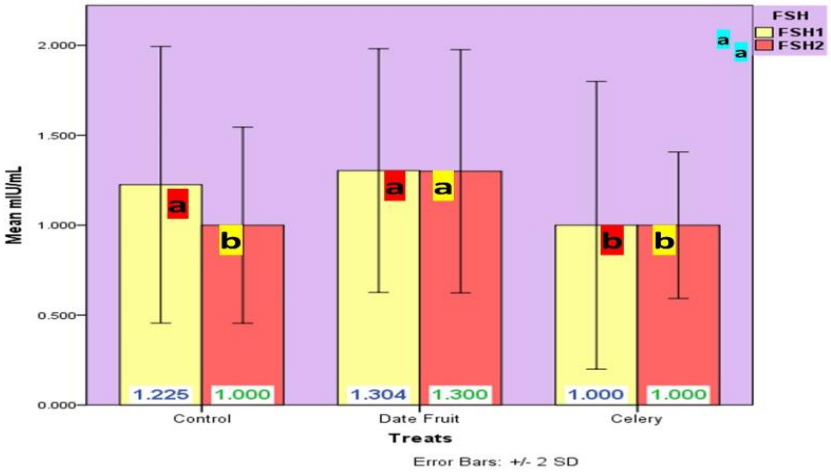

Fig.2: The effect of rutab and celery on FSH hormone levels in the serum at the first and second pregnancy (MEAN ± SD).

* The averages with the same small letter are not significantly different from some (P<0.05).

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Generally, there is no significant difference in levels of Progesterone between the first pregnancy and the second (fig. 3). Nevertheless, there is a significant difference in Progesterone levels of date fruit treatment reach (7.20 mlU/mL) in the second pregnancy compared to all treatments. At the same time, no significant difference in levels of Progesterone between both the control and celery treatments (fig. 3).

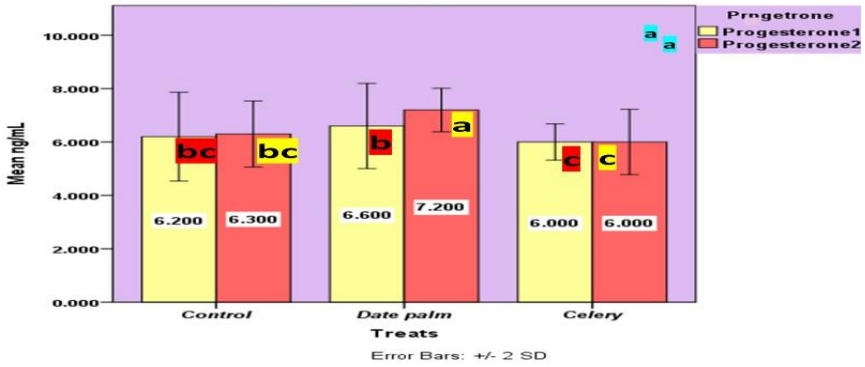

Fig.3: The effect of rutab and celery on Progesterone hormone levels in the serum at the first and second pregnancy (MEAN ± SD).

* The averages with the same small letter are not significantly different from some (P<0.05).

There was a non-significant height in litter size just in the control and celery groups in the first pregnancy (fig. 4). Furthermore, both treatments failed to decrease the first or second gestation period except for a slight reduction when using celery as a food source (fig. 5). Concerning Offspring weight, a significantly raised first pregnancy about second pregnancy generally (fig. 6).

