

## Potency and Characteristics of Bali Cattle Twin Birth

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**Abstract.** Cattle twin birth is a rare occurrence that might be due to two factors, natural factors or external interventions such as the use of hormones. This study was aimed to determine to what extent Bali cattle were potential to deliver twin birth. Natural twin birth observation was conducted by survey method and data service while for super ovulation was conducted on 6 cows that never gave birth to twins. The Intervention method used a variety of hormonal preparations started with installing CIDR implant on day 1 to day 7 of CIDR removal of the implant, injecting 1 cc of GnRH hormone injections intra-muscular on day 9, injecting 800 mg intra-muscular PMSG on day 20, injecting 2 cc PGF2alpha intra-muscular on day 22, then conducting artificial insemination after lust symptoms appeared after day 24 applicated 3 times. Control treatments were applied on 6 cattle without hormone injection. Data were analyzed descriptively. The survey data showed Bali cattle twin birth in Bali Island was 64 heads of parent population in Bali from a total of 203,727 breeding or 31.9%, but cattle with hormone manipulation delivered 30% of the total treatment although no previous twin birth history was recorded. Conclusively, manipulation of external stimuli such as hormones gained good response although no genetic ever gave birth to twins.

**Key words:** bali cattle, twin born naturally, hormone treatment

**Abstrak.** Sapi lahir kembar adalah kejadian langka yang mungkin disebabkan karena dua faktor, faktor alam atau intervensi eksternal seperti penggunaan hormon. Penelitian ini bertujuan untuk menentukan sejauh mana sapi Bali memiliki potensi untuk memberikan kelahiran kembar. Pengamatan kelahiran kembar alami dilakukan dengan metode survei dan layanan data sedangkan untuk kegiatan super ovulasi dilakukan pada 6 sapi yang tidak pernah punya riwayat melahirkan anak kembar sebelumnya. Metode Intervensi digunakan berbagai persiapan hormonal mulai dengan pemasangan CIDR implant pada hari 1 sampai hari 7 CIDR implant diangkat, suntikan hormon GnRH sebanyak 1cc intra-muscular pada hari 9, dilanjutkan dengan penyuntikan 800 mg PMSG intra-muscular pada hari 20, selanjutnya suntikan PGF2alpha sebanyak 2cc intra-muscular pada hari 22, kemudian inseminasi buatan dilakukan setelah gejala birahi muncul pada hari 24 dan diinseminasi sebanyak 3 kali. Sedangkan perlakuan kontrol yang diterapkan pada 6 sapi tanpa injeksi hormon. Data dianalisis secara deskriptif. Data hasil survei menunjukkan sapi Bali kelahiran kembar di Pulau Bali sebanyak 64 induk melahirkan kembar dari total 203.727 atau 31,9%, tetapi dengan memanipulasi hormon pada ternak menghasilkan 30% lahir kembar dari keseluruhan treatment meskipun tidak ada tercatat riwayat kelahiran kembar sebelumnya. Kesimpulan dengan manipulasi rangsangan eksternal seperti hormon ternyata memperoleh respon yang baik meskipun tidak ada genetik pernah melahirkan anak kembar.

Kata kunci: sapi bali, kelahiran kembar, perlakuan hormon

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### Introduction

Bali cattle have several advantages among other local livestock so much in demand to be maintained. Bali cattle are well-known in Bali itself since Balinese farmer both fields and gardens will maintain Bali cattle. Besides, resistance to extreme environment makes Bali cattle superior meat producer (carcass) (Suyasa et al., 2011). Many other areas breeding Bali

cattle such as Sulawesi, Nusa Tenggara and East Nusa Tenggara are in great demand because of high fertility rate (Guntoro, 2004), and the demand is increasing year to year. Of 100 thousand heads quota prepared annually, Bali is only able to meet about 60-70 thousand head per year (Disnak Bali, 2013). This indicates that the market opportunity for Bali cattle is still very large, along with business development of

local beef cattle area (Suryana, 2009), which is a challenge and an opportunity for farmers to increase productivity. To increase productivity (production and reproduction), various attempts have been made and multiple births in cattle become an alternative choice, by increasing one birth to twin birth. The objective of this research was to determine the potential of Bali cattle that gave twin birth in Bali and distribution locations.

