Evaluation of the effect of three fixed-time artificial insemination (FTI) protocols on reproductive parameters in milk-producing girolando cow

Evaluación del efecto de tres protocolos inseminación artificial a tiempo fijo (iatf), sobre parámetros reproductivos en vacas girolando productoras de leche

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Abstract

This study was framed within the research line of the Faculty of Agricultural Sciences entitled: production, management and sustainable development of agricultural, livestock and forestry products with an ecosystem approach. In addition, it was aligned with the sub-line of the Zootechnics degree course: local, regional and national integrated livestock development and management. The development of the research work entitled, evaluation of the effect of 3 fixed-time artificial insemination protocols (FTAI), on reproductive parameters in girolando cows producing milk, was carried out at the Universidad Técnica Luis Vargas Torres, located in the parish of San Mateo, Mutile, Esmeraldas, Esmeraldas province, in order to evaluate

the pregnancy rate per treatment, percentage of accumulated pregnancy rate and service per conception per treatment. For the experiment 12 girolando cows were chosen, between first and second calving, all cows had a 30 days equal preparation management, with a body condition (CC) of 3 to 4.5, then 3 groups of 4 cows each one were formed, randomly distributed.

Key words: Artificial insemination, Hormones.

Resumen

Este estudio se enmarcó dentro de la línea de investigación de la facultad de Ciencias Agropecuarias titulada: producción, manejo y desarrollo sustentable de los productos agrícolas, pecuarios y forestales con enfoque de ecosistema. Además, se alineó con la sub línea de la carrera de Zootecnia: desarrollo y manejo pecuario integral local, regional y nacional. El desarrollo del trabajo investigativo titulado, evaluación del efecto de 3 protocolos inseminación artificial a tiempo fijo (IATF), sobre parámetros reproductivos en vacas girolando productoras de leche, se realizó en la Universidad Técnica Luis Vargas Torres, ubicada en la parroquia San mateo, recinto mutile, cantón Esmeraldas, provincia Esmeraldas, con la finalidad de evaluar la taza de preñez por tratamiento, porcentaje de taza de preñez acumulada y servicio por concepción por tratamiento. Para el experimento se escogieron 12 vacas girolando, entre primer y segundo parto, todas las vacas tuvieron un manejo de preparación igual de 30 días, con una condición corporal (CC) de 3 a 4.5, posteriormente se formaron 3 grupos de 4 vacas cada uno, distribuida al azar.

Palabras clave: Inseminación Artificial, Hormonas.

Introduction

Low reproductive efficiency, characterised by low fertility percentages, is one of the biggest problems that can occur on a livestock farm and is one of the biggest complications in the tropics, negatively impacting production (Tipan, 2015).

South American countries are based on traditional production systems, with no technology, no control and no records, and Ecuador is no exception. This leads to deficient reproductive programmes. All these problems can be overcome with artificial insemination (AI) using synchronisation protocols that allow fixed-time insemination (FTI) to be performed on a large number of cows simultaneously (Mendoza & Vasquez, 2012).

In addition, the use of Artificial Insemination (AI) has the advantage of incorporating genetics from superior animals that are adapted to the conditions of the production system (Novoa, Preisseiger, Zangrilli, & Callejas, 2013). Knowledge of the effect of various hormones on the reproductive cycle of the cow has made it possible to manipulate and synchronise it. Progestagens, prostaglandins or gonadotropin-releasing hormones can be used to induce oestrus (Avaroma & Cherigo, 2010).

The present research work evaluated three synchronisation protocols for fixed-time artificial insemination, therefore, the rate of oestrus induction was compared with the rate of oestrus induction in the first three protocols (Avaroma & Cherigo, 2010).

Methodology

The experiment was carried out at the Faculty of Agricultural Sciences of the Technical University "Luis Vargas Torres" of Esmeraldas, located at the Mutile Experimental Station, on the left bank of the Esmeraldas River, in front of the town of San Mateo, via Mutile, located at 0° 53' North longitude, 79° 53' West latitude, at an altitude of 20 m above sea level, Canton and Province of Esmeraldas, Parish of San Mateo, UTM 17 N 653452 - UTM 098964, Average

temperature 28 °C, Relative Humidity 85%, Topography slightly undulating.

The research had a duration of 145 days divided into:

- 15 days of cow selection
- 30 days of cow preparation
- 10 days of synchronisation and IATF
- 60 days of waiting for pregnancy diagnosis by rectal palpation
- 30 days for archiving results and statistical analysis.

The present investigation had a sample of 12 dairy cows which were divided into three groups of 4 for each of the treatments. The cows had equal preparation management with similar body condition and were between first and second calving. The experimental arrangement corresponded to a completely randomised design (CRD) with 3 treatments and 4 replicates per treatment.

The variables to be analysed were:

- Percentage of pregnancy rate per treatment.
- Percentage of cumulative pregnancy rate.
- Percentage of service per conception for all treatments.

A gynaecological check-up was carried out, animal identification (earring, brand, deworming with ivervectin at 1%, vitamin with catosoal b12, ad3, minerals pecutrin and ganasal, 400 g/day for 15 days.

Table 1. *Scheme of the distribution of the treatments.*

Tratamientos	Protocolo			# de animales por tratamiento
	Día 0	Día 8	Día 10 (56H)	
T1	DIB+BE (2ml)	PGF²α (2ml) + eCG (2ml) + CPE (1ml).	IATF+ GNRH (2ml)	4
T2	DIB+BE (2ml)	PGF²α (2ml) + eCG (2ml) + CPE (1ml).	IATF	4
T3	DIB+BE (2ml)	Retiro DIB	IATF	4

Source: Own elaboration.

