



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2023; 12(2): 1906-1910  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 28-11-2022  
Accepted: 30-12-2022

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## Effects of melatonin on body weight and body girth in male dromedary camels (*Camelus dromedarius*)

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#### Abstract

The present study aimed to evaluate the effects of melatonin on the body weight, body girth and fertility of dromedary male camels during the non-breeding and subsequent breeding seasons. Twelve apparently healthy male camels maintained at National Research Centre on Camel, (NRCC) Jorbeer, Bikaner under uniform conditions of feeding and management were selected and randomly divided into two groups i.e. Treatment Group (T<sub>M</sub>) and Control group (C) of 6 animals each (n=6). The camels in treatment group (T<sub>M</sub>) were treated with melatonin at the dose 18mg/28kg, subcutaneously whereas Control group (C) received plain corn oil. A second dose of melatonin at higher dose rate 1mg/kg body wt was administered in camels of T<sub>M</sub> group which did not showed any subsequent change in the behaviour till 6 October 2018. The body weight of male camels was recorded at weekly interval and Hump girth (thoracic, hump and abdominal girth) were measure at fortnightly up to breeding season (17<sup>th</sup> weeks). The body weight and hump girth were non significantly increased initially than decreased in treatment group (T<sub>M</sub>) group than Control group (C).

**Keywords:** Camel, melatonin

#### Introduction

Camels are seasonal breeders [1, 2, 3] with breeding usually confined to the colder months of the year. It is also called "rutting period" or "rut", during which male camel exhibit morphological, behavioural and endocrinological peculiarities [4].

In temperate regions, photoperiod controls seasonal reproductive activity in mammals. Melatonin secretion conveys photoperiodic information that facilitates the organization of seasonal and circadian rhythms. High melatonin levels occur during the night and low levels during the day [5, 6, 7]. In animals, melatonin is involved in the entrainment (synchronization) of the circadian rhythms including sleep-wake timing, blood pressure regulation, seasonal reproduction, and many others [8]. Melatonin secretion in the camel exhibits a significant seasonal variation that runs parallel with photoperiodic changes over the year. Melatonin play buffering role on body weight by fluctuations [9]. Melatonin increased food intake and gain body weight in mice [10]. Melatonin reduced mean weight gain without food intake differences in young male Zucker diabetic fatty (ZDF) rats and male Wistar rats [11, 12].

#### Materials and Methods

The study was designed to evaluate the effect of melatonin administration on body weight and body girth male camels.

#### Experimental procedure

Twelve apparently healthy male camels with age in a range of 6 -12 years and body weight ranged from 601 -837 kg maintained at National Research Centre on Camel, (NRCC) Jorbeer, Bikaner under uniform conditions of feeding and management were selected. All male camels were maintained under proper hygienic conditions and kept separated from female camels. These camels were randomly divided into two groups i.e. Treatment Group (T<sub>M</sub>) and Control group (C) of 6 animals each (n=6).

In treatment group (T<sub>M</sub>), the camels were treated with melatonin i.e. crystalline melatonin powder (Sigma Aldrich, USA) dissolved in sterile corn oil administered at the dose 18mg/28kg, subcutanesely (SC) [13, 14] on the specified date i.e. 1<sup>st</sup> September 2018.

The male camels in Control group (C) (n=6) received plain corn oil, SC. The camels were observed for behavioural signs of Rut daily early morning.

A second dose of melatonin at higher dose rate 1mg/kg body wt. [15] was administered in camels of T<sub>M</sub> group which did not showed any change in the behaviour till 6 October 2018 after the first dose of melatonin. Semen collection was performed in camels exhibiting behavioural signs of Rut [16]. The behavioural signs, reaction time, copulation time were also recorded.

**Body Weight**

Body weight were measured at weekly interval.

**Body Girth**

The thoracic, hump and abdominal girth were measure at

fortnightly.

**Results**

**Body weight**

The body weight gain of male camels was recorded at weekly interval (1 September to 31 December 2018) for both MLT treated and male control camels (Fig.14). The mean of 1<sup>st</sup> week to 17<sup>th</sup> week ranged from 711.167±12.61 to 679.67±52.6 Kg with overall mean is 727.12±5.98 Kg for MLT treated male camels (Fig. 14). For control male camels the body weight for 1<sup>st</sup> to 17<sup>th</sup> weeks of recording ranged from 685.67±35.38 to 690.17±58.14 Kg with overall mean 698.77±8.96 Kg.

