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Original Article

Role of Date Palm Pollen on Heifer's Puberty and Maturity in Iraq

Al-Abbasi, H. H. H[1] *, Mahdi, A. S[1], Washam, A. F[1], Al-Wazeer, A. A. M[1]

1. Department of Animal Production, Faculty of Agriculture, University of Kufa, Najaf, Iraq

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Corresponding Author: hasanh.alabbasi@uokufa.edu.iq

Abstract

The use of herbal remedies has played a crucial role throughout medicine, and human beings have always used these valuable resources to treat their health problems and diseases. *Phoenix dactylifera* (Palm) is one of the most famous medicinal plants. Therefore, this study was designed to investigate the possible effects of date palm pollen supplementation on the heifer's puberty. This study was conducted in Najaf- Iraq, on 10 crossbred heifers 6 months old, from December 1st, 2021, to August 1st, 2022. The animals were divided randomly into two groups: T1 was supplemented with 2g of date palm pollen (DPP) plus the main ration, while T2 was supplemented only with the main ration. The results revealed a significant effect (P<0.05 and P<0.01) in T1 over T2, accelerati ng theheifer's puberty and sexual maturity. The results also showed a significant effect (P<0.01) between T1 and T2 at the level of the hormones FSH, LH and estrogen in the age of puberty, as well as the presence of a significant difference (P<0.01) and (P<0.05) between T1 and T2 at the level of the hormones FSH and estrogen in the age of sexual maturity. The results also showed a significant effect (P<0.05) for T1 and T2 in weight at puberty and maturity. This study aimed to accelerate puberty and sexual maturity in the heifers.

Keywords: Date palm pollen, Heifers, Puberty, Maturity, Hormones

1. Introduction

The use of herbal remedies has played a crucial role throughout the history of medicine, and human beings have always used these valuable resources to treat their health problems and diseases (1, 2). *Phoenix dactylifera* (Palm) is one of the most famous medicinal plants. It is well documented that the dates have acute pharmacological effects. It has been found that compounds such as proteins, fats, sugars, plant sterols and 3 types of coumarin have been identified in palm flowers. A study showed that using the aqueous extract of palm pollen increased the birth ratio of male-to-female offspring (1, 3).

Date palm pollen (Phoenix Dactylifera) or DDP was one of the most important by-products of date palm trees (1, 2). DPP has nutritional properties enable it to fight infections and increase immunity (4). In addition, it contains estradiol, similar to the estrogen hormone, and it can stimulate the ovaries (5, 6). Date palm pollen was monocotyledon, used as an additive nutrient because it contains essential and non-essential amino acids, fatty acids, proteins, carbohydrates, vitamins and minerals (7).

It has been known that sex hormones belong to a class of steroid hormones made entirely of cholesterol. Cholesterol is converted to pregnenolone in mitochondria; consequently, this molecule converts to testosterone, estrogen, and progesterone in the testes, granulosa cells, and the cells of the corpus luteum, respectively (4, 8). In adult females, estrogen's most

important biological function would be as follows: 1) regulation of the oestrous cycle, 2) regulation of the pregnancy, lactation, and libido. Progesterone is known as the most important progestin hormone. The ovaries synthesize this hormone from the middle of the oestrous cycle. On the other hand, it is produced in large quantities by the placenta during pregnancy (9). The primary function of this sex hormone has been known as the preparation of the uterus for implantation after successful fertilization, preserving the uterine wall during pregnancy, and stimulation and development of the mammary glands (1, 3).

It is well-documented that there exists a solid relationship between nutrition and sexual development. Puberty in cows does not occur suddenly but is a gradual process of maturation of the endocrine and reproductive systems enabling the female for successful reproduction (3). In heifers, the average age of puberty is 12 months and 18 months in cows, detected at the first pregnancy (10). The high age of puberty and the high variation between breeds lead to economic loss in the local flocks (11, 12).

Therefore, this study was designed to investigate the possible effects of date palm pollen supplementation on the heifer's puberty.

2. Materials and Methods

2.1. Experimental Animals

This study was conducted on 10 crossbred heifers 6 months old, divided into 2 groups randomly 5 for each. The first group was fed with chief ration: straw 49%, green gross 25%, concentrated ration 25% and 1% salt and vitamins plus date palm pollen supplementation 2 g/animal; this ration may be changed as necessary weekly till puberty. The Second group was fed with chief ration, without any supplementation of date palm pollen.

