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Clinical Study of Estrus Appearance Time, Duration of Estrus and Effect of Temperature and Lighting Hours on Estrus in Iraqi Mares

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Abstract: This study was conducted in Southern Iraq. Were subjected to the study of 15 mares with one adult stallion, between the ages of 5-20 years, during the period from February to September 2021. Cases were diagnosed by rectal palpation ,vaginal examination using a vaginal speculum and teaser. The result show revealed 13.3% of mares its seasonally polyestrous, 33.3% irregular estrus while its recorded 53.3% polyestrous animals. also The results show decreased in Follicular phase duration in June 4.71±0.19 day significant ($p<0.05$), then in May, July and August 5.91±0.08, 5.23±0.23 and 5.84±0.22 day respectively while its increased follicular phase duration during April, February, march and September 6.5±0.15, 7.2±0.20, 7.1±0.17 and 7.25±0.17 day respectively, this results show An inverse relationship between the length of the day and the temperature with duration of the follicular phase. And The results in table 2 show the Number of mares in estrus 10,10, 12, 12, 14, 13, 13 and 12 with percentage 66.66, 66.66, 80.00, 80.00, 93.33, 86.66, 86.66 and 80.00, from February to September respectively, The highest number of estrus cases was recorded in June month, with 14 at a temperature of 42 degrees and a lighting period of 14.10 hours. While the lowest percentage was recorded in the February and march months at a temperature of 25 and 27 degrees and a lighting period of 10.52 and 11.49 hours respectively.

Keywords: rectal palpation, vaginal examination, vaginal speculum and teaser

Introduction:

Chronobiology is the study of biological timekeeping, often known as the regular physiological cycles and rhythms. Numerous organisms rely on chronobiological patterns as a survival adaptation. The capacity of creatures to react to shifting cycles of light and dark enabled them to anticipate cyclical changes in their environment. Their capacity to anticipate environmental changes and adapt physiologically afforded them a survival advantage, especially in terms of reproductive success. Seasonal rhythms in reproduction enable animals to reproduce when the chance of offspring survival is highest, such as under good weather conditions and when food resources are more readily available (Murphy, 2019). Numerous periodicities control the timing of reproduction in mares seasonally polyestrous long-day breeders. Circadian rhythms last for around 24 hours, circaannual changes last for about 1 year, The breeding season and the non-breeding season are the two main phases of the mare's circannual reproductive rhythm. Additionally, four distinct periods—the breeding season proper, the autumnal transition, the winter anestrus, and the vernal transition—can be used to further categorize these circannual changes (Sharp, 2011). Estrous cycles, which last roughly 22 days, represent the correct infradian reproductive rhythms (Aurich, 2011). The time when mares have their normal estrous cycles is known as the breeding season. In the Northern Hemisphere, a mare's first ovulation typically occurs between April 7 and 9.1 days later, following

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which she will begin her regular estrous cycles (Sharp, 1983). In previous studies, we've learned a lot about reproduction as such (Zaid, 2017 and 2006; Abd-Alhadi, and Ibrahim, 2022; Al-Hamedawi,2023 and 2012; Alrubaie, 2022; Hussein,2022), and this research is ongoing. The purpose of this study is to attempt to provide answers to the following questions: When does estrus appear? How long does it last? How does temperature and lighting affect estrus? In Iraqi mares.

Materials and methods

This study was conducted Southern Iraq. 15 mares and one adult stallion, aged between 5-15 years, were used during the period from February to September 2021. Cases were diagnosed by rectal palpation, vaginal examination using a vaginal speculum and teaser.

Results and Discussion:

At the time of occurrence, the duration of estrus and the estrous cycle were investigated. The first indicator is reported in days from the first signs of heat to the most recent coverage. A stallion, rectal palpation and vaginal speculum were used to detect the mares in heat, The interval from the end of one estrus to the end of the next is recorded as the duration of the estrous cycle. The seasonality acpects was determined depending on the time of its occurrence into three categories (seasonally polyestrous, polyestrous and irregular estrus animals). The present study revealed 13.3% of mares its seasonally polyestrous, 33.3% irregular estrus while its recorded 53.3% polyestrous animals, these finding agreement with (Morel, 2015; Popova, 2015), They mentioned the possibility of estrus occurring in winter and autumn Depending on feeding and keeping conditions, also (Aurich, 2011) Mention influence of hormonal drugs and other methods to stimulate the onset of the estrous cycle in a timely manner, and (Nikolov, 2008) The estrous cycle in mares is characterized by unevenness and uncertainty, both in terms of periodicity and heat duration. One of the reasons for their lower fertility is because of this.