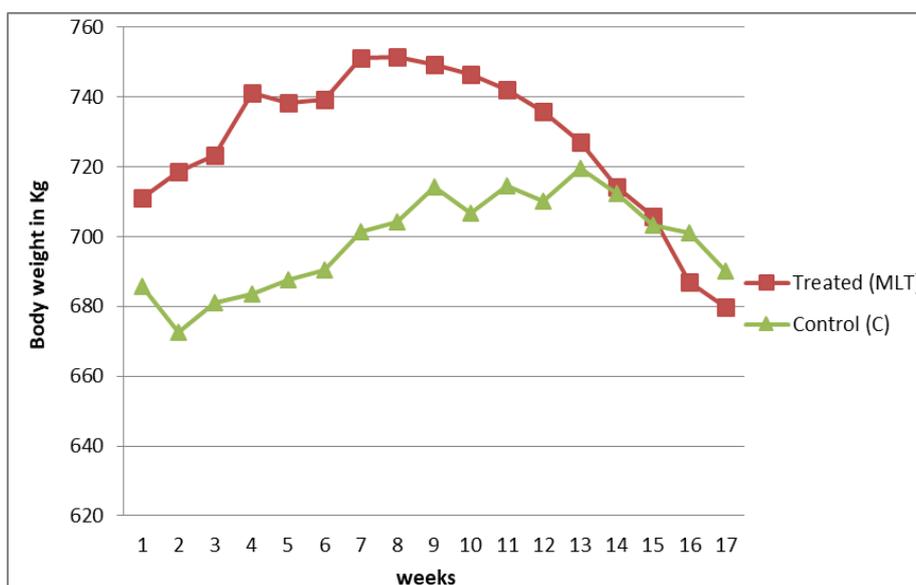
**Table:** Effect of melatonin treatment on body weight (Kg) in MLT treated and control male camels before the breeding season to mid breeding season

| Weeks            | MLT treated               | Control                  |
|------------------|---------------------------|--------------------------|
| 1 <sup>st</sup>  | 711.17±12.61              | 685.67±35.38             |
| 2 <sup>nd</sup>  | 718.5±17.32               | 672.5±42.80              |
| 3 <sup>rd</sup>  | 723.33±19.57              | 681±38.12                |
| 4 <sup>th</sup>  | 741±17.87                 | 683.67±41.17             |
| 5 <sup>th</sup>  | 738.33±23.64              | 687.75±41.93             |
| 6 <sup>th</sup>  | 739.17±25.74              | 690.42±41.90             |
| 7 <sup>th</sup>  | 751.167±26.68             | 701.33±43.68             |
| 8 <sup>th</sup>  | 751.33±29.39              | 704.17±41.51             |
| 9 <sup>th</sup>  | 749.33±25.92              | 714.33±41.73             |
| 10 <sup>th</sup> | 746.33±43.59              | 706.83±42.12             |
| 11 <sup>th</sup> | 742±51.36                 | 714.67±53.87             |
| 12 <sup>th</sup> | 735.83±57.52              | 710.167±48.68            |
| 13 <sup>th</sup> | 727±66.74                 | 719.67±61.73             |
| 14 <sup>th</sup> | 714.33±56.95              | 712.33±63.62             |
| 15 <sup>th</sup> | 705.67±77.74              | 703.33±47.70             |
| 16 <sup>th</sup> | 686.83±52.36              | 701.17±64.85             |
| 17 <sup>th</sup> | 679.67±52.6               | 690.17±58.14             |
| Overall          | 727.117±5.98 <sup>B</sup> | 698.77±8.96 <sup>A</sup> |

Mean values having different superscripts in a row (capital letter) differ significantly (*p*<0.05)

The mean body weight of MLT treated camels increased from 711.17±12.16 kg in the first week of treatment to 741±17.87 Kg in the fourth week of treatment. Whereas for untreated camel the body weight did not increase during this period. After the second melatonin treatment the body weight of treated camels increased by around 10 Kg in the seventh week

of treatment. However, during the same period the body weight of untreated control camels also increased. Stable decrease in body weight was observed during the peak breeding season (16<sup>th</sup> and 17<sup>th</sup> week) for both MLT treated and control camels.



