



Factors influencing the gestation length in thoroughbred mares bred during foal heat in India

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Period of pregnancy is a biological variable of commercial importance in most domestic species. The pregnancy period reported by several studies in various breeds of horses ranges from 300–380 days (Rossdale *et al.* 1984, Immegart 1997). This variability in gestation lengths in mares when compared to other farm animals is much wider and the extent of variation in gestation length can be attributed to various factors, like nutritional status of the mare, maternal age, month of mating, year of mating, climatic factors, breed, sex of the foal and foal heat (Morel *et al.* 2002, Perez *et al.* 2003, Sevinga *et al.* 2004, Valera *et al.* 2006, Van Rijssen *et al.* 2010, Satue *et al.* 2011, Ali *et al.* 2014). The precise prediction of the parturition in a high value stock demands perfect management, thorough supervision during parturition to improve the fetal survivability postpartum, and to make it economically viable. Therefore, this investigation was carried out to examine the intrinsic and extrinsic factors affecting the gestation length in mares bred during foal heat.

The study was conducted in a Thoroughbred Stud Farm situated in the southern part of India located at 13.0232 N latitude and 77.0252 E longitude with an average altitude of 2,536 feet. Gestation length of 33 mares, who had foal at foot were analyzed for a period of seven years (2008–2015, excluding data of the year 2009) aged between 6 and 23 years. The mares were kept in an open shelter and outdoor paddock, fed a daily ration according to their reproductive status in a manner that is generally practiced in Indian stud farms. From the mares at foal heat, data pertaining to variables such as gestation length, year of foaling, age of mare and foal gender were collected and subjected for analysis of variance using SPSS.V.16 software (SPSS Inc, Chicago, Illinois, USA).

The gestation length ranged from 317 to 361 days with the mean value of 335.73 ± 1.00 days in mares bred during foal heat. The pregnancy period in mares bred during the

period 2008–2010, 2011–2012, 2013–2014 and 2015 were 338.10 ± 1.85 (10), 336.67 ± 2.33 (6), 333.00 ± 1.89 (10) and 335.43 ± 1.81 (7) days, respectively (Table 1). The statistical analysis revealed non-significant ($p \geq 0.05$) influence of period of foaling on gestation length. The mean gestation length reported in thoroughbred mares in the current study is in agreement with the previous observations of 334 days (315–360) in Thoroughbred mares in Southern Brazil (Kurtz-Filho 1997), 334.3 ± 0.22 days in Arabian mares in Eskisehir Province, Turkey (Celik 2009), 335.5 ± 10.2 days (range 320–360 days) for Arab mares bred during foal heat in Kingdom of Saudi Arabia (Ali *et al.* 2014). While the gestation length reported in the present study is found to be longer when compared to 332.85 ± 19.8 days in Algeria (Meliani *et al.* 2011) and shorter than 342.20 ± 1.91 days in Marwari Breed of horses in Northern part of India (Talluri *et al.* 2016). Gestation lengths from 300 to 380 days were reported in various breeds of horses across the globe is parallel to the present data (Satue *et al.* 2011). The similarities and variations in the gestation lengths in mares in the present study when compared to mares in other countries in the subtropical parts of the world could be due to the variation in extrinsic factors like location, climatic conditions, photoperiodism and managerial practices. The mean gestation lengths in mares bred in foal heat during the year 2008 and 2010 was found to be longer when compared to gestation length observed during the period 2011–2012, 2013–2014 and 2015 though statistically not significant ($p \geq 0.05$). In contrast to these results, Valera *et al.* (2006), Celik (2009) and Meliani *et al.* (2011) have opined that the period of breeding has its influence on gestation length in mares. The other reasons for the change in gestation lengths with respect to period were attributed to the nutritional quality of feed, bad winter weather, difference in management, photoperiodism (Perez *et al.* 2003, Sevinga *et al.* 2004).