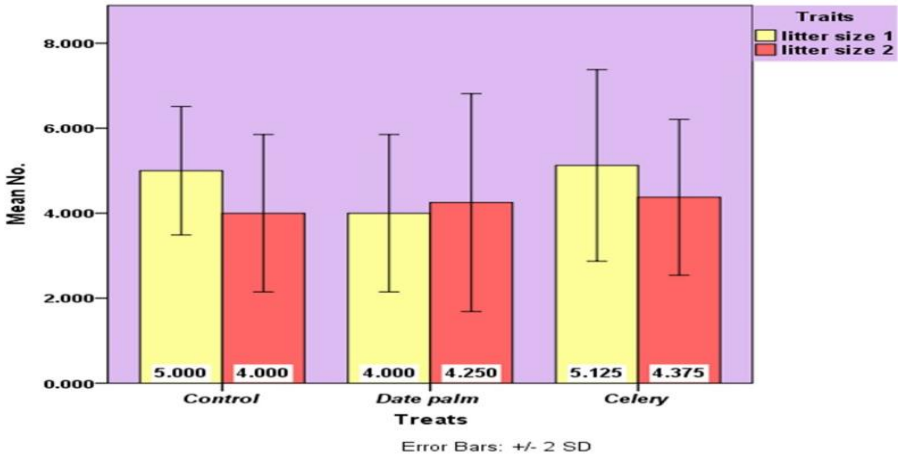

Fig.4: The effect of rutab and celery on litter size at the first and second pregnancy (MEAN ± SD).

* The averages with the same small letter are not significantly different from some (P<0.05).

Discussion

This study is the first that assesses the influence of rutab date fruit on rabbit doe reproductive efficiency. According to the findings, using rutab date fruit in the diet can enhance levels of LH and FSH, litter weight at birth, and size at weaning. Our results suggest that rutab date fruit can be employed in rabbit feeding. However, more research is needed to confirm the current findings, understand the mechanism of action, and assess the cost-effectiveness of this diet. The high level of FSH may be due to the sharp drop in the Inhibin hormone, which is reduced with age, causing a significant release of FSH in blood serum(Zaidi et al., 2009). Some plants may contain substances that affect the growth, behaviour and live performance of mammalians(Whittaker & Feeny, 1971). Some plants efficiently regulate fertility and increase weights, such as Combertodendon africanum. As well as stimulating the pituitary gland to increase female hormones LH (Luteinizing hormone) and FSH such as Glycyrrhiza glabra, Pimpinella anisum, Allium cepa(T. Benie & Thieulant, 2003; Tanon Benie, Izzi, Tahiri, Duval, & Thieulant, 1990; Ghalehkandi, Asghari, Beheshti, Valilu, & Yeghaneh, 2012; Mahood, 2012; Yang, Kim, Pyun, & Lee, 2018). Also, (Tanon Benie et al., 1990) found that injections of Combertodendon africanum extract to female mice promoted a significant increase in the weight of the uterus.

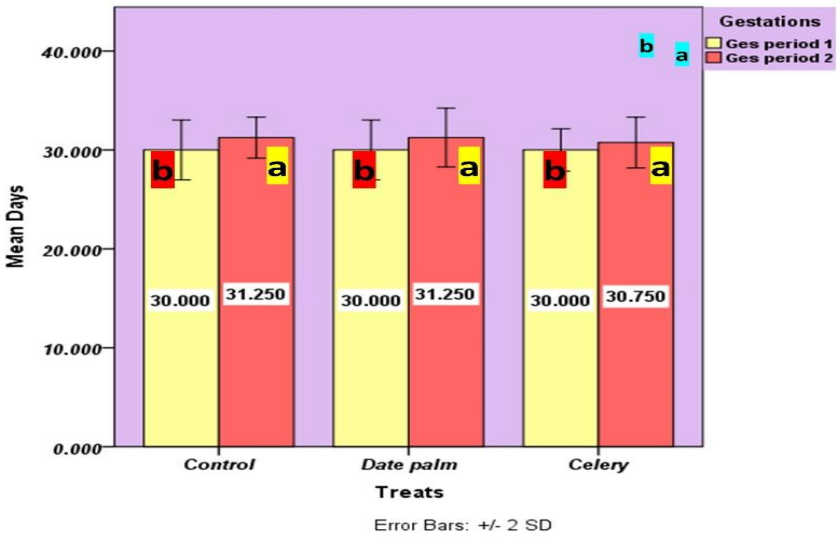

Fig.5: The effect of celery and rutab on the gestation period of a first and second pregnancy (MEAN ± SD).