**Graph 1:** Effect of melatonin treatment on body weight (Kg) in MLT treated and control camels before and during breeding season

**Effect of MLT treatment on thoracic, hump and abdominal girth in treated and control camels.**

In present experiment, the thoracic, hump and abdominal Girth of male camels was recorded at fortnight interval from 1 September to 31 December for both MLT treated and control group male camels.

**Thoracic girth**

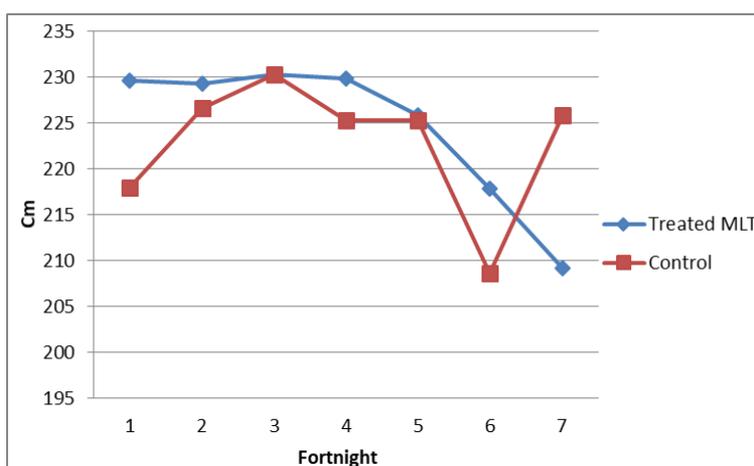
The thoracic girth of MLT treated and control male camels ranged from 229.66±5.67 to 209.16±6.77cm and 218±6.31 to 225.83±2.50 cm respectively. The overall mean of thoracic girth in MLT treated and control male camels was 224.57±2.40 and 222.88±1.94 respectively.

**Table:** Effect of melatonin treatment on body weight (Kg) in MLT treated and control male camels before the breeding season to mid breeding season

| Fort night  | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 5 <sup>th</sup> | 6 <sup>th</sup> | 7 <sup>th</sup> | Overall     |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------|
| Treated MLT | 229.66±5.68     | 229.33±6.47     | 230.33±4.66     | 229.83±4.85     | 225.83±5.76     | 217.83±7.44     | 209.17±6.78     | 224.57±2.41 |
| Control     | 218±6.32        | 226.66±4.62     | 230.33±3.48     | 225.33±2.30     | 225.33±3.36     | 208.67±7.53     | 225.83±2.51     | 222.88±1.94 |

The thoracic girth did not evidence any clear trend during 7<sup>th</sup> fortnight of study both in MLT treated and control camels

exact around 8 cm reducing in the 7<sup>th</sup> fortnight of study in MLT treated camels.



**Graph 2:** Effect of melatonin on thoracic girth in MLT treated and control male camels before and during breeding season

**Hump girth**

The hump girth of MLT treated and control male camels ranged from 281.83±5.46 to 248.83±6.95 cm and

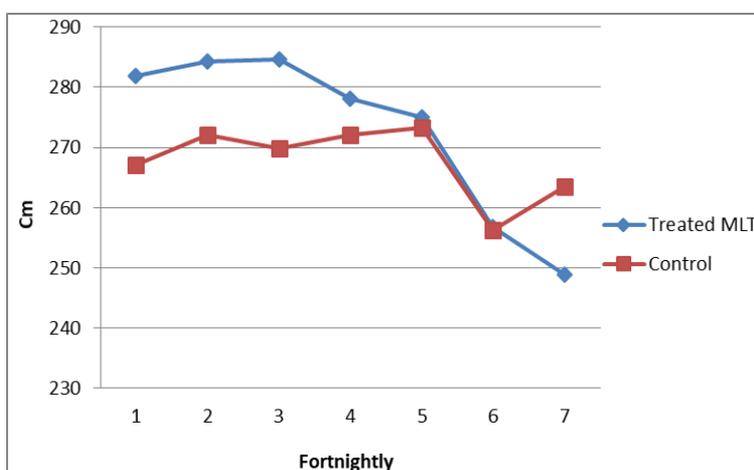
267.16±8.65 to 263.05±7.12 cm respectively. The overall mean of thoracic girth in MLT treated and control camels was 272.82±2.75 and 267.74±3.32 cm respectively.

