INCREASE THE LITTER SIZE OF BALI SOWS USING *P.G. 600* INJECTION AND *FLUSHING* IN THE FORM OF GLUCOSE

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ABSTRACT

The aim of this study was to increase the litter size of Bali sows using P.G. 600 injection and flushing in the form of glucose. A total of 32 Bali sows and one mature Bali boar were used. All of the Bali sows have farrowed twice. This study used Completely Randomized Design (CRD) with 2 x 2 Factorial arrangement. P.G. 600 as the first factor (H) was divided into two, i.e. without injecting P.G. 600 (H_0) and with injecting P.G. 600 (H_1). Flushing as the second factor (F) was also divided into two, i.e. without flushing (F_0) and with flushing (F_1). Thus, there were four treatment combinations in this study, namely, H_0F_0 (Control), H_0F_1 , H_1F_0 , and H_1F_1 , with eight replications. A total of 10 ml P.G. 600 or 800 i.u. FSH and 400 i.u. LH was administered to each sow by subcutaneous injection behind the ear immediately after weaning its piglets. Flushing to each sow was started at weaning its piglets until the time of mating by adding 400 g of glucose a day to the basal ration. The result of this study showed the average litter size of Bali sows receiving combined treatments H_0F_0 (Control), H_0F_1 , H_1F_0 , and H_1F_1 were 6.63 $\pm$ 1.51, 7.63 $\pm$ 1.30, 7.50 $\pm$ 1.07 and 9.50 $\pm$ 1.41 piglets. The total litter weights at birth per-sow were 3.063 $\pm$ 0.658, 4.547 $\pm$ 0.707, 3.453 $\pm$ 0.596, and 5.191 $\pm$ 1.293 kg; and the average birth weights per-individual were 0.472 $\pm$ 0.093, 0.604 $\pm$ 0.101, 0.466 $\pm$ 0.094, and 0.560 $\pm$ 0.093 kg, respectively. Statistical analysis showed, the effect of injecting P.G. 600 (H_1F_0) increased significantly ($P < 0.05$) the litter size of Bali sows, however, the litter weight at birth per-sow and birth weigth per-individual were not affected. Both effects of flushing (H_0F_1) and treatment combination of P.G. 600 injection and flushing (H_1F_1) increased significantly ($P < 0.05$) the litter size, litter weight at birth per-sow and birth weight per-individual of Bali sows. There were no interaction effects observed between treatments to the all of variables recorded on this study.

Key words : P.G. 600, flushing, litter size, Bali sows.

MENINGKATKAN JUMLAH ANAK BABI BALI DENGAN MENGGUNAKAN INJEKSI P.G. 600 DAN PAKAN TAMBAHAN BERUPA GLUKOSA

ABSTRAK

Penelitian ini bertujuan untuk meningkatkan jumlah anak babi Bali dengan menggunakan suntikan P.G. 600 dan pemberian pakan tambahan berupa glukosa. Sebanyak 32 ekor induk babi Bali dan seekor pejantan babi Bali yang sudah dewasa digunakan dalam penelitian ini. Semua induk babi Bali tersebut sudah pernah beranak dua kali. Penelitian ini menggunakan Rancangan Acak Lengkap (RAL) dengan pola Percobaan Faktorial 2 x 2. P.G. 600 sebagai fakor pertama (H) dibagi menjadi dua, yakni tanpa penyuntikan P.G. 600 (H_0) dan dengan penyuntikan P.G. 600 (H_1). Pemberian pakan tambahan (F)