## Materials and Methods

The research used exploration method (determination of the region/location) to obtain locations or map of a population with multiple births, and descriptive methods to get a true picture of an object (Suparmoko, 1998). Purposive sampling was used to determine 8 districts and one municipality in Bali, further exploration was done by the method of data collection in collaboration with provincial and district livestock services in which the activities carried out. Data collection techniques included interviews, recording and observation to obtain primary and secondary data. Six cows were assigned to hormones superovulation treatment and 6 cows without hormone treatment served as a control. Superovulation was conducted using the installation of CIDR implant hormone (progesterone 1.38 g)

intrauterine, and administration of hormone GnRH (Fertagyl <sup>™</sup>, Intervet International BV, Boxmerr Holand) containing 100 µg per ml of pure gonadorellin, given lutaprost (PGF2alpha) and Folligon hormone (PMSG) 800 mg, with intermittent hormone system and synchronize estrus.

Six Bali cows underwent CIDR implant installation (vaginal insert) on day 0 (D-9), then (D-2) CIDR implants were removed, on day 9 (D0) injection of GnRH hormone 1 cc intra-muscular, day 20 (D10) PMSG hormone injections of 800 mg intra-muscular, day 22 (D12) PGF2alpha injection of 2 cc intra-muscular, AI (artificial insemination) were performed after lust symptoms appeared on day 24 (D14-15) for 3 times every morning and afternoon. Superovulation hormone treatment was accompanied by vitamin E (Vigantol E) to improve the reproductive system. Whereas, Six cows in control treatment were not given anything prior to AI (artificial insemination).

## Results and Discussion

Table 1. shows that twin births occurred in 8 district and 21 sub districts, with the highest occurrence was 22 multiple births in Jembrana district (33.85%), followed by 7 twins each in Tabanan, Buleleng, Gianyar and Bangli (10.77%), 6 and 5 multiple births in Klungkung

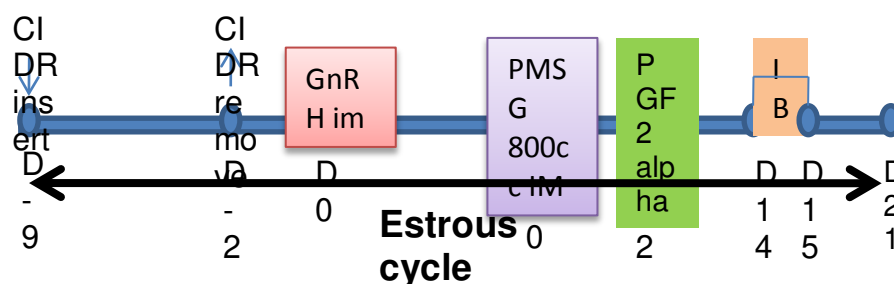


Figure 1. Estrous cycle

Explanation: D= Day; CIDR= Controlled Internal Drug Release; PG= Prostaglandin; PMSG= Pregnant Mare Serum Gonadotropin; IB= Insemination; GNRH= Gonadotropin Releasing hormon

(9.23%) and Badung (7.69%), respectively, the least was 4 twins in Karangasem (6.15%).