2.2. Blood Collection

The blood was collected three times, at the first, middle, and end of the study, to determine the FSH, LH, estrogen, and testosterone in the blood. After blood collection and centrifugation, blood samples were transported under cooling to the laboratory to estimate these hormones; they were estimated by mini-vides instrument, France origin. Which was work under the antigen-antibody reaction process; the test of estrogen was done by put 200 µL which acts as an antigen, putting a strip in the tray of instrument for any sample which acts as an antibody and finally, putting SPR (Surface Plasmon Resonance) which represent micropipette in ELISA test, timing the instrument for one hour and press start icon for starting, after one hour the results will produce printed on piper at the upper of the instrument. FSH was estimated similarly, but the time was 40-45 minutes. All heifers were weighed and scored at the exact three times of blood collection. Body condition score (BCS) is performed before feeding and drinking water; heifers score from 1-5 by inspection, the grade 1 for the thinner female and grade 5 for the fatter.

2.3. Statistical Analysis

The data were analyzed statistically with SAS statistical Analysis System (2012) for the study of date palm pollen effecting on the advance of puberty and sexual maturity in heifers in Iraq by using CRD and comparing the significant effect between means with Duncan (1955).

3. Results and Discussion

The results showed that T1 and T2 did not differ in hormones levels on the first day of the study (Table 1), while T1 and T2 significantly differed ($P<0.01$) at the level of the hormones FSH (70.42±3.24, 27.53±1.58 ng/ml), LH (18.27±2.14, 0.96±0.08 ng/ml) and estrogen (19.16±3.09, 9.44±1.52 pg/ml) at the age of puberty, as well as the presence of a significant difference ($P<0.01$) and ($P<0.05$) between T1 and T2 at the level of the hormones FSH (70.42±3.24, 27.53±1.58 ng/ml) and estrogen (27.03±3.14, 12.55±2.21 pg/ml) at the age of sexual maturity (Tables 2 and 3).

The results mention that was no significant effect between T1 and T2 in body weight on the first day of study, but there was a significant effect ($P< 0.05$) for

T1 on T2 in weight at puberty age (150.33±3.19, 142.66±2.12 kg) and in maturity age (206.66±1.64,198. 66±1.19 kg) (Table 4).

Results showed that there was no significant effect between T1 and T2 on body condition score on the first day and body condition score in puberty age, but there was a significant effect (P<0.05) for T1 on T2 in BCS at maturity age (4.60±0.64, 3.96±0.29) (Table 5), and there was a significant effect (P≤0.01) for T1on T2 in advance of puberty age (4.66±0.44, -0.33±0.01 months) and maturity age (8.66±1.20,-1.33±0.10 months) (Table 6).

Table 1. Effect of date palm pollen on the concentration of hormones in heifer's blood plasma on the first day of study

Treatments	Means±S.D			
	FSH	**LH**	**estrogen**	**Testosterone**
T1	16.72±1.2[a]	0.83±0.08[a]	6.18±0.6[a]	0.12±0.06[a]
T2	17.40±1.3[a]	0.81±0.09[a]	7.21±0.54[a]	0.14±0.014[a]
Significant	N.S	N.S	N.S	N.S

N.S: No significant

Table 2. Effect of date palm pollen on the concentration of hormones in blood plasma at puberty

Treatments	Means±S.D			
	FSH	**LH**	**estrogen**	**Testosterone**
T1	70.42±3.24[a]	18.27±2.14[a]	19.16±3.09[a]	0.13±0.04a
T2	27.53±1.58[b]	0.96±0.08[b]	9.44±1.52[b]	0.11±0.01[a]
Significant	**	**	**	NS

* Level of significance (P ≤0.05)

Table 3. Effect of date palm pollen on the concentration of hormones in blood plasma at maturity

Treatments	Means±S.D			
	FSH	**LH**	**E2**	**Testosterone**
T1	70.42±3.24[a]	0.82±0.12[a]	27.03±3.14[a]	0.12±0.08[a]
T2	27.53±1.58[b]	0.77±0.09[a]	12.55±2.21[b]	0.11±0.05[a]
Significant	**	NS	*	NS

* Level of significance (P≤0.05)

Table 4. Effect of date palm pollen on body weight on the first day of study, puberty and maturity

Treatments	Means±S.D		
	1st day	**Puberty**	**Maturity**
T1	98.66±4.21[a]	150.33±3.19[a]	206.66±1.64[a]
T2	101.33±4.17[a]	142.66±2.12[b]	198.66±1.19[b]
Significant	N.S	*	*

* Level of significance (P≤0.05)

Table 5. Effect of date palm pollen on BCS on the first day of study, puberty and maturity

Treatments	Means ± S.D		
	1st day	Puberty	Maturity
T1	1.00±0.0[a]	3.4±0.19[a]	4.60±0.64[a]
T2	1.00±0.0[a]	3.16±0.12[a]	3.96±0.29[a]
Significant	N S	NS	*

* Level of significance ($P \leq 0.05$)

Table 6. Effect of date palm pollen on the advance of puberty and sexual maturity in heifers