sebagai faktor ke dua juga dibagi menjadi dua, yakni tanpa memberikan pakan tambahan (F_0) dan dengan memberikan pakan tambahan (F_1). Dengan demikian, ada empat macam perlakuan kombinasi masing-masing, H_0F_0 (Kontrol), H_0F_1 , H_1F_0 , dan H_1F_1 , dengan delapan kali ulangan. Sebanyak 10 ml P.G. 600 or 800 i.u FSH dan 400 i.u. LH diberikan kepada tiap ekor induk melalui suntikan di bawah kulit belakang telinga segera setelah anak disapih. Pemberian pakan tambahan kepada tiap ekor induk dimulai saat penyapihan anak sampai saat induk kawin dengan cara menambahkan 400 g glukosa setiap hari pada ransum dasar. Hasil penelitian ini menunjukkan bahwa rataan jumlah anak babi Bali yang menerima perlakuan kombinasi H_0F_0 (Kontrol), H_0F_1 , H_1F_0 , dan H_1F_1 masing-masing adalah 6,63 $\pm$ 1,51, 7,63 $\pm$ 1,30, 7,50 $\pm$ 1,07 and 9,50 $\pm$ 1,41 ekor. Total bobot anak saat lahir per-induk masing-masing adalah 3,063 $\pm$ 0,658, 4,547 $\pm$ 0,707, 3,453 $\pm$ 0,596, and 5,191 $\pm$ 1,293 kg; dan rataan bobot lahir anak per-ekor masing-masing adalah 0,472 $\pm$ 0,093, 0,604 $\pm$ 0.101, 0,466 $\pm$ 0,094, and 0,560 $\pm$ 0,093 kg. Analisis statistika menunjukkan bahwa pengaruh penyuntikan P.G. 600 (H_1F_0) meningkatkan secara nyata ($P < 0,05$) jumlah anak babi Bali, tetapi bobot anak saat lahir per-induk dan bobot lahir anak per ekor tidak dipengaruhi. Baik pengaruh pemberian pakan tambahan (H_0F_1) dan perlakuan kombinasi penyuntikan P.G. 600 dan pemberian pakan tambahan (H_1F_1) meningkatkan secara nyata ($P < 0,05$) jumlah anak, bobot anak saat lahir per-induk, dan bobot lahir anak per ekor. Tidak ada pengaruh interaksi terjadi antara perlakuan terhadap semua variabel yang dicatat dalam penelitian ini.

Kata kunci : P.G. 600, pakan tambahan, jumlah anak, babi Bali.

INTRODUCTION

The science of reproduction could be assumed as a knife with double-edged blade. On one side, it is used to reduce the people population through family planning program in densely populated country, like in Indonesia. On the other hand, in field of animal husbandry, it is used to increase the reproductive performance of the farm animals. Among those farm animals, pig has played an important role and can not be neglected in contributing meat or animal protein for human being. At present, pigs are kept in different part of the world for different of purposes, i.e. for meat, litters, suckling pigs, and pigs as manure producer. Pig is well known as a polytocous animal and polyestrous throughout the year. The female has two long uterine horn (bicornuate uterine) and a negligible uterine body. The duration of estrous in pigs is in the range of 30 – 60 hours,

the ovulation occurred between 36 – 40 hours after onset of estrous, whereas length of estrous cycle is 21 days and duration of gestation is within 111 – 119 days (Hunter, 1982). Several symptoms of estrous in pigs are restlessness, swelling and reddening of the vulva, riding of other sows and occasionally a mucous discharge appeared from its vulva (Devendra and Fuller, 1979; Anderson, 1980). According to Tan Hok Seng (1957) Bali pig is a crossbred between native Bali pig (*Sus vittatus*) and South China pig (*Sus vittatus*) breed. According to Devendra and Fuller (1979) Bali pig is one of tropical pigs crossbred in Indonesia with low litter size. They recorded that in a survey conducted throughout Bali involving 7,685 sows, the average litter size of Bali sows was found to be 6.2 piglets. According to Anderson (1980), there is a positive relation between ovulation rate and litter size, where on certain limit and normal conditions, higher ovulation rate will produce more litter size and *vice versa* (e.g. ovulation rates continue to increase with subsequent gestations followed by increase litter size until reaches maximal levels by the fourth or fifth parity). Anderson (1980) also stated the number of piglets farrowed increase between the first and fourth litters, but by the eighth litter the number of live births declines while the number of stillborn increases. Injection of gonadotrophins hormone could be used to increase the ovulation rate (Hunter, 1964). On the other hand, flushing is also could be used to increase the ovulation rate (Zimmerman *et al*., 1958; 1960). Based on above theories, this study want to observe the effect of gonadotrophins hormone by using P.G. 600 injection and flushing in the form of glucose, respectively, and the combined treatments to increase the litter size of Bali sows.

MATERIALS AND METHODS

Animals.

A total of 32 Bali sows and one Bali boar were used on this study. All of the Bali sows have farrowed twice and the Bali boar has attained the age of two years.

Ration.