In Karangasem District, 3 and 1 twin births occurred Bebandem and Sidemen subdistricts, respectively. Badung District consisted of 2 subdistricts, Mengwi and Abiansemal. In Jembrana regency, twin births occurred in 5 districts namely subdistrict Pekutatan (3), Negara (7), Jembrana (3), Melaya (7) and Mendoyo (2). Twin births in 3 districts of Tabanan regency were in Baturiti (5), Marga (1) and Tabanan (1), while Buleleng district only had two area with twin birth, Gerokgak (6) and Seririt (1). Twin birth was also found in 2 subdistricts of Klungkung, Banjarangkan (3) and Klungkung (2); in 3 subdistricts of Bangli, Susut (1), Tembuku (3), and Bangli (3); and in two subdistricts of Gianyar, Gianyar (2) and Payangan (3).

In Table 1. Also shows that the sexes in cattle born twins were 3 types, 22 male-male (33.85%), 29 female-female (44.62%), and 14 male-female (21.54%). Both male-male and female-female twin with a single offspring was capable of reproduction, while multiple births with male-female sex will lead to infertile (sterile), so it cannot be a parent and only to be cut (Puslitbangnak, 2008).

Percentage of living twin birth was 91.15% from 100 cows (200 calves) or only 8.85% mortality. These data also showed that the percentage of living multiple births was high and almost equal to that of single births. Percentage of mating in the afternoon (72.31%) was strongly influenced by time to observe cattle's lust and the AI officer chance to perform AI mating only in the afternoon after finishing their work in Department of Livestock

Table 1. Incident twin birth and sex from Bali cattle in Bali

No	District	Sub District	Total Number Twin Birth	Sex			Live Percentage per District
				Male- Male	Male- Female	Female- Female	
1	Jembrana	Pekutatan	3		1	2	100
		Negara	7	1		4	
		Jembrana	3	2		1	
		Melaya	7	1	2	4	
		Mendoyo	2	1		1	
2	Tabanan	Baturiti	5	2		3	94
		Marga	1		1		
		Tabanan	1	1			
3	Buleleng	Gerokgak	6	1	3	2	90.91
		Seririt	1		1		
4	Klungkung	Klungkung	2	1		1	100
		Banjarangkan	3		1	2	
5	Bangli	Bangli	3	1	1	1	71.43
		Tembuku	3		1	2	
		Susut	1	1			
6	Gianyar	Gianyar	4	3		1	80
		Payangan	3	2		1	
7	Karangasem	Bebandem	3		1	2	92.85
		Sidemen	1			1	
8	Badung	Mengwi	3	2	1		100
		Abiansemal	3	1	1	1	
Total			65	22	14	29	
Percentage from twins birth (%)				33.85	21.54	44.62	91.15 *

\*Average live percentage of twin birth per District

Table 2. Quantity of Twin Birth, Number of mating, time and mating system

	District	Twin Birth (Head)		Number of Mating		Time for Mating		
		1 time	> 1 time	1 time	> 1 time	morning	afternoon	evening
1	Karangasem	4		4		3	1	
2	Badung	6		6		1	1	4
3	Jembrana	21	1*	20	2	5	2	15
4	Tabanan	7		7				7
5	Buleleng	7		5	2		1	6
6	Klungkung	5		5				5
7	Bangli	7		7		3		4
8	Gianyar	7		7		1		6
Total		64	1	61	4	13	5	47

\*Jembrana District Case only delivers birth twice

Sub-district/district.

Table 2 showed that data of animal mating from 65 cows giving twin birth, 37 (56.92%) were naturally mated and 28 (43.08%) used artificial insemination (AI), and all AI officers in Bali districts used straw from UPT Disnak Bali Province in Baturiti. Only 2 natural mating occurred in Bali farms while artificial insemination (AI) for multiple births were found in some areas such as Badung District (6 occurrence) and Tabanan District (7 occurrence) had twin birth from artificially inseminated cows (100%). As for the 6 other districts were either by natural mating or AI. From data collected there was one cow give birth to twins repeatedly. Data showed most of mating process in the evening time or about 47 cows or about 73% for incidence mating process in the morning 13 cows or about 20% and for incidence mating in the afternoon 5 cows or about 7%.

