Estimation of the intercalving period in Italian Mediterranean buffalo

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ABSTRACT: Aim of this study was to estimate the average intercalving period of a buffalo herd/population, by using the percentage of subjects that are able to conceive within 90 days post-partum, and that, consequently, have an intercalving period lower than 400 days, in order to give a precocious judgment on its fertility. A total number of 8,845 intercalving periods were recorded in 4 farms and 4 Provinces of Campania and Lazio Regions. In all the farms the out of breeding season mating technique was adopted and a constant diet was administered throughout the year. Values were grouped for primiparous and pluriparous buffaloes and were divided in four calving periods: January-March; April-June; July-September; October-December. Within each group/farm ANOVA was performed and the means were analysed by t Student test. In each group the mean value and the percentage of subjects with an intercalving period lower than 400 days (% < 400 days) were calculated and the regression analysis was carried out between the values of the intercalving periods and the % < 400 days. Finally, an all-in regression analysis was performed by using the data of 55 groups, excluding those with less than 25 values. The regression analysis between % < 400 days and the mean value of the intercalving period was always significant, except in one case. The comparison between the real values and those calculated allows to affirm that, if the percentage of subjects with an intercalving period lower than 400 days is higher than 50%, an intercalving period lower than 450 days will be probably recorded.

key words: Buffalo, Intercalving, Seasonality, Longevity.

INTRODUCTION - The intercalving period is one of the most important parameters to evaluate the productive and reproductive efficiency in a farm and/or in a population (Bettini T.M., 1968**.** Singh, B. et al., 1992). It is worth pointing out that the value is reliable if the recording is performed for long time and the culling rate is considered. In fact, the calculation is usually underestimated, especially if it is carried out for short periods, because the subjects that did not conceive or that will be eliminated are not taken into account. In a single farm, the value of the intercalving period has low practical application, because it is calculated *a posteriori*, and hence its excessive length can not be modified. An approximate precocious estimation of the intercalving period is more useful compared to an exact value calculated after one or more years. In this case, the value would be influenced by either the

higher (shortest intercalving period) or the lower (longer intercalving period) culling rate of the farm. For this reason, the aim of this study was to evaluate a possible association between the percentage of subjects with a shorter (< 400 days) intercalving period and the mean value, that can be calculated only after several years.

MATERIAL AND METHODS - The intercalving periods of 2,845 buffaloes bred in four Provinces (CA, LT, SA and CE) and that calved in 1999 were recorded until 2001. Other 1,593 subjects bred in CE province (Farm s.a., localized in the low Volturno valley) were registered from 2001 to 2006 and 514 animals bred in SA province (Farm M) were analyzed from 2003 to 2006. Values were grouped for primiparous and pluriparous buffaloes and were divided in four calving periods: January-March (Jan-Mar); April-June (Apr-Jun); July-September (Jul-Sep); October-December (Oct-Dec). Furthermore, other 501 subjects bred in Latina province (Farm C) were studied from 1999 to 2001 and other 3,392 buffaloes bred in Caserta province (Farm S.T., localized in the average Volturno valley) were recorded for 10 years. In these last 2 cases, it was only possible to divide the values in four calving periods: Jan-Mar; Apr-Jun; Jul-Sep; Oct-Dec. In the farm S.T. the data were also divided in months. In all the farms the out of breeding season mating (OBSM) technique was adopted and a constant diet was administered throughout the year. Within each group/farm ANOVA was performed and the means were analysed by t Student test. In each group the mean value and the percentage of subjects with an intercalving period lower than 400 days (% < 400 days) were calculated and the regression analysis was carried out between the values of the intercalving periods and the % < 400 days. Finally, an all-in regression analysis was performed by using the data of 55 groups, excluding those with less than 25 values.

RESULTS AND CONCLUSIONS - Buffaloes that delivered in the period Oct-Dec, showed the longest intercalving period, because of the OBSM technique, that does not allowed the conception between October and February. Also buffaloes that calved between January and March showed a long intercalving period, probably because the resumption of ovarian activity in these subjects coincided with the increasing day length. The shortest intercalving periods were recorded in the last two quarters, when the resumption of ovarian activity coincides with the decreasing day length. In farms M II, LT I and LT II the longest intercalving period was recorded in Oct-Dec, probably due to a longer interruption of sexual promiscuity. In Farm M I and CA II no significant differences were recorded among the periods.

The regression analysis between the percentage of animals with an intercalving period < 400 days and the mean value was statistically significant in each farm ($P<0.01$ for Farm C and s.a. and $P<0.05$ for farm M). A high statistical difference ($P<0.000$) was found if the 55 data were grouped (Figure 1), in farm S.T. (where the data were divided in 12 months; Figure 2) and in all provinces. However, the regression analysis between the percentage of animals with an intercalving period < 400 days and the mean value was not significant in Farm S.T., when the data were divided in the four periods (Table 1). Data from the regression analysis showed that if the percentage of subjects with an intercalving period < than 400 days is higher than 50%, the intercalving period will be lower than 450 days. This calculation allows a precocious estimation of the fertility in a farm, independently from the culling rate.