All sows were given a basal ration consisted of 45% pounded and cooked banana (*Musa paradisiaca*) stem, 30% rice bran, 20% forage {swampcabbage (*Ipomoea reptans*) + sweet potato *(Ipomoea batatas*) stems and leaves}, 4% rice crust (*kerak nasi* in Indonesian language), and 1% mineral-10, with calculated nutrients content of dry matter (DM) = 34.69%, crude protein (CP) = 3.74%, crude fiber (CF) = 5.25%, nitrogen free extract (NFE) = 23.58%, Fat = 0.714%, and metabolizable energy (ME) = 1,077 Cal/kg. The basal ration was given to the Bali sows *ad libitum* twice a day.

Management.

Each sow was raised in an individual concrete pen completed with feed and water troughs. The pens, feed and water troughs were cleaned daily.

Design of Experiment.

Completely Randomized Design (CRD) with 2 x 2 Factorial arrangement was used on this study (Battacharrya and Johnson, 1977). P.G. 600 as the first factor (H) was divided into two, i.e. without injecting P.G. 600 (H_0) and with injecting P.G. 600 (H_1). Flushing as the second factor (F) was also divided into two, i.e. without flushing (F_0) and with flushing (F_1). Thus, there were four kind of treatments combination, i.e., H_0F_0 , H_0F_1 , H_1F_0 , and H_1F_1 , with eight of replications, respectively. Injecting P.G. 600 consisted of 800 i.u. FSH and 400 i.u. LH to each sow was administered by subcutaneous injection

behind the ear immediately after weaning its piglets. Flushing to each sow was started at weaning its piglets until time of mating by adding 400 g of pure glucose a day to the basal ration. The variables recorded on this study were litter size, litter weight at birth per-sow and birth weight per-individual of the Bali sows.

RESULTS

Results of this study showed the average litter size of Bali sows receiving combined treatments H_0F_0, H_0F_1, H_1F_0, and H_1F_1 were 6.63 $\pm$ 1.51, 7.63 $\pm$ 1.30, 7.50 $\pm$ 1.07 and 9.50 $\pm$ 1.41 piglets, respectively. The litter weight at birth per-sow were 3.063 $\pm$ 0.658, 4.547 $\pm$ 0.707, 3.453 $\pm$ 0.596, and 5.191 $\pm$ 1.293 kg, whereas the average of the birth weight per-individual were 0.472 $\pm$ 0.093, 0.604 $\pm$ 0.101, 0.466 $\pm$ 0.094, and 0.560 $\pm$ 0.093 kg, respectively **(Table 1)**.

Table 1. Effects of P.G. 600 injection and flushing in the form of glucose on litter size, litter weight at birth per-sow and birth weight per-individual of Bali sows.

Treatments	The Average of		
	Litter Size (piglets)	Litter Weight at Birth per-Sow (kg)	Birth Weight per-Individual (kg)
H_0F_0	6.63 $\pm$ 1.51[a]	3.063 $\pm$ 0.658[a]	0.472 $\pm$ 0.093[a]
H_0F_1	7.63 $\pm$ 1.30[b]	4.547 $\pm$ 0.707[b]	0.604 $\pm$ 0.101[b]
H_1F_0	7.50 $\pm$ 1.07[b]	3.453 $\pm$ 0.596[a]	0.466 $\pm$ 0.094[a]
H_1F_1	9.50 $\pm$ 1.41[b]	5.191 $\pm$ 1.293[b]	0.560 $\pm$ 0.093[b]

H_0F_0 = Control
H_0F_1 = Flushing with 400 g of glucose a day to each sow started at weaning its piglets until time of mating.
H_1F_0 = Injection of two vials of P.G. 600 to each sow immediately after weaning its piglets.
H_1F_1 = Treaments combination of P.G. 600 injection and Flushing.
[ab] Values with different superscripts within the same column are differ significantly ($P < 0.05$).

The results of this study showed that all treatments P.G. 600 and glucose supplementation singly or in combination has a significant ($P < 0.05$) effect on litter size. Similar results were also observed on litter weight at birth per-sow and birth weight per-individual except for treatment H_1F_0 or P.G. 600 has not a significant ($P > 0.05$) effect.

DISCUSIIONS

Result of this study showed that both injecting gonadotrophins hormone with two vials of P.G. 600 (each vial consisted of 400 i.u. FSH and 200 i.u. LH) to each sow immediately after weaning its piglets and flushing with 400 g glucose a day to each sow started at weaning its piglets until time of mating increased significantly the litter size of the Bali sows. However, there were no interaction effects between treatments to the all variables recorded on this study. Treatment of P.G. 600 injection did not effect the litter weight at birth per-sow and birth weight per-individual of the Bali sows, however, treatment of flushing in the form of glucose increased significantly the litter weight at birth per-sow and birth weight per-individual of the Bali sows.