### Outside Stimulation

Treatment with external stimuli on the cow that never produce the data obtained twins. On the control treatment, the distance between estrous and conception was not available because it did not include the provision of vitamin. The data recorded were only the distance from estrus to conception up to  $\pm 12$  hours after the first estrous symptom appeared. At the super ovulation treatment,

showed 1 cow not give response, because the cow was still in lactation stage. From Table 3. can be showed about 80% conception rate in the super-ovulation treatment was much higher than control that was only 25% conception by artificial insemination. This data showed that the effect of GnRH and PGF was significant to improve the high conception rates. It also affected the number of non-return rate. In the treatment, 80% cows did not show estrus symptom returned and only 20% of total number of 6 cows showed estrous symptoms, while the control was only 25% of number of cows that showed on estrous symptom, the rest showed symptoms of estrus again in the next month and naturally mated again. During the pregnancy, no cows showed any symptoms of abortion until the end of pregnancy.

Factors contributing to the success of super ovulation include the existence of intrinsic and extrinsic factors. Intrinsic factors including the physiological condition of the cow, the presence of dominant follicle function, and decreasing number of embryos. Extrinsic factors include poor quality of feed given during treatment and the cows are still in the period of lactation. The possibility of less amount of semen can also cause the failure of super ovulation. This study, performed 3 times using 3 straw AI for cattle treatment, whereas in the control cows only done 1 time AI with 1 straw,

Table 3. Superovulation response parameters of the study

Parameter	Treatment	Control
Cattle showed estrous (%)	83	100
The distance between estrous (hours)	35.6	0
The distance between treatment and conception (hours)	50.2	0
Conception rate (%)	80	25
The number of insemination per conception	3	1
Length of estrous cycle (days)	14	19.75
Incidence of abortion in trimester I	0	0
Incidence of abortion in trimester II	0	0
Incidence of abortion in trimester III	0	0
NR (Non Return Rate)	80	25

Description: The primary data taken from farmers

Table 4. Result of super-ovulation treatment

Parameter	Quantity (head)	Gender (head (%))		Average of birth weight (kg)	
		Male	Female	Male	Female
Cows treated	6				
Gave birth triplets	2	4 (66.66)	2 (33.33)	10	8
Gave birth twins	0	0			
Give birth single	4	2 (50.00)	2 (50.00)	15.5	14.4

as is commonly done farmers. The length of estrous cycle in the treatment is 14 days because of the effect synchronization using PGF and GnRH to facilitate the application of PMSG. This hormone also improve the reproductive system for cows that having longer anestrous cycle. The data showed that from 6 cows, two gave birth to 3 calves (triplet), and the other 4 only 1 calf each. Results of hormonal treatment indicated twin produced 6 calves with each male-male-male and the other one is male-female-female as presented in Table 4.

According to Yasa (2001), average weight of male and female Bali calves is 16 kg and 15 kg, respectively. The lower weight in female was due to three calves per parturition so the nutrients from parents were rationed for three. Economic analysis on the use of hormones for super ovulation treatment showed that this treatment was still expensive. The cost of hormones treatment per head of cattle was approximately 873 rupiah. Farmers are still reluctant to use this technology because of the lack of understanding about super-ovulation and the high price.

Twin incidence will be highly influenced by the twin genes that exist in the parent and in male, the other thing is the possibility of ovulation more of 1 parent who allows the double fertilization. According to Research-Department of Agriculture (2009) in common with natural mating showed a greater incidence of twins born than the AI but when seen by districts then to Badung, Tabanan and Klungkung have the opposite phenomenon, whereby mating AI shows the odds of multiple births more. According to Arifin Bashir (2009) AI can also be used to obtain multiple births in calves, which is important to be there more of one egg each ovulation.

## Conclusions

Bali cattle have considerable potential to produce twins although usually only one birth. Twinning in Bali cattle could was possible through natural factors and external factors namely external hormonal intervention. Provision of external hormonal treatment to stimulate twin birth was not limited to cows previously gave birth to twin.

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