Table 1. Intercalving period in primiparous (I), pluriparous (II) and in the four periods of the year. Multiple R and significance of the regression analysis between % < 400 days and the mean value of the intercalving period in each farm, provinces and in total were also reported.

Months	Jan-Mar		Apr-Jun		Jul-Sep		Oct-Dec		Total		Multiple R	Signif. of F
Farm/ Prov.	n	mean	n	mean	n	mean	n	mean	n	mean		
C	251	439^{B}	154	409^{A}	72	427^{AB}	24	512^{C}	501	432	0.994	0.006
S. T.	1256	494^{a}	961	479^{b}	841	486^{ab}	334	494^{ab}	3392	488	0.770	0.230
S. T. *									3392	488	0.889	0.000
M I	43	444	43	421	6	443	1	538	93	434		
M II	158	432^{a}	138	443^{ab}	48	429^{a}	77	466^{b}	421	441	0.811 **	0.027
s.a I **	355	537^{A}	331	482^{B}	108	479^{B}	26	584^{A}	820	509		
s.a II	125	477^{ab}	297	461^{a}	278	481^{b}	73	483^{ab}	773	473	0.871 **	0.005
CA II	92	454	54	450	41	440	16	420	203	448		
CE I	53	512^{A}	61	447^{B}	49	471^{AB}	36	455^{AB}	199	472		
CE II	239	448^{Aa}	263	423^{b}	194	453^{A}	56	498^{B}	752	444		
LT I	86	461^{A}	15	496^{AB}	9	488^{AB}	7	569^{B}	117	474		
LT II	145	400^{A}	104	411^{A}	103	403^{A}	26	463^{B}	378	408		
SA I	241	501^{a}	82	484^{ab}	55	458^{b}	32	464^{ab}	410	489		
SA II	277	447^{a}	211	453^{ab}	216	447^{a}	61	483^{b}	765	452	0.760***	0.000
Total	3326	478^{A}	2717	460^{B}	2032	468^{B}	770	488^{A}	8845	471	0.829	0.000

*S.T. for 12 months; I = primiparous; II = pluriparous; ** primiparous + pluriparous; *** all Provinces.
Values with different superscripts within row are significantly different (^{a,b} $P<0.05$; ^{A,B} $P<0.01$).

Figure 1. Linear regression trend (55 cases) between the percentage of animals with an intercalving period < 400 days and the relative mean (days) value (Multiple R = 0.859; R^2 = 0.738; P<0.001): real and calculated (cal) values.

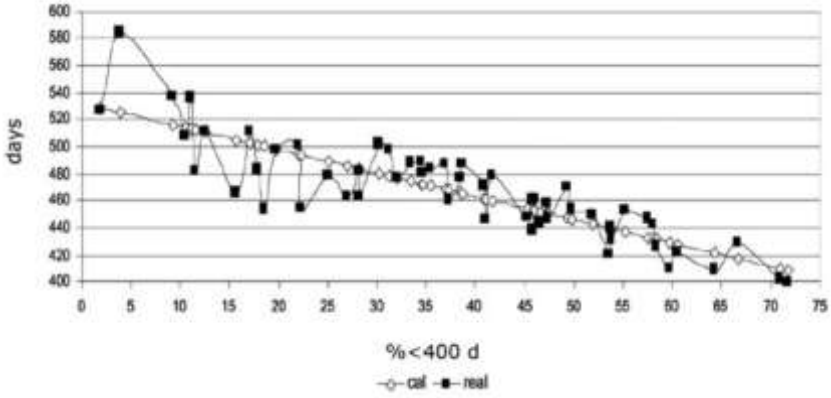
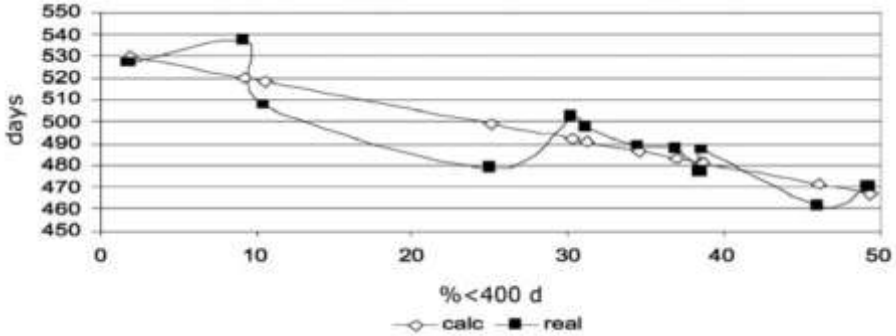


Figure 2. Linear regression trend between the percentage of animals with an inter-calving period < 400 days and the relative mean value (Multiple R = 0.889; R^2 = 0.790; P<0.001), recorded in S.T. farm by dividing the data in twelve months (n=3,392): real and calculated (cal) values.



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