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Study of some variation factors of breeding performances in dairy cattle

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ABSTRACT

In order to study the effect of some parameters on the reproduction performances, a review of the reproduction of nine herds of dairy cattle located in the East of Algeria was established in a period of five years. The females demonstrated an infecundity following an extension of the interval between calving ICC= 405±50,9d, the interval calving-first service ICS1 =99±36, 5 as well as the interval calving-fecundate service ICFS =132± 25, 22. The fertility is good as the success rate at the first insemination SR1 and the fertility index are acceptable (SR1= 53, 8±21, 46 and IF= 1, 68±0,49 respectively). Simple c orrelations are investigated between different data of reproduction, thus between the parameters of reproduction and the other factors, susceptible to affect them. A correlation was proven between the interval calving-first service and the success rate at first service R=0, 74; also with the interval between calving ICC R=0,81. A strong correlation between the interval calving-fecundate service ICFS and the interval between calvings ICC was shown R=0, 86. The study of the models for the major livestock shows that the best model is obtained for the parameter interval between calving ICC and the interval calving-fecundate service ICFS (R^2=80%). Another model highly significant was that between interval calving and the interval calving-first service (R2=70%), the other models are less significant. The effect of certain factors like age, number of lactation, season and moment of the realization of the first insemination and milk yield on different parameters of the evaluated reproduction parameters, was investigated, no correlation was highlighted. Nevertheless, the absence of the effect of the politic of the first insemination on the fertility of cows doesn`t exclude the importance of the choice of the moment and the season of the realization of the first insemination, because the excellent success rate obtained in spring is at (50- 70d) of the post partum SR1=72%. The knowledge of the risk factors, object of this study, helps to the establishment of an efficient strategy of control and monitoring in order to limit at least the lost in calves and in milk yield associated with bad performances.

Key words: Infecundity- calving-number of lactation- risk factors-Algeria.

INTRODUCTION

The etiology of infertility and fecundity is varied and usually mutlifactoriel, in the practical conditions, the bovine infertility could not be dissociated of the management like, the quality of heat detection, feeding, environment factors. As it could be due to intrinsic factors related to the animal like, the non fecundation, or the embryonic mortality that could occur even when the management conditions are optimal **[1]**.

The factors susceptible to modify the evolution of the reproductive life of females are numerous, for the facility of the presentation, the factors responsible of the infecundity are gathered in two categories, one groups the individual factors interesting more the animal, the other grouping more the collective factors proper to the herd and relevant to its environment or to the farmer and its ability to manage the numerous aspects of its herd breeding.

Since the multiplicity of the existant relations between the different factors responsible of the reproduction performances, it appears increasingly essential to use multivariate analysis methods of these factors in a manner to evaluate the respective effect of each of them in a given environment.

The aim of this work , trough the study of some farms and during a period of five years, is to define the breeding parameters of dairy cows and to try to determinate the effect of some factors of variation as, the age, the lactation range, the dairy production, and the politic of the first insemination on the reproduction performances.

MATERIELS AND METHODS

2.1. Samples description

The study was realized in nine rearing located in the Eastern part of Algeria, a pre survey was conducted in order to determinate the exploitations that will be the object of our study. The total number of the cows is 493 reproductive females of the Montbeliarde and the Prim Holstein breeds; the feeding is composed mainly of sorghum, maize, vetch-oat, lucerne and the barley seeds.

The mean dairy production is around 18L/d, the diagnostic of gestation is done by rectal palpation two months after the setting to reproduction, some farms did it via scanning, the setting of breeding is spread along the year, two modes of breeding are practiced, natural fight, artificial insemination, however the latter tends to take place and to become the essential mode of insemination. In fact, the natural service is done for cows in case of failure of the artificial insemination.

The detection of heat is done by the observance of the cows; the registrations are not always updated. The herders realize the prophylaxis against different diseases: An internal and external deworming, a vaccination against foot and mouth disease, rabies, and enterotoxemia, a brucellic detection and a tubercilination. The dominant pathologies are mastitis, metritis, digestive and respiratory pathologies.