The result of this study was supported by Pope *et al*. (1968) recorded that the litter size was increased from 8.3 piglets in control to 10.3 piglets in the treated gilts injected with gonadotrophins using 1,200 i.u. of PMS. A similar result was also recorded by Longenecker and Day (1968) recorded that the superovulated sows injected with 1,200 i.u. PMS given on the day of weaning the piglets farrowed an average of 2.0 piglets more per litter. On the other hand, Baker *et al*. (1970) recorded in gilts that injecting 1,000 i.u. of PMS resulted a significant increase in litter size, i.e., 9.8 piglets in the treated gilts *versus* 8.3 piglets in control. Combined follicles stimulating hormone (FSH) and

luteinising hormone (LH) or pregnant mare's serum gonadotrophin (PMS) and human chorionic gonadotrophin (HCG) are hormones preparation usually used for inducing superovulation of eggs or ova in pigs (Gibson *et al*., 1963; Hunter, 1964, 1982; Britt and Roche, 1980). Longenecker *et al*. (1965) recorded that treatment with a single injection of 1,200 i.u. PMS on the day the piglets were weaned induced superovulation and increased fecundity in sows. Day *et al*. (1967) also recorded a statistically significant increase in ovulation rate was obtained in gilts injected with 1,200 i.u. PMS. FSH and PMS has a similar function, i.e., to induce the growth and maturation of ovarian follicles and stimulates its production of oestrogens, whereas, LH and HCG has another similar function, i.e., to induce ovulation of follicles with release of the eggs or ova (Hunter, 1982). According to Britt and Roche (1980), the injection of PMS alone or in combination with HCG has been employed to induce superovulation where the response obtained is related to the reproductive state of the female and the dose and timing of gonadotrophin hormone treatment. They declared, when combination of PMS and HCG is given in gilts, ovulation occurs about 110 to 120 hours later, compared to about 40 hours after HCG when the two gonadotrophins are given separetely. Furthermore they explained, inseminations after the combination treatment should be given about 96 hours after the treatment, compared to 24 hours after HCG when the double treatment is used. All doses of PMS between 500 i.u. and 1,500 i.u. produce superovulation but the response is much greater in the gilts receiving the 1,500 i.u. dose of PMS (Hunter, 1964).

According to Bazer *et al*. (1967), the gilts fed restricted feeding (1.81 kg a day) flushed for a 14 day period prior to breeding by *ad libitum* feeding increased the litter size from 8.3 piglets in control to 10.9 piglets in the treated gilts. They stated that uterine

capacity limits litter size. On the other hand, Lodge and Hardy (1968) recorded that one day flushing by doubling the feed intake on the first day of estrous resulted a significant increase in litter size, i.e., 10.8 piglets in the treated gilts *versus* 8.95 piglets in control. Commonly, the convensional flushing persisted for 5 to 15 days before mating and ovulation response seems to result from increased energy intake during the period of major follicular development (Zimmerman *et al*., 1960). The addition of pure energy sources (glucose and fat) to a basal diet during a day-14 period prior to ovulation was reported by Zimmerman *et al.* (1958; 1960) to significantly increased ovulation rate in pigs. Glucose is one of pure energy of feedstuff with high energy content. Glucose influence undirectly, whereas gonadotrophins hormone influence directly the ovary of the sows in inducing the growth of follicles, maturation and ovulation of the eggs or ova. In the body, one molecule of glucose produce energy as many as 288.8 Calories (Harper *et al*., 1979). They clarified, glucose could be absorbed directly by the intestine and stored as glycogen in the body.

The increase of litter weight at birth per-sow and bith weight per individual of the Bali sows flushed with glucose may be caused by the effect of energy intake addition from glucose in its ration. However, of course this clarification needs further study. It was conclusion that :

1. P.G. 600 injection increased the litter size of the Bali sows, however, the litter weight at birth per-sow and birth weight per-individual were not effected.

2. Flushing in the form of glucose increased the litter size, litter weight at birth per-sow and birth weight per-individual of the Bali sows compared to control.

3. There were no interaction effects between P.G. 600 injection and flushing in the form of glucose to the litter size, litter weight at birth per-sow and birth weight per-individual of the Bali sows.

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