The duration of gestation in mares aged 6–11, 12–17 and 18–23 years was 332.64 ± 1.22 , 337.21 ± 1.36 and 337.68 ± 4.33 , (days) respectively (Table 1). The age of mare had no influence on the gestation length in mares

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Table 1. Effect of period, age of mare and sex of foal on the gestation length (days) in thoroughbred Mares bred during foal heat

Period (years)	Gestation length (days)	Age (years)	Gestation length	Foal sex	Gestation length
2008 to 2010	338.10±1.85 (10)	6–11	332.64±1.22 (11)	Male	336.94±1.27 (17)
2011 to 2012	336.67±2.33 (6)	12–17	337.21±1.36 (19)	Female	334.45±1.55 (16)
2013 to 2014	333.00±1.89 (10)	18–23	337.68±4.33 (3)		
2015	335.43±1.81 (7)				

Figures in the parenthesis indicate the number of mares.

bred during foal heat. The age of the mare has been considered as an important factor in determining gestation length in mares (Satue *et al.* 2011, Meliani *et al.* 2011), although some discrepancies existed. Several authors failed to detect differences in gestation length when comparing mares of different ages (Kurtz Filho *et al.* 1997, Davies Morel *et al.* 2002, Winter *et al.* 2007). Similarly, this study also showed that gestation length increases with increase in age numerically, but found to be statistically non-significant ($p \geq 0.05$). It has been postulated that the influence of aging is related to the decrease in placental nutritional efficiency (Wilsher and Allen 2003) and/or the metabolic and hormonal drive to grow (Gluckman and Hanson 2004). Indeed, Wilsher and Allen (2003) showed that mare's age and parity influenced the development of microcotyledons and microcotyled on surface density, presumably due to degenerative changes in their endometrium. The degeneration of endometrium results in patchy areas where fewer and less well development microcotyledons result in a serious reduction in the level of nutrition available to fetus (Allen *et al.* 2007). As a consequence of age and multiparous state, there could be slowing of intra-uterine growth which prolongs gestation length and delays foaling.

In mares bred during foal heat, colt foal pregnancies lasted for 336.94±1.27 days, which were found to be statistically ($p \geq 0.05$) similar to that of filly foal pregnancies which lasted for 334.45±1.55 days in the present study (Table 1). This difference in gestation lengths between colts and fillies pregnancies is in agreement with the previous studies of 346.2±0.72 days v/s 342.4±0.65 days (Morel *et al.* 2002), 337.9 v/s 335.5 for Andalusian mares, and 341 v/s 339.6 days for Arabian mares (Valera *et al.* 2006), 353±0.6 v/s 351±0.5 days for Thoroughbred mares (Van Rijssen *et al.* 2010), 333.71±8.39 v/s 332.19±8.68 days in pure bred Arabian mares (Meliani *et al.* 2011), 350.3±0.6 v/s 347.8±0.6 days in Standard bred mares (Dicken *et al.* 2012), 337.1±0.7 v/s 332.7±0.9 days in heavy draft mares (Aoki *et al.* 2013), 342.9±11.0 v/s 338.9±9.9 days in Thoroughbred mares (Korabi *et al.* 2014), 343.18±2.44 v/s 343.72±2.94 days in Marwari mares (Talluri *et al.* 2016) and 344.32±0.93 v/s 341.96±0.92 days in Mangalarga Paulista breed of horses (Ferreira *et al.* 2016). According to the documentation of Valera *et al.* (2006) foal's gender accounts for 0.430% of the total variation of gestation length in Andalusian brood mares. Even though, the reason for varying lengths of gestation length due to differences in foal sex is not elucidated yet, but it is agreed that male

body development is greater than females and normal pregnancy ends only when the foetal growth is optimum, and hence the gestation length of colt pregnancy would be longer in the present study (Wilsher and Allen 2003). Furthermore, Jainudeen and Hafez (2000) pointed towards the different endocrine functions of male and female foetuses and their different interactions with the endocrine control of parturition. Zegher *et al.* (1999) justified the difference was due to androgen action and to sex chromosome-linked effects.

SUMMARY

The obtained data represent the record of reproductive performance of mares in the southern part of India. Statistically, the period of breeding, age of mares, sex of the foal had no influence on gestation length in Thoroughbred mares bred during foal heat, although increased age had enhanced the gestation length by 1–4 days and mares carrying colt foals had 1–2 days longer gestation than that of filly foals. The findings of present study need to be confirmed on a large population before making their use in equine husbandry practices.

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