Table n°1 : Animals number of the studied farms

Farms	F1	F2	F3	F4	F5	F6	F7	F8	F9
Cows	129	09	21	46	79	24	30	30	18
Heifers	30	05	05	14	12	5	8	8	20
Total	159	14	26	60	91	29	38	38	38

2.2. The calculated variables

A review of the reproduction was established during five compains that lays in many years. This present work concerns only the last compain (2010-2011), the parameters evaluating the breeding performances are the interval calving-calving, the range calving-first conception service, the mean range between services, total fertility index, the success rate at the first insemination. The parameters susceptible to affect the breeding parameters, subject of this study are: the age of animals, the range of lactation, the rate of milk yield an finally the moment and the season of realization of the first service.

2.3. Statistical analysis

Variation factors of the breeding performances

During a statistical analysis, the correlation coefficients were calculated between the different reproduction parameters (ICC, ICS1, ICFS, ISS, IF). The relation between the variation factors (age of the animal, dairy production, lactation range, the politic of the first insemination), the performances being not always linear, these variables are considered as qualitative variables, the analysis was performed by comparing the means, the effect of all the variables to the performances at a threshold of 5% were tested by ANOVA multivariable, the results are presented as correlations for the quantitative variables and the means associated to the standard deviation for the qualitative variables, the analysis were done using the software **[2].**

RESULTS AND DISCUSSION

3.1. The reproduction performances in the studied rearing

3.1.1. The fecundity parameters

Table n°2: The mean of the reproduction performances evaluated in the cattle in the concerned rearing

Reproduction parameters (mean)	F 1	F 2	F 3	F4	F5	F6	F7	F8	F9	Mean+SD of the herd	Objective Days
ICC	459± 44,2	470± 30,6	319± 60,1	386± 55,1	417± 124	456± 114	383± 55,4	401± 81,5	354± 77,0	405±61	365J*
ICS1	139± 34,2	159± 58,6	60± 67,5	91± 73,3	134± 60,5	102± 60,2	72± 31,5	61± 18,0	77± 31,3	99±36,5	60*
ICFS	140± 67,4	156± 85,3	94± 50,3	122± 88,9	134± 114	181± 107,4	112± 58,6	126± 80,1	124± 133,8	132±25,2	85*
ISS	162	00	136	75	0	160	54	84	34	78±63,1	21±3

ICC: Intervals between calvings, **ICS1**: Interval between calving and the first service; **ICFS :** Interval between calving and fertilizing service. I**SS:** Interval mean between services.

We notice that all the rearing except the farm 3, present an infecundity following the interval calving-calving which exceeds the objective values**[3,4,5,6,7,8 ,9]**

The statistical analysis did not show any significant difference between the farms, concerning the fecundity parameters, one difference was observed between farm 3 and farm 6 for the parameter ICS1 and between farm 1 and farm 3 for the parameter **ISS (**P=**0,**017 and P=0,003respectively).

3.1.2. Fertility parameters

The rate of success of the first service (RS1) and the index of the total fertility (TFI).

Table 3 The fertility parameters calculated during the evaluation period

Farms	1	2	3	4	5	6	7	8	9	**TM**	SD
SR1 %	72	100	38,7	46	55	30	35	52	56	53,8	21,5
MeanTFI	1.47	1	2.57	1	2	1,7	1,66	1,86	1,94	1,68	0,49

TM:Total mean for all the rearings SD: Standard deviation

We have calculated the success rate of the first service in the farms and we have noticed a good fertility for the farm 1,2,5,8 and 9 and an average fertility for the farms 3,4,6,7 in comparison to the objectives of 40-50% **[3, 5 ,11]** or superior to 60% according to other authors **,** we have observed, in addition, that the fertility index values are excellent comparing to the objective of 2 **[5,10],**there was no significant difference between the farms (signification marqued at p≤0,05).

3.2 Results of the means of factors of variation during the evaluation period

Table n˚4 : Means of the qualitative variables in the concerned herds

	Mean	**SD**	**Max**	**Min**
Milk ProdI/D	18,3	6,3	30,5	10,5
Age(years)	3,5	1,2	5	3,5
Rang lact (years)	2,4	1,7	6	2,4