DIB: bovine intravaginal device; BE: oestradiol benzoate; PGF²α: prostaglandin; eCG: equine chorionic gonadotropin; CPE: oestradiol cypionate; FTAI: fixed-time artificial insemination.

The materials used in the experiment were 12 cows, 12 straws and the hormones to be used in the ovulation induction methods. The presentations of the hormones were (GnRH), (PGF²α), (BE), (eCG), (DIV), and (cypionate estradiol).

This was the initial phase of the research in relation to field work, and consisted of a selection focused on body condition, followed by a gynaecological check-up to examine the reproductive state, the uterus and the size of the ovaries. This selection was carried out in order to choose the most suitable animals for this research.

The preparation phase of the cows was the same for all three groups and included the following:

- Deworming with Ivermectin 1%.
- Intramuscular application of a dose of livanal (iodine).
- They received a daily mineral concentrate (pecutrin and ganasal).
- All cows were subjected to the same feeding and management.

Experimental phase.

In this phase the application of the hormone group for the three methods of ovulation synchronisation was carried out.

The hormones were applied intramuscularly in the morning hours with due immobilisation of the animal so as not to cause problems for the operator.

Insemination in the three methods was carried out with semen of the Girolando breed and was performed by the same technician.

Results

Percentage pregnancy rate by treatments.

The results of percentage pregnancy rate before IATF of the groups was determined by:

- Transrectal palpation with ultrasound at 60 days after IATF.

With the method used in this synchronisation, pregnancy was achieved by means of Artificial Insemination in treatment (1), 3 out of 4 cows were pregnant, these results express a 75%. With treatment (2), 1 out of 4 cows became pregnant, these results show a 25%. Treatment (3) did not get pregnant, resulting in 0%.

Table 2. *Percentage of pregnancy rate by treatments.*

TRATAMIENTOS	# VACAS POR TRATAMIENTOS	TOTAL PREÑADAS	TOTAL VACÍAS	% DE RESULTADO
T1	4	3	1	75%
T2	4	1	3	25%
T3	4	0	0	0%
TOTAL, % PREÑEZ		4	4	33.33%

Source: Own elaboration.

According to Butler (1995), in spite of technological advances in semen management and artificial insemination, the percentage of pregnancy in lactating cows has decreased to 30-50% at first service. However, analysing fertility by categories, it has been shown that virgin heifers have 65-80% of pregnancies at first service, likewise first calving cows and those of several calvings present average values of 51 and 38% respectively, of pregnancy at first service.

While in this project we obtained a result of 33.33% where we could say there is no difference in the percentage of gestation, we agree with the opinion of Butler (1995), in the first service.

However, numerically, the best result for pregnancy percentage was obtained in T1 with a value of 75%. These results are superior to the data obtained by BO & Baruselli (2006), which indicate that with the insertion of progesterone releasing devices (PRID) in cows there are gestation rates between 35 and 55%.

Analysed the results obtained in pregnancy presentation with T1, in their first service of 75% and in the second service (25%) where it is visualized a difference much to what was found by Cutia et al, (S.F) who obtained between 50 and 55% of pregnancy in cows.

To determine the Cumulative Pregnancy Percentage (AP), it is necessary to recognise the total number of pregnancies, it can be calculated by relating the total number of cows pregnant with AI plus the overhaul, divided by the total number of cows treated multiplied by one hundred (Hincapié et al. 2008).

The result for the treatments with the protocol used is 41.66 % (12 cows).

Table 3. *Percentage of cumulative pregnancy rate.*

Tratamientos	N°. Vacas/ tratamientos	1.servicio Gestantes	2. servicio Gestantes	Total, gestantes
T1	4	3	0	3
T2	4	1	1	2
T3	4	0	0	0
Total, de % preñez		75%	25%	5
Preñez acumulada				41.66%

Source: Own elaboration.

Lumbi and Vargas (2014) in their research evaluated three oestrus synchronisation methods (DIB, Prostaglandin + Progesterone + Benzoate oestradiol + Gonadotropin) where for treatment 2 (DIB+BE+PGF2α+ECG +CE), with an accumulated pregnancy of 60%, while in this research we obtained an accumulated pregnancy result of 41.66%, lower than that presented by the aforementioned author.

In this study we obtained an average number of services per conception of 1.66 in cows, respectively. These results show how many services were used on average in the cows.

Table 4. *Service per conception of treatments.*

TRATAMIENTOS	1 SERVICIO		2 SERVICIO		TOTAL, PAJUELA
	Pajuela Utilizada	Vacas Gestantes	Pajuela utilizada	Vacas Gestantes	
T1 (4)	4	3	1	0	5
T2 (4)	4	1	3	1	7
T3 (4)	4	0	4	0	8
TOTAL	12	4	8	1	20
PORCENTAJE DE PAJUELA POR ANIMAL					1.66

Source: Own elaboration.

The studies carried out by Flores (2005), using PGF2α in acyclic cows, obtained values of 6.75 (S/CT); Madero (2000), working with five zebu breeds and using the same protocol, obtained 2.41 services per pregnant cow. In this research, 1.66 (S/CT) was obtained in cows with hormones and it can be attributed to these results that factors related to feeding, temperature, semen handling factors and optimal heat detection can lead to lower S/CT percentages.

Conclusions

The investigators of the present research work express the following conclusions:

There were no differences in the rate of animals with oestrus manifestation in the evaluated treatments, 100% of the treated cows showed oestrus. The combination of injectable hormone and device is a more effective alternative for artificial insemination. On the other hand, the pregnancy percentage was not affected by the type of implant nor by the type of service; however, the final percentages obtained suggest that this technique can be an optimal tool to improve reproduction, production and productivity of cattle farms in Ecuador.

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