รายงานโครงการวิจัยเงินทุนคณะสัตวแพทยศาสตร์
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การศึกษาอัตราการอยู่รอดของตัวอ่อนนับตั้งแต่ตกไข่จนกระทั่งถึงคลอดในแม่สุกรท้องแรกพันธุ์แลนด์เรซและพันธุ์ยอร์คเชีย

(STUDY OF SURVIVAL RATE FROM OVULATION TO FARROWING IN PUREBRED LANDRACE AND YORKSHIRE SOWS IN THE FIRST PARITY)

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STUDY OF SURVIVAL RATE FROM OVULATION TO FARROWING IN PUREBRED LANDRACE AND YORKSHIRE SOWS IN THE FIRST PARITY

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Abstract

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STUDY OF SURVIVAL RATE FROM OVULATION TO FARROWING IN PUREBRED LANDRACE AND YORKSHIRE SOWS IN THE FIRST PARITY

The aim of the present study was to investigate the ovulation rate and its relationship with number of total pigs born in purebred gilts under tropical climate condition. This study was conducted at two swine breeding herds (A and B) in the northeastern part of Thailand from April to December 2001. The sources of swine genetic material originate from northwestern Europe. Gilts were mated (AI) on the second or later observed estrus and had to weigh at least 130 kg body weight. In most cases, they were mate at third estrus. One hundred and twenty-seven gilts, 24 Landrace and 24 Yorkshire from herd A, and 42 Landrace and 35 Yorkshire from herd B were used. Gilts were examined once by laparoscopy under general anesthesia between days 8 to 15 after mating. The ovaries were examined and the pathological findings were recorded. The number of corpora lutea was counted, and was assumed to equal the ovulation rate. Subsequent mating results and farrowing data were recorded. The data was analyzed with analysis of variance. Single or double unilateral cysts and par-ovarian cyst did not affect mating results. Landrace gilts were significantly younger at first mating than Yorkshire gilts (244 vs. 249 d, $P<0.05$). At first mating, Yorkshire had significantly higher ovulation rate compared to Landrace (15.3 vs.13.8, $P<0.001$). No difference in number of total piglets born between the two breeds, but Yorkshire had significantly higher ovum wastage than Landrace. The total prenatal loss from ovulation to farrowing is 31.0% and 37.5% in Landrace and Yorkshire, respectively. Both the low ovulation rate and the high prenatal loss were contributed in the low litter size in gilts raised under tropical climate condition.

Key words : ovulation rate, prenatal loss, litter size, purebred gilts

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การศึกษาอัตราการอยู่รอดของตัวอ่อนนับตั้งแต่ตกไข่จนกระทั่งถึงคลอดในแม่สุกรท้องแรกพันธุ์แลนด์เรซและพันธุ์ยอร์คเชีย

