

A Retrospective Study of Arabian Stallion Fertility Used in National Stud Farm of Tiaret (West of Algeria)

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Abstract: The aim of this paper to evaluate the stallion fertility in advance and to aid breeding management. The collection of a historical information about the Arabian stallions adults (n=101) and 495 mares with range age between (8 and 26) years in the national stud farm of Chaouchoua Tiaret. Fertility was measured using three endpoints: foaling rates (FR), percent pregnant per cycle (PC) and percent pregnant per season (PR) during (2003-2013). The pregnant per season rate (PR) was of 84 % The foaling rate (FR) was of 80%, the pregnancy cycle rate (PC) was of 96 % ; a strong correlation existed between the number of mares mated and (PC) ($r = -0.59$; $p < 0.01$). We conclude that breeding records existed in many forms (foaling, pregnancy per cycle, or per season rates), but there is still a need to develop tests that can predict fertility with a reasonable degree of certainty before the stallion has begun his breeding career.

Key words: Fertility • Pregnancy Rate • Foaling Rate • Stallion

INTRODUCTION

In Algeria, stallions are selected for breeding primarily on their athletic powers, or other phenotypic characteristics. Fertility or fertility potential are usually at best secondary considerations and in most cases, assessment is limited to selecting out stallions that clearly do not possess the characteristics necessary for reasonable fertility. Evaluating the fertility or 'fertility potential' of a stallion is an important part of sire selection and of breeding management. In addition, knowledge of past fertility and semen quality can be invaluable in the investigation of problems, or suspected problems, with fertility. Of course, the true indices of fertility are the pregnancy and foaling rates, however both are retrospective and are influenced dramatically by factors extrinsic to the stallion, such as mare quality and breeding management [1-4].

Colenbrander *et al.* [4] reported that stallion fertility can be measured in various ways (Foaling, pregnancy or non-return rates per cycle, season or first cycle), The

variation in the relationship between sperm quality and stallion fertility may be limited by number of stallions examined, as well as the number of mares bred by each stallion [5-7].

To our knowledge, there are few works on evaluation of the stallion fertility in Algeria; for that purpose our work concerned the collection of historical information about the Arabian stallions in the national stud farm of Chaouchoua Tiaret. The aim of breeding is not only to produce a foal but also to achieve genetic progress. Fertility was measured using two endpoints: foaling rates (FR) and percent pregnant per cycle (PC) and percent pregnant per season (PR).

MATERIALS AND METHODS

The Study Area: The study was realized in the national stud farm of Tiaret, which is situated in approximately 300 km in the southwest of Algiers. The province of Tiaret is characterized by a continental climate with harsh winter, hot and dry summer and average rainfall of 300–400 mm

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Table 1: Summary of data for each breeding year in stud farm of Tiaret (2003-2013)

	Mean	SD	Min	Max
Number of stallions	9.18	0.87	8	10
Number of mares mated	45.00	2.96	38	49
PR%	84	8.02	65	93
FR %	80	8.62	61	91
Report mares/stallions	5	0.70	4	6

Pregnant per season rate: (PR), foaling rates: (FR)

per year. The stud farm, created in 1877, on a surface of 800 ha, with a total of 250 horses, compound of two main races (Arabian and Barb).

Data Collection: The stallion's identity, age and fertility status of the mare, the mating dates and the cycle number were recorded per mare fertility data from 101 Arabian stallions and 495 mares were collected during (2003-2013) (Table 1). Age of horses belonged to the national stud farm of Chaouchoua Tiaret and subjected to the current study (ranged from 8 to 26) years.

Percent pregnant per cycle (PC, total number of mares pregnant divided by the total number of mare cycles bred). Percent pregnant per season (PR, total number of mares pregnant divided by the total number of mares bred during the year) and foaling rates per season (FR, total number of foals produced divided by the total number of mares bred during the year).

Pregnancy diagnosis and status, was determined using trans-rectal ultrasonography [8] from day 14 to 42 after ovulation and successful breeding. Abortion due to twins was the highest cause of pregnancy loss in the second half of gestation [9].

Fertility definitions in these studies included anecdotal descriptions [10, 11] seasonal pregnancy rates [5, 12-14] pregnancy rates per cycle [7, 12-14] live foal registration [15].

Statistical Analysis: Data were analyzed using IBM SPSS 20 and expressed as the mean $\pm$ standard error of mean (SD) min; max and variance. Data collected were subjected to various statistical tools in a one-way analysis of variance followed by the Student Newman-Keuls multiple comparison test. The Pearson's correlation coefficients were used to assess the association between the parameters studies.

RESULTS

The results of different data during the present investigation: pregnant per cycle rate (PC), pregnant per season rate (PR) and foaling rates (FR) as well as their evolution from 2003 to 2013 were summarize in Table 1, Figures 1 and 2.

It should be noted that the technique of the reproduction used in Algeria was handled for breeding registered by the national stud farm.

The number of stallions used varying from 8 to 10 stallions and the number of mares mated fluctuating between 38 and 49 mares.

It could be noted from Table 1 and the figure 1 that mares of age >11 years, had pregnant per season rate (PR) of 84% (range 65% to 93 %) and a foaling rate (FR) of 80 % (range 61% to 91 %).