(Voigt, 2020) reports, in the Northern Hemisphere, spring and late autumn form more irregular periods of estrus cycle activity, representing transitions between two extremes (transitional phases). And disagree with our study, also The first ovulation in the spring marks the beginning of the breeding season (Burkhardt, 2009). This difference resulted from the different regions in which the research was conducted, as well as the different breeds of horses and the method of green feeding and breeding. This dis agree with (Jassim *et al*, 2015) that mention The biggest element that can adversely affect animal performance is if domestic animals are given natural grass.

The results in table 1show decreased in Follicular phase duration in June 4.71±0.19 day significant ($p<0.05$), then in May, July and August 5.91±0.08, 5.23±0.23 and 5.84±0.22 day respectively while its increased follicular phase duration during April, February, march and September 6.5±0.15, 7.2±0.20, 7.1±0.17 and 7.25±0.17 day respectively, this results show An inverse relationship between the length of the day and the temperature with duration of the follicular phase. this finding coincided with (Al-Timimi and Abdul-Azeez, 2011) The duration of the follicular phase was longer in January, February, and March than in April, May, and June. Also (Ginther *et al*, 2008), Duration of the follicular phase is approximately 5-7 days, with a seasonal variation of 3-9 days. Estrus is thus extended in autumn (7-10 days) and significantly shortened in late spring and early summer (4-5 days). While disagree with (Burkhardt, 2009), Estrus cycle activity is more irregular in the spring and late autumn, representing a transition between two extremes (transitional phases). The breeding season begins with the first ovulation in the spring. This difference is due to the different study areas.

While the lutel phase duration show in table 4-1, 14.9±0.27, 14.7±0.26, 14.33±0.14, 14.25±0.13, 14.14±0.09, 14.07±0.07, 14±0 and 14±0 from February to September respectively. The result show significant increased ($p<0.05$) in February and march when comparative with other month of the study, This difference is due to the different in number of mares in estrous, The length

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of the lutel phase ranged from 14-16 days, and its length was not affected by the different months during the study period. The diestrus, or luteal phase, begins at ovulation with the formation of CL, which is responsible for progesterone synthesis. These results partially agree with the researchers (Ginther *et al*, 2008; Crowell-Davis, 2007), regarding the length of the lutel phase, but differ with them in terms of its length changing with the change of season, as they mentioned estimates a 14-15 day average duration, but can be more durable in mid-summer (16 days) than in spring or autumn (13 days). And agree with (Aurich, 2011) and (Davies Morel, 2015), The luteal phase lasts 15-16 days, during which the mare exhibits no sexual receptivity to the stallion.

The duration of estrus cycle show in table 4-1, 22.10±0.33, 21.80±0.13, 20.83±0.16, 20.16±0.16, 18.85±0.20, 19.30±0.26, 19.84±0.22 and 21.25±0.17 from February to September respectively. The result show significant increased ($p<0.05$) in February when comparative with other month of the study, This difference is due to the different of length of follicular phase and different the number of mares in estrous. The results showed that the length of the estrus period was shortened when the length of the lighting period and the temperature increased. Its agree with (Bergfelt,2000), The approximate length ranges between 18 and 22 days, based on a 21-day period on average. also (Klein, 2013), A mare's estrous cycle lasts about 21 days, but it can last anywhere from 18 to 24 days. Based on behavior or gonadal events.

Estrous cycle which divided to Building up phase of proestrus, Follicles are forming and producing estrogen. The mare may be in estrus, but she has not yet accepted the stallion. Estrus refers to sexual receptivity, Elevated estrogen levels in mature follicles just before ovulation. Metestrus, the end of sexual receptivity. Granulosa cells form the developing corpus luteum and begin to produce progesterone after ovulation and the last stage Diestrus, Mature CL (corpus luteum) characterizes this phase with high progesterone levels and low estrogen levels. Follicles may begin to develop but are unable to ovulate.