* The averages with the same small letter are not significantly different from some ($P<0.05$).

A high level of free radicals in the body may lead to infertility. The date palm fruit works as an antioxidant because it contains flavonoids, phenol, vitamin C, and vitamin A. That potentially impacts promoting fertility and improving the quality of the egg. One of the benefits of date fruit for women is that taking it in the last month of pregnancy helps facilitate childbirth and provides the necessary energy for delivery.

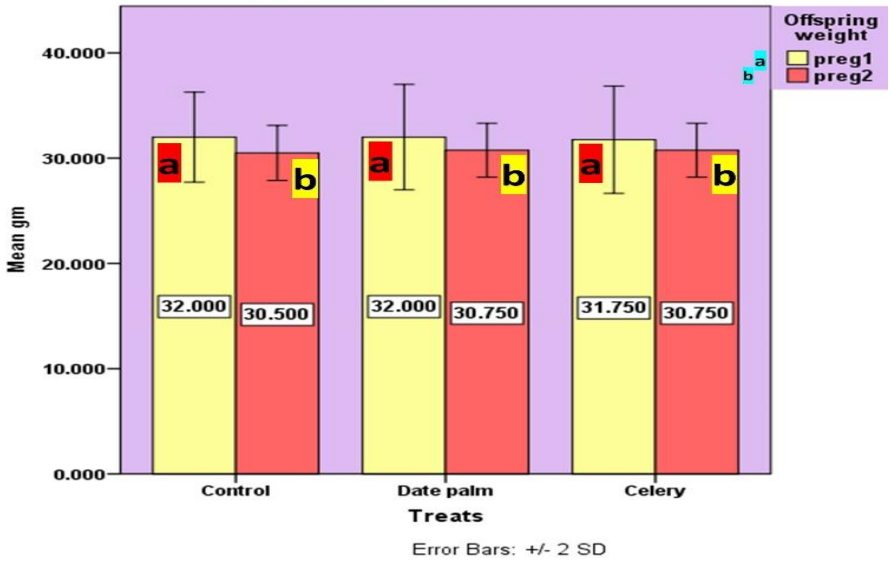

Fig.6: The effect of rutab and celery on offspring weight at the first and second pregnancy (MEAN ± SD).

* The averages with the same small letter are not significantly different from some (P<0.05).

According to a study, women who ate six pills of date fruit per day for four weeks had a more mature cervix with a larger average width and a shorter duration of labour. A more recent study found that women taking tinkering had less need for medical intervention to induce labour in the last four weeks of pregnancy. Despite there many benefits for celery in the male reproductive system and its role in spermatogenesis in rats, and reduce hyperlipidaemia, anticancer, and anti-inflammation (Hardani, Afzalzadeh, Amirzargar, Mansouri, & Meamar, 2015).

There are few works of literature about celery and its effects on the reproductive system in female rabbits. This study tries to investigate the fundamental role of celery in this aspect. The high level of LH caused by the celery seems to not affect ovulation due to the mechanism of ovulation and its induction in the doe; (YoungLai, Thompson, & Foster, 1989) the slight elevation of FSH in the treatment groups may be insufficient in the quantity used in this trial of date fruit and celery to increase the follicle number in the ovary and promote follicle maturation.

Progesterone hormone is secreted from luteal cells in the corpus luteum; in the rabbit, Progesterone production depends upon oestradiol produced from follicles (Holt, 1989). Other parameters, litter size, gestation period, and newborn weight, have shown no change than the control group; it may be due to less date palm fruit and celery quantity in the provender to make the expected change.
To confirm our result, we need more investigation into different seasons and light periods and a greater quantity of celery and date palm fruit.

Conclusion:
There is no perceptible effect of date Palm fruit and celery on reproductive performance in rabbit doe, nevertheless, date Palm fruit's impact is significant on some levels of hormones LH, FSH, and Progesterone.

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