3.4 Effect of the qualitative factors on the reproduction performances

3.4.1 Effect of the season of the first insemination on the success rate SR1

The success rate is high in spring SR1=72%±6, as it is reported by **[9],** whereas it is low in winter with 37%±23 (prolonged anoestrus), the high TR obtained in certain farms could be explained by the good insemination technic, inseminator skill, the good quality of the sperm, the correct ration as well as an excellent heat detection. The rate is slow in summer with 46%±13,7, the fertility decreases in summer (prolonged temperature period) **[13]**. We admit a fall of the fertility of 16% when the temperature increases with 1°Cin comparison to the normal of the day of insemination (indirect action on the embryo and also on the mother by mean of an endocrine inbalance).The positive rate is optimum in autumn. According to Cosnard **[14]** the TR is the best in the period between September and October. This result is similar to our results. SR1=53,6%±12, it is different with that reported by Hanzen **[9]** , the SR1 is low in autumn due to the high rate of the repeat breeding in cows calving in autumn fig 1. No significant difference was seen among the seasons (signification marqued at p≤0, 05).

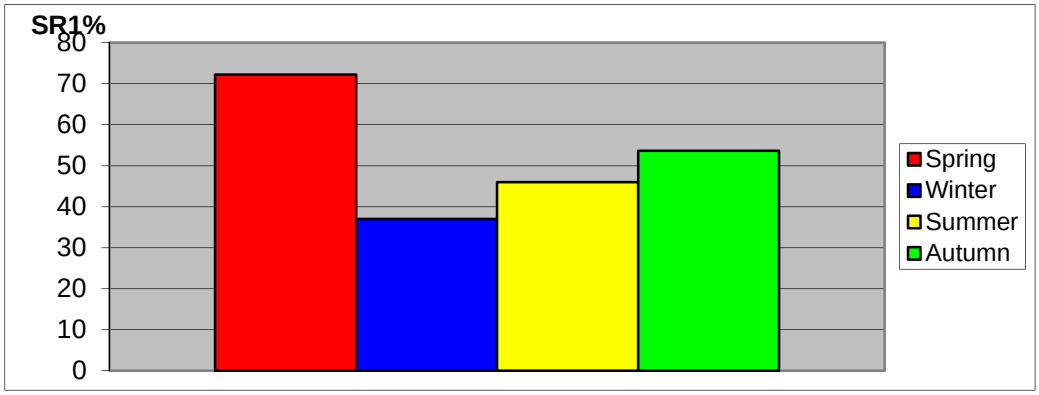

Fig1: Variation of SR1 according to the season

3 .4.2 The effect of the interval calving-first service on the fertility of cattle

The maximal success rate with ICS1 from 50 to 70d also, with services realized between 70 and 90d (SR1= 55%±7 and 66,8%±23 respectively). These results confirm those reported in the literature (maximum fertility between 60 and 80Jpp). These result are in contradiction with the results reported in the literature SR1 =78% with inseminations at more than 90 d for the farm 2; some pathologies of the *post partum* oblige the farmers to delay the inseminations and consequently, the fecundation happens tardily, however for the major rearings, the average of SR1 is equal to 45,2%±18. A SR1 of 64% is obtained for the realized inseminations before 50d in the farm4, this result does not meet the standards, less chance to conceiving (absence of complications in *post partum* which allows a perfect uterine involution and then, an excellent success rate) yet for all the herds, the average of SR1 is equal to 46,2%±11 . 100% of the success is found for the realized inseminations between 70 et 90d in the farm5; this result could not be significant due to the low and the non representativity of the herds (high rate in livestock with problems if a limited number of cattle is seen in heat and the latters were inseminated) **[5].**

The statistical analysis demonstrates the presence of a positive correlation between these two parameters.R= 0,74. at P≤0, 05 , Fig 2.