The table 1 and the figure 2 showed the evolution of number of mares services for each stallion during a breeding season (every year) with an average of 6 mares by stallion, (range 5 to 7) mares.

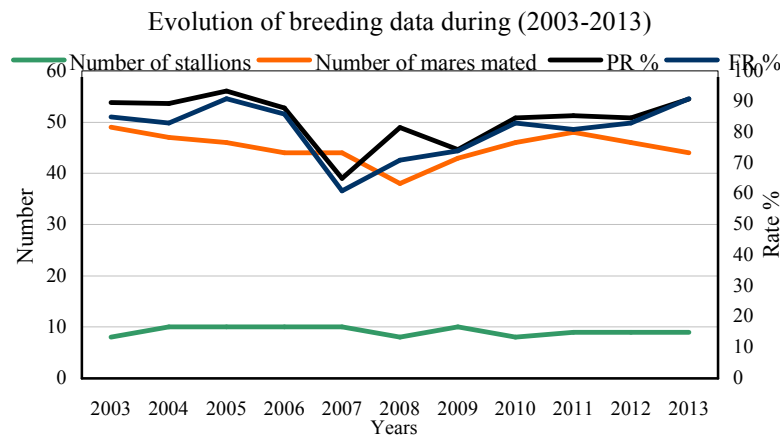


Fig. 1: Evolution of breeding data during (2003-2013).

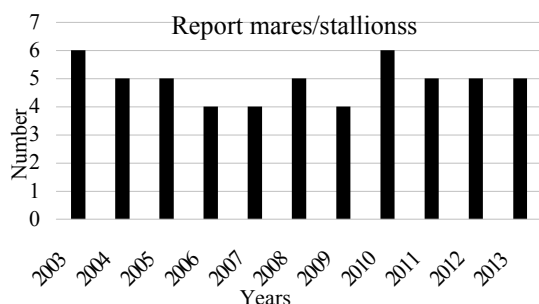


Fig. 2: The evolution of report mares/ stallions.
Per cycle, pregnant rate (PC) % was (96%) varying between 67% and 100%.

Table 2: The mean of pregnant/cycle rate (PC) % of stallions

	Mean	SD	Min	Max
Age of stallions	14.21	5.60	8	26
Number of mares mated	5.32	5.38	1	18
PC %	96	8.42	67	100

Pregnant per cycle rate: (PC)

Table 3: Correlation between number of mares mated, age and pregnancy cycle rate (PC).

	Age of stallions	Number of mares mated	PC %
r	1	-0.39	0.19
Age of stallions	1	-0.39	0.19
Number of mares mated	-0.39	1	-0.59**
PC %	0.19	-0.59**	1

** . Correlation is significant at $p < 0.01$. Pregnant per cycle rate : (PC)

Table 3 shows a strong correlation existed between the number of mares mated and pregnant cycle rate ($r = -0.59$; $p < 0.01$), a positive correlation between age of stallions and pregnancy cycle rate ($r = 0.19$; $p > 0.05$).

DISCUSSION

The variation in the reproductive performance differs between species. In the horse the foaling rate per stallion varies by more than 40%, as was illustrated in this study. In cattle and pigs this variation in reproductive performance has been reduced to 10% by improving management and selection for fertility [16]. Similarly,

the foaling rate (FR) was 80 % [17]. The fertility rate was 10 % low in barren mares as compared to lactating mares. In the current study, the reproductive status (Barren or lactating) did not affect the fertility rate which is in agreement with the observation reported by Pimentel *et al.* [18] probably because there was a reduced number of certain categories (Maiden mares) and there was an uniform distribution of these categories among stallions. Moreover, foaling rates typically range from 40 to 80%

[19-21]. This variation is large compared to that of other species after insemination, namely 50-60% for cattle and 75-85% for pigs [2].

The mean pregnant per season rate (PR) for Algerian horses was of 84 %. Love [22] reported that seasonal pregnancy rate is historically used to describe stallion fertility. However; it may not be the most sensitive fertility measure, since it does not account for the number of estrus cycles a mare is bred prior to becoming pregnant.

The per cycle pregnant rate (PC) of this study was (96) % that is comparable to those of the of Morris and Allen [3]. Colembrander *et al.* [4] reported that the experimental studies demonstrate that fertilization rates can reach high levels in mares mated at the appropriate time with semen from a stallion of proven fertility (>90%).

The strong correlation existed between the number of mares mated and pregnant cycle rate ($r = -0.59$; $p < 0.01$), was in agreement with the observation reported by Voss *et al.* [6]. The reproductive performance of stallions can be affected by the mating frequency.

To improve the reproductive efficiency of horses, it is essential to have insight into factors that may have an influence, e.g. breeding system, age of the stallion, number of breeding by the stallion, timing of insemination and fertility status and age of the mare [19, 23].

CONCLUSION

Breeding records exist in many forms (Foaling, pregnancy or non-return rates per cycle, or per season rates), but there is still a need to develop tests that can predict fertility with a reasonable degree of certainty before the stallion has begun his breeding career.

Breeding records should be the most detailed, objective historic information that the clinician can obtain. That range from poorly organized handwritten papers to highly organized computerized spreadsheets listing numerous mathematic parameter.

However, even computerized record-keeping programs usually remain inadequate for summarizing and measuring relevant fertility endpoints and further collection and analysis are needed for accurate assessment of breeding performance.

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