**Table:** Effect of melatonin treatment on hump girth (cm) in MLT treated and control group of male camels before and during breeding (fortnightly) (Mean±SE)

| Fortnight | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 5 <sup>th</sup> | 6 <sup>th</sup> | 7 <sup>th</sup> | Overall     |
|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------|
| Treatment | 281.83±5.46     | 284.33±3.40     | 284.66±5.55     | 278.16±4.61     | 275±2.99        | 256.83±6.31     | 248.83±6.95     | 272.82±2.75 |
| Control   | 267.16±8.65     | 272±9.29        | 269.83±7.21     | 272±9.07        | 273.33±5.81     | 256.33±14.38    | 263.5±7.12      | 267.74±3.32 |

The hump girth of MLT treated and control camels did not evidence specific trend during the 7 fortnight of study

although the hump decreased as the breeding season approached both in treated and untreated male camels



**Graph 3:** Effect of melatonin treatment on hump girth on MLT treated and control group male camels

**Abdominal girth**

The abdominal girth of MLT treated and control male camels ranged from 214.66±5.11 to 192.33±5.59 cm and 197.83±6.95

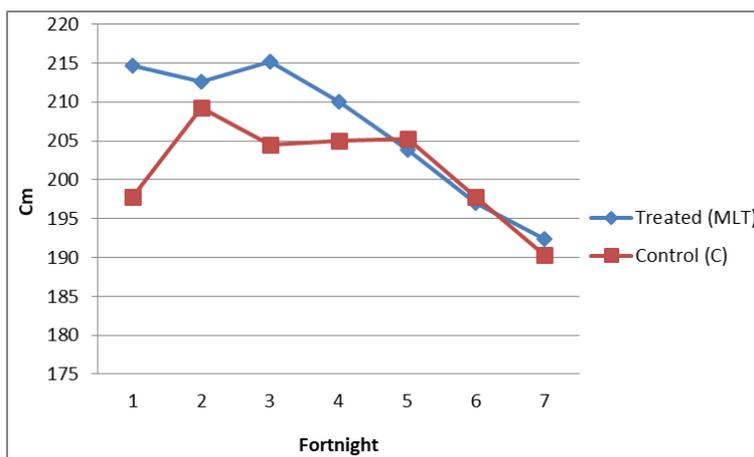
to 190.33±4.36 cm respectively. The overall mean of thoracic girth in MLT treated and control male camels was 206.52±2.28 and 201.45±2.47 cm respectively.

**Table:** Effect of melatonin treatment on abdominal girth (cm) in MLT treated and control group of male camels before and during breeding season (fortnightly) (Mean±SE)

| Fortnight | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 5 <sup>th</sup> | 6 <sup>th</sup> | 7 <sup>th</sup> | Overall     |
|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------|
| Treatment | 214.66±5.11     | 212.66±4.38     | 215.17±6.12     | 210±5.25        | 203.83±5.34     | 197±5.62        | 192.33±5.59     | 206.52±2.28 |
| Control   | 197.83±6.95     | 209.33±7.63     | 204.5±8.40      | 205±6.19        | 205.33±4.80     | 197.83±6.63     | 190.33±4.36     | 201.45±2.47 |

During the first 3 fortnight of study the abdominal girth in MLT treated and control camels evidence numor vaseations

but nearing breeding season from the 4<sup>th</sup> fortnight in treated camels and the 6<sup>th</sup> and 7<sup>th</sup> fortnight in untreated control.



**Graph 4:** Effect of melatonin treatment on abdominal girth in MLT treated and control group male camels

**Discussion**

**Body weight, thoracic, hump and abdominal girth**

Body weight, thoracic, hump and abdominal Girth were increased than decreased continuously during rut and the overall body weight of male camels in MLT treated camels was decreased significantly compared to control camels. Similar finding found reduced mean weight gain in young

male Zucker diabetic fatty (ZDF) rats and male Wistar rats. [11, 12]. Melatonin increased body weight in mice [11, 12]. Similar finding was found in a previous study on camels [17] that due to continuous stress, a net reduction of food intake and frequent diarrhoea all males tend to lose weight (up to 35% of their original bodyweight).



Camel (A) Before treatment (B) After treatment (In Rut season)

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