Treatments	Means±S.D			
	Puberty	Maturity	Puberty advanced	Maturity advanced
T1	7.3±2.21[a]	9.33±1.18[a]	4.66±0.44[a]	8.66±1.20[a]
T2	12.33±3.17[b]	19.0±2.09[b]	-0.33±0.01[b]	-1.33±0.10[b]
Significant	*	**	**	**

* Level of significance ($P \leq 0.05$)

The result showed in tables 2 and 3 that there was a significant effect between T1 and T2 in FSH (70.42±3.24, 70.42±3.24 ng/ml), LH (18.27±2.14, 0.82±0.12 ng/ ml), estrogen (19.16±3.09, 27.03±3.14 pg/ml) in blood plasma at puberty and maturity age respectively that may be due to adding DDP to the ration of animals, which is containing cholesterol, carotene and estrone, which affects the activity of the gonads and causes an increase in the FSH and LH hormones (13, 14). Also, it contains cytochrome enzymes and estrogen-like compounds that can increase this estrogen (15, 16).

There was a significant effect on body weight (150.33±3.19 and 206.66±1.64) in puberty and maturity age table 4. That could be due to DPP containing chlorine and sodium, which increase appetite and thus weight gain (17). Also, it contains zinc, which is needed for hormone production, vitamin synthesis, energy production, enzyme activity and other physiological processes related to reproduction, growth and health. The deficiency of zinc affects almost all physiological processes like growth, reproduction, immunity, milk production and other processes of animals (18). There was a significant effect in BCS (4.60±0.64, 3.96±0.29) in maturity age T1 and T2, respectively table 5. It may be due to the DPP additive because it contains antioxidants, which work to improve scoring. Antioxidants activity improves growth cells, immunity, body weight, body condition score, the stress of heat and fertility, which leads to improved health of heifers and, finally, enhancement of sexual maturity (7), also there was a significant effect for DPP in advanced of puberty and maturity age 7.3 and 12.33 months for T1 on T2 9.33 and 19.0 months table 6, maybe because of date pollen were led to accelerating puberty and sexual maturity, duo to DPP contains carbohydrates, proteins, saponins, alkaloids, minerals (potassium, sodium, magnesium, copper, nitrogen, zinc, magnesium, cobalt, nickel, iron) (19). Thus, DPP was a rich source of antioxidants, energy and hydrophobic minerals, so it was suitable as a standard component in the human and animal diet (20). Carbohydrates begin in puberty, precocious puberty and sexual maturity, from a series of experiments on calves shows that they can be continuously stimulated by starting to feed a high-energy diet, such as carbohydrates in beef veal at about 3 months of age (11, 21, 22).

The body needs 1 gram of iron per day. Iron is necessary for energy metabolism and respiration. As part of the enzymes involved in synthesizing collagen and some neurotransmitters, it increases immunity, improves the health of calves and reduces anaemia, which leads to increased body acquisition (23), which leads to early puberty and sexual maturity. Manganese is an essential mineral for animal life, primarily as an enzyme stimulant. It is used for average growth and development. Manganese was responsible for the production of glycoproteins and mucopolysaccharides by participating in the activation of enzymes to form the organic matrix of bone and cartilage. Part of manganese superoxide dismutase reduces the accumulation of highly reactive oxide molecules in cells, helps with choline biosynthesis, and increases fat metabolism in the liver to produce the energy necessary for growth and early puberty (11, 24). Also, zinc, copper, manganese, and chromium these minerals were essential for humans and animals; they provide more restful sleep, lose menopausal hot flashes, reduce stress-related problems, reverse signs of ageing, improve hormonal systems performance, improve vision, decrease depression, and increase muscle strength. Dramatically increase the absorption of trace minerals in the liver, heart, kidneys, spleen and lungs where they are most needed. The biofeedback episode causes the hypothalamus and thyroid gland to release a series of youth-promoting hormones, such as growth hormone and estrogen, as well as hormones that stimulate the adrenal gland and thyroid gland. For these reasons, it leads to precocious puberty and sexual maturity. An increase in the level of hormones in the blood plasma and a high rate of body condition score and weight are all factors that advance the age of sexual maturity and puberty of cows (25, 26), as well as environmental factors, feeding management and the sexual composition of animals affect these dates. The effect of breed type on lifespan at reaching heifers has been demonstrated in several studies comparing dairy and beef heifers and within breeds early versus late maturity (27, 28).

Authors' Contribution

Study concept and design: A. F. W.
Acquisition of data: H. H. H. A.
Analysis and interpretation of data: A. S. M.
Drafting of the manuscript: A. A. M. A.
Critical revision of the manuscript for important intellectual content: H. H. H. A.
Statistical analysis: A. S. M.
Administrative, technical, and material support: A. S. M.

Ethics

The studies were approved by the University of Kufa, Najaf, Iraq Ethics Committee.

Conflict of Interest

The authors declare that they have no conflict of interest.

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