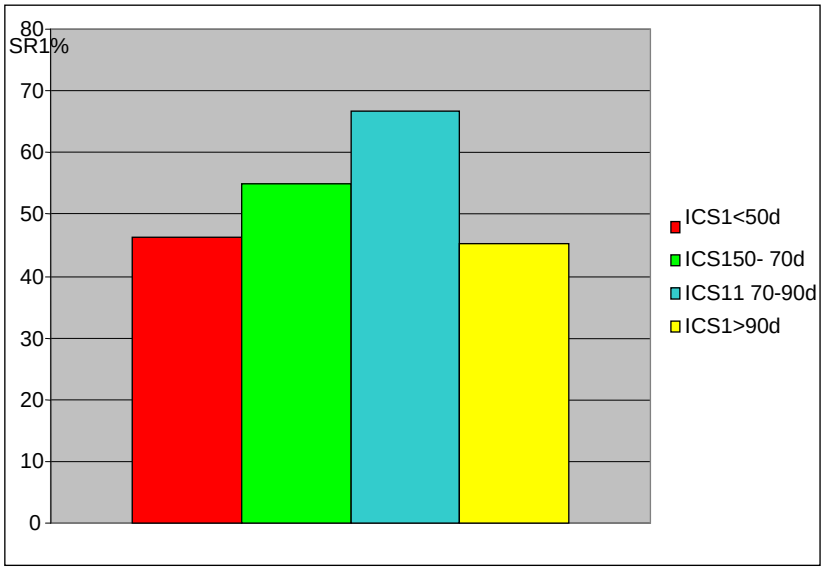

Fig 2: Variation of the success rate at the first insemination according to the interval calving-first service in the studied livestock

Table n˚5: Factors of variation of SR1, ICS1, ICC (multi variance analysis)

Factor	Mean	Number of animals	P
Interval calving first insemination SR1	**Success Rate at the first insemination SR1**		
>50d	46±11,2	122	**NS**
50à70J	55 ± 7,5		
70à90d	66,8±23,2		
<90d	45,2±18		
Season of first insemination			
	SR1%	143	**NS**
Spring	72		
Winter	37		
Summer	46		
Autumn	53		
Milk production	**ICS 1 days**	127	**NS**
<17L/d	140d		
17 to 25L/d	290d		
>25L/d	113d		
Range of the lactation	**ICS1d**	120	**NS**
<3years	80		
3to5years	97		
>5 years	79		
AGE	**ICC d**	261	**NS**
<6 years	437		
6 to9 years	408		
>9years	372		

***NS**: No significant difference, degree of significance marqued at p<0, 05.*

3.4.2. Correlations among the variables

We noted that the same variables are correlated between them, ICS1 is correlated with ICF(R=0, 61), the term of the first insemination affects to a large degree the date of the fecundation, the ICS1 decreases to 27% of the ICFS **[9]**, the correlations of the ICC with the ICS1 and the ICFS is easy to understand, due to the fact that all these intervals are components of the ICC(R=0,81and R=0,86 respectively). No correlation between the ICC and the number of the lactation, which does not mean that such correlation does not exist, several studies highlighted the influence of the range of lactation on the ICC **[1]**. Adamou **[15]** reported that the ICC decreases with the increasing of the number of lactations whereas Stevenson cited by **[15]** proved the contrary. Similarly for the dairy production, no correlation was proven, although the opposite conclusions regarding the effect of this latter were observed on the reproduction performances. Moreover, such influence is important only at high level of yield, whereas in the context of this study, the dairy production registered is pretty average, the same results were observed by **[12]**.

Table n°6: Matrix of correlation between the different parameters evaluated in the livestock studied

Var	ICS1	ICFS	ISS	ICC	PROD LT
ICS1	1	0,61 SN*	-0,25	0,81 SN*	0,26
ICFS	0,61 SN*	1	0,1	0,86 SN*	-0,07
ISS	-0,25	0,1	1	0,02	-0,27
ICC	0,81 SN*	0,86 SN*	0,02	1	0,14
PROD LT	0,26	-0,07	-0,27	0,14	1
SR1	0,74SN*	0,26	-0,46	0,52	0,36
TFI	-0,55	-0,46	0,22	-0,63	-0,33

**SN: R value correlation coefficient is significant at p ≤0,05*

CONCLUSION

Overall; the parameters of fertility are satisfying, however aninfecundity is noticed following an extension of the interval between calving which is not profitable. Regarding the study of some factors of reproduction performances variations in dairy cattle the results show that the age, the range of lactation as well as the level of dairy production does not present any influence on the studied parameters whereas, the effect of the politic of the first insemination is marked by the maximal fecundity of the cows in spring with the inseminated females at 50 to 70d post partum, it is minimal in winter.

In fact, to improve the fecundity of cows, it is necessary to choose the moment of the first insemination in relation to the calving (best fertility between 60 to 80dpp). Thus, choosing the season to realize the first insemination (excellent

fertility in spring and in autumn) provides a good detection of heat and also the exclusion of any infection in the post partum.

Once the factors of variation of the reproduction performances are determinate, their impact on the rentability of cattle are estimated, measures could be taken to minimize their effects on the reproduction performances.

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