Table (1) Estrus appearance time and Duration of estrus from February to September, in Iraqi mares

month	Duration of estrus (days)		
	Follicular phase	Luteal phase	Estrus cycle
Feb.	7.2±0.20 a	14.9±0.27 a	22.10±0.33 a
March	7.1±0.17 a	14.7±0.26 a	21.80±0.13 ab
April	6.5±0.15 b	14.33±0.14 b	20.83±0.16 b
May	5.91±0.08 c	14.25±0.13 b	20.16±0.16 b
June	4.71±0.19 d	14.14±0.09 b	18.85±0.20 c
July	5.23±0.23 c	14.07±0.07 b	19.30±0.26 b
August	5.84±0.22 c	14±0 b	19.84±0.22 bc
Sep.	7.25±0.17 a	14±0 b	21.25±0.17 b
p. value	0	0	0

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Effect of temperature and lighting hours on estrus in mares:

The results in table 2 show the Number of mares in estrus 10,10, 12, 12, 14, 13, 13 and 12 with percentage 66.66, 66.66, 80.00, 80.00, 93.33, 86.66, 86.66 and 80.00, from February to September respectively, The highest number of estrus cases was recorded in June month, with 14 at a temperature of 42 degrees and a lighting period of 14.10 hours. While the lowest percentage was recorded in the February and march months at a temperature of 25 and 27 degrees and a lighting period of 10.52 and 11.49 hours respectively.

The results in table 2 show The cycle of estrus in the mares was always occurring throughout the study period, but in varying proportions among the mares, The course of estrus in mares is marked by inequity and uncertainty, both in terms of periodicity and heat duration, This is one of the reasons for low fertility. Exogenous factors such as age, reproductive state, nutrition, body condition, and environmental temperature, in addition to photoperiod, have a significant impact on the mare's seasonal reproductive activity. As a result, in most horse populations, a proportion of mares continue to cycle all year.

The results are consistent with (Morel, 2015; Popova, 2015), Mares are seasonal polyestrous animals. Their heat usually occurs in the spring, but it can also occur in the winter and autumn depending on the conditions of feeding, keeping, and their purpose also (Vilhanova *et.al*., 2021) that mention The mean number of days in estrus from 2015 to 2018 was 5.701.22. In July, the shortest estrus was seen. It lasted an average of 4.67 days and 0.58 hours. The daylength on July 15th was 15 hours 40 minutes, while the monthly average for outside temperature was 21.6 +/- 0.52 °C. March had the greatest average estrus length (8.33 0.91 days). In these years, the daylength in March averaged 11 hours 48 minutes, and the average air temperature was 6.90.67 °C. Environmental aspects and estrus duration have a negative association. Estrus lasted for shorter amounts of time as ambient temperature increased (r = 0.754, P0.0001), and it lasted for shorter amounts of time as daylength increased (r = 0.708, P0.0001). . while disagree with (Voigt, 2020), spring and late autumn in the Northern Hemisphere form more irregular periods of estrus cycle activity, representing transitions between two extremes (transitional phases). The breeding season begins with the first ovulation in the spring (Burkhardt, 2009). This difference is the result of different regions and environmental conditions that surround horses during the research period.

Table (2) No. of mares in estrus from different months, in Iraqi mares.

month	Total no. Of mares	No. of mares in estrus	%	Temperature°	Light Hours
Feb.	15	10	66.66	25°	10.52
March	15	10	66.66	27°	11.49
April	15	12	80.00	37°	12.52
May	15	12	80.00	37°	13.45
June	15	14	93.33	42°	14.10
July	15	13	86.66	43°	14
August	15	13	86.66	45°	13.12
Sep.	15	12	80.00	35°	12.15

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References:

1. Abd-Alhadi, S., & Ibrahim, N. . S. S. (2022). Hormonal Assay for Estimation of Progesterone Levels in Normally and Induced Estrus Bitches. *The Iraqi Journal of Veterinary Medicine*, *43*(2), 1–5. https://doi.org/10.30539/ijvm.v43i2.953. (Original work published December 28, 2019).
2. Al-Hamedawi, T. M. (2012). Reproductive performance improvement in primiparous lactating holstein cows by different hormonal treatments. Iraqi Journal of Veterinary Sciences, 26(2), 85–87. https://doi.org/10.33899/ijvs.2012.67464.
3. Al-Hamedawi, T. M., and Hatif, S. A. "Effect of Melatonin and in Combination With CIDR on Reproductive Performance in Anestrus Lactating Iraqi Buffaloes (Bubalus bubalis)" (2020). The Iraqi Journal of Veterinary Medicine 44, no. 2: 99–103. https://jcovm.uobaghdad.edu.iq/index.php/Iraqijvm/article/view/981
4. Alrubaie, N. H. M., Alyasiri, E. A., & Al-Hamedawi, T. M. (2022). Efficacy of Nigella sativa extract on individual activity and viability of cryopreserved sperm of Holstein bulls raised in Iraq. International Journal of Health Sciences, 6(S1), 14282–14287. https://doi.org/10.53730/ijhs.v6nS1.8652.
5. Al-Timimi R.I and Abdul-Azeez F.R. (2011). Athesis of study of various Aspect of estrous cycles in mares during winter in iraq, university of Baghdad, college of veterinary medicine, obstetric.
6. Aurich, C. Reproductive cycles of horses. Anim Reprod Sci 2011; 124:220-28.
7. Bergfelt DR (2000) Estrous synchronization. In: Equine breeding management and artificial insemination. Samper, JC (ed.) Saunders Company, Philadelphia: 165-177.
8. Burkhardt, J. (2009) Transition from anoestrus in the mare and the effects of artificial lighting. The Journal of Agricultural Science, 37 (1), 64-68. DOI: https://doi.org/10.1017/S0021859600013083.
9. Crowell-Davis SL (2007) Sexual behavior of mares. Horm Behav 52: 12-17.
10. Davies Morel, M. C. G. (2015). Equine Reproductive Physiology, Breeding and Stud Management (4th ed.). Oxfordshire: Wallingford : CABI.
11. Ginther OJ, Beg MA, Neves AP, Mattos RC, Petrucci BP, et al. (2008) Miniature ponies: 2. Endocrinology of the oestrous cycle. Reprod Fertil Dev 20: 386-390.
12. Hussein, E., & Hussein, K. (2022). Assess the Efficiency of Silver Nanoparticles for Treatment of Endometritis in Iraqi Breed Cows. Egyptian Journal of Veterinary Sciences, 53(2), 263–271. https://doi.org/10.21608/ejvs.2022.106646.1315.
13. Jassim E. AL-Musawi , Shaker A. Hassan , Sundus F. Muhammad, (2015). Effect of Cold Stress on Some Blood Parameters of Sheep and Goats. (2017). International Journal of Science and Research (IJSR), 6 (1), 1617–1620. https://doi.org/10.21275/art20164378.
14. Klein, B. G. (2013). Cunninghams Textbook of veterinary physiology (5th ed., Vol. 1). St. Louis: Elsevier Saunders 423.
15. Morel, M.C.D. (2015) Equine reproductve physiology, breeding and stud management (5th Editon). Aberystwyth University: CABI.
16. Murphy, B. A. (2019, May 1). Circadian and Circannual Regulation in the Horse: Internal Timing in an Elite Athlete. Journal of Equine Veterinary Science. W.B. Saunders. https://doi.org/10.1016/j.jevs.2019.02.026.
17. Nikolov, I., (2008). Biology and biotechnologies of reproducton of agricultural animals. Plovdiv: Akademichno izdatelstvo na Agraren Universitet – Plovdiv.

All rights reserved. © 2023

18. Popova, M. (2015) Duraton of oestrus and estrous cycles in mares from Purebred Arabian and Shagya-Arabian breeds. In: Scientfc Works, LIX, book 2. Plovdiv: Agricultural University, 239-248.
19. Sharp, DC. The effects of artificial lighting on reproduction. In: Robinson, NE, editor. Current Therapy in Equine Medicine, Philadelphia: Saunders; 1983, p. 399-401.
20. Sharp, DC. Vernal Transition into the Breeding Season. In: McKinnon, AO, Squires, EL, Vaala, WE, & Varner, DD, editors. Equine reproduction, United Kingdom: John Wiley & Sons; 2011, p. 1705-15.
21. Voigt, U. (2020) Influence of Weather Parameters on the Fertility of Horse Mares (Equus Caballus). Thesis submitted in fulfilment of the requirements for the degree of Dr. agr. (Agriculture) in Fachbereich Agrarwissenschaften der Justus-Liebig-Universität Gießen, p. 148.
22. Z. Vilhanova, F. Novotny, I. Valocky, V. Hura, P. Hornskova & M. Karamanova. (2021), Effect OF Seasonal Environment AL Changes on SelecTted Reproductive Parameters In Mares, Bulgarian Journal of Veterinary Medicine, 2021, 24, No 2, 208□218 ISSN 1311-1477; DOI: 10.15547/bjvm.2019-0083.
23. Zaid, N. W. (2006). Effect of Prostaglandins F2 α on the Evaluation of Vaginal Epithelial Cells of Iraqi Ewes during Puerperium. The Iraqi Journal of Veterinary Medicine, 30(2), 138–144. https://doi.org/10.30539/iraqijvm.v30i2.824.
24. Zaid, N. W. (2017). Testosterone role during seasons changes in the dogs testes: Najlaa Sami Ibrahim and Nazih Wayes Zaid. The Iraqi Journal of Veterinary Medicine, 41(1), 125–130. https://doi.org/10.30539/iraqijvm.v41i1.93.

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