ทำการศึกษาอัตราการตกไข่ และความสัมพันธ์ของอัตราการตกไข่กับจำนวนลูกแรกคลอดทั้งหมดในสุกรสาวพันธุ์แท้ ในสภาพภูมิอากาศแบบร้อนชื้น ทำการศึกษาที่ฟาร์มสุกรพ่อแม่พันธุ์ 2 แห่ง (A และ B) ในภาคตะวันออกเฉียงเหนือของประเทศไทย ระหว่างเดือนเมษายน 2544 ถึง ธันวาคม 2544 พันธุกรรมสุกรมีต้นกำเนิดจากยุโรปตะวันตกเฉียงเหนือ สุกรสาวได้รับการผสมเทียมเมื่อตรวจพบการเป็นสัดครั้งที่ 2 หรือมากกว่า และต้องมีน้ำหนักตัวไม่น้อยกว่า 130 กก. ส่วนมากได้รับการผสมเมื่อเป็นสัดครั้งที่ 3 สุกรสาวทั้งหมด 127 ตัว เป็นพันธุ์แลนด์เรซ 24 ตัว กับพันธุ์ยอร์คเชีย 24 ตัว จากฟาร์ม A และพันธุ์แลนด์เรซ 42 ตัว กับพันธุ์ยอร์คเชีย 35 ตัว จากฟาร์ม B ได้รับการตรวจด้วยวิธีลาพาโรสโคปภายใต้การวางยาสลบทั้งตัว ในวันที่ 8-15 หลังจากผสมเทียม ทำการตรวจนับก้อนเหลืองบนรังไข่ และบันทึกพยาธิสภาพที่พบ จำนวนก้อนเหลืองใช้แทนอัตราการตกไข่ (จำนวนไข่ที่ตก) ทำการติดตามบันทึกผลของการผสมพันธุ์จนถึงคลอดรวมทั้งจำนวนลูกที่คลอด ทำการวิเคราะห์ข้อมูลด้วยวิธีการวิเคราะห์ความแปรปรวน ถุงน้ำรังไข่ 1-2 ใบบนรังไข่ข้างเดียว และถุงน้ำที่ท่อนำไข่ไม่มีผลต่อการผสมติดและอุ้มท้องจนคลอด สุกรสาวพันธุ์แลนด์เรซมีอายุเมื่อผสมครั้งแรกน้อยกว่าสุกรสาวพันธุ์ ยอร์คเชียอย่างมีนัยสำคัญ (244 vs. 249 วัน, $P<0.05$) สุกรสาวพันธุ์ยอร์คเชียมีอัตราการตกไข่สูงกว่าสุกรสาวพันธุ์แลนด์เรซอย่างมีนัยสำคัญ (15.3 vs.13.8 ใบ, $P<0.001$) จำนวนลูกแรกคลอดทั้งหมดไม่แตกต่างกัน แต่สุกรสาวพันธุ์ยอร์คเชียมีการสูญเสียไข่/ตัวอ่อนก่อนคลอดสูงกว่าพันธุ์แลนด์เรซ การสูญเสียไข่/ตัวอ่อนก่อนคลอดตั้งแต่ตกไข่จนถึงคลอดเท่ากับ 31.0% และ 37.5% ในพันธุ์แลนด์เรซและพันธุ์ยอร์คเชียตามลำดับ ทั้งอัตราการตกไข่ต่ำและการสูญเสียสูงเป็นสาเหตุของการมีขนาดครอกเล็กในสุกรสาวที่เลี้ยงในเขตภูมิอากาศร้อนชื้น

คำสำคัญ : อัตราการตกไข่ การสูญเสียก่อนคลอด ขนาดครอก สุกรสาวพันธุ์แท้

Introduction

Reproductive efficiency of gilts and sows in tropical areas, such as Thailand, is lower than in template areas (Kunavongkrit et al., 1989; Tantasuparuk et al., 2000). The sources of swine genetic material in Thailand generally originate from temperate and subtropical areas, i.e. countries in West Europe and North America, where the climate is quite different from that in Thailand. It has been demonstrated that the climate conditions of high temperature and humidity contribute to the lower reproductive efficiency, particularly, the lower litter size at birth (Tantasuparuk et al., 2000).

Litter size is determined by ovulation rate, fertilization rate and prenatal survival rate (van der Lende and Schoenmaker, 1990). Ovulation rate defines the upper limit of litter size (Hughes and Varley, 1980). Litter size can be in some degree improved by genetic selection (Bennett and Leymaster, 1989; Deckert and Dewey, 1994; Gama and Johnson, 1993; Johnson et al., 1999). Ovulation rate in purebred sows have been reported under tropical climate conditions (Tantasuparuk et al., 2001), unfortunately, the subsequent farrowing data were not available and prenatal loss could not be calculated. Therefore, the reason for low litter size at birth of sow in this area has not been elucidated.

To our knowledge, the ovulation rate and prenatal loss from ovulation to farrowing in purebred gilts have not yet been reported under tropical conditions with high ambient temperature and high humidity.

The aim of the present study was to investigate ovulation rate and its relationship with number of total pigs born in purebred gilts under tropical climate condition

Materials and Methods

This study was conducted at two swine breeding herds (A, B) in the northeastern part of Thailand from April to December 2001. Average daily 24h temperature was 29.2° C, and average daily peek temperature was 33.8°C. These two herds belong to the same breeding company and located 20 km apart from each other. The herds had both Landrace (L) and Yorkshire (Y) breed. The crossbred offspring (L x Y and Y x L) were produced. They followed the same management procedures and health program, which mainly recommended by the breeding company in northwestern Europe who supplied the genetic materials for the nucleus herds. The nucleus herds located separate from the study herds. The gilts and sows were housed in open buildings, and were kept in groups of four for estrus stimulation and in individual stalls during gestation, whereas lactating sows were kept in individual farrowing pens. During the growth period gilts were fed a diet based on corn, broken rice, rice bran, soybean meal and fish meal, containing 16% CP and 3.2 Mcal of DE/kg. The feed allowance progressively increased from 2 kg/d to 2.5 kg/d. At 23 weeks of age, the gilts were moved to breeding unit, where the vaccination program was performed. Gilts were mated (AI) on the second or later observed estrus and had to weigh at least 130 kg body weight. In most cases, they were mate at third estrus. Landrace gilts were inseminated twice with Yorkshire proven boar semen and Yorkshire

gilts were inseminated twice with Landrace proven boar semen. Gilts were fed 1.6-2.0 kg/d during the first 3 weeks after mating, then 2.2-2.6 kg/d until 12 week of gestation and thereafter 2.6-2.8 kg/d until farrowing. The individual feed allowance was depended on body condition. The gestation diet contained 14% CP and 2.9 Mcal of DE/kg. Hormonal induction of estrus was not performed.

One hundred and twenty-seven gilts, 24 Landrace and 24 Yorkshire from the herd A, and 42 Landrace and 37 Yorkshire from herd B were used. Gilts were examined once by laparoscopy (Kunavongkrit and Lohachit, 1988) under general anesthesia between days 8 to 15 after mating. Gilts were sedated with 2 mg/kg body weight of Azaperone (Stresnil®, Jansen, Belgium), and then anaesthetized with 0.8 g/gilt of Thiopental sodium (Pentothal® Sodium, Abbott, India). The ovaries were examined and the pathological findings were recorded. Cystic degeneration was categorized according to Ebbert and Bostedt (1993). The number of corpora lutea (CL) was counted, and was assumed to equal the ovulation rate. Subsequent mating results and farrowing data were recorded.

Statistical Analyses

The data was analyzed with analysis of variance using the SAS software (SAS Institute Inc., 1996). GLIMMIX macro (Wolfinger and O'Connell, 1993) was used for analyzing farrowing rate. The model included fixed effect of breed, herd, age and weight. Prenatal loss (ovum wastage) was calculated by number of total piglets born minus number of CL (Lambert et al., 1991.). Proc GLM was used for analyzing age at first mating, weight, ovulation, number of total piglets born, and ovum wastage. The models included fixed effect of breed and herd, and interaction between breed and herd.

Results

One gilt was excluded from the analyses due to large, multiple bilateral follicular cystic ovaries, without CL. Two gilts with 2-3 bilateral cysts, with CL, and one gilt with vaginal discharge at the day of laparoscopic examination (normal ovaries) resulted in return to estrus. Single or double unilateral cysts and par-ovarian cyst did not affect mating results (Table 1).

Table 1. Pathological finding found during examination and subsequent mating result.

Pathological finding	Not farrow (n)	Farrow (n)
Multiple bilateral follicular cystic ovaries, without CL	1	-
2-3 bilateral cysts, with CL	2	-
Single or double unilateral cysts, with CL	-	6
Par-ovarian cyst, with CL	1	6
Vulva discharge, normal ovaries with CL	1	-

Table 2. Farrowing rate (least square means, %) of laparoscopic examined gilts.

		Not farrow (n)	Farrow (n)	Farrowing rate (%)
Breed	Landrace	11	53	84.1
	Yorkshire	13	49	78.5
Farm	A	9	39	82.1
	B	15	63	80.8
Landrace	A	3	21	87.5
	B	8	32	80.0
Yorkshire	A	6	18	75.0
	B	7	31	81.6

No difference in farrowing rate between groups of examined and unexamined gilts (data not show). No difference was found in farrowing rate between the two breeds (Table 2).

Table 3. The differences between the two breeds.

	Landrace	Yorkshire	Significance
Age at 1st mating, d	244	249	$P<0.05$
Weight, kg	138	136	$P>0.05$
Ovulation rate	13.8	15.3	$P<0.001$
Number of total born	9.3	9.4	$P>0.05$
Ovum wastage	4.4	5.5	$P<0.05$

Landrace gilts were significantly younger at first mating than Yorkshire gilts (Table 3). Yorkshire had significantly higher ovulation rate compared to Landrace at first mating. No difference in number of total piglets born between the two breeds, but Yorkshire had significantly higher ovum wastage than Landrace. The total loss from ovulation to farrowing is 31.0% and 37.5% in Landrace and Yorkshire, respectively. The cumulative relative frequencies (centiles) of prenatal survival rate are shown in Figure 1.

Discussion

The present study was carried out under tropical conditions with a high temperature and high humidity. Thus, the climatic conditions differ from the climate in studies published earlier on this topic. Furthermore, only purebred Landrace and Yorkshire breeds, which originate from northwestern Europe, are focused in this study.

Age at first mating in the present study is in consistent with the data reported in the literature with the range of 167 to 346 days (King et al., 1982; Love, 1979; Paterson et al., 1980), but the mean value was higher compared with some reports (Peltoniemi et al., 1999; Tummaruk et al., 2001).

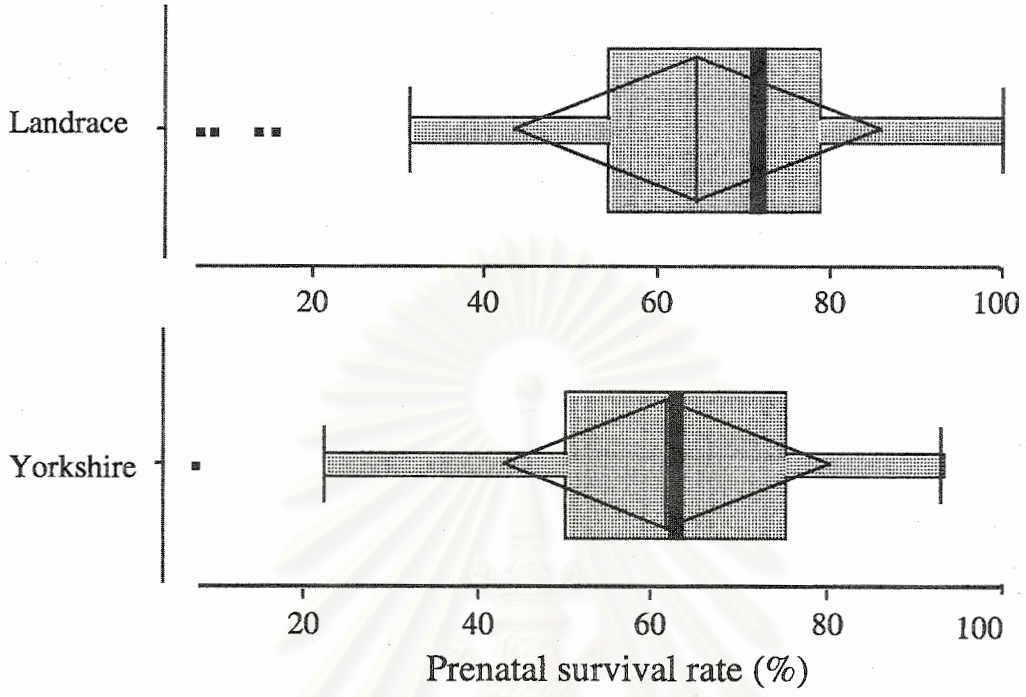

Figure 1. The cumulative relative frequencies (centiles) of prenatal survival rate, the midline of rhombus represents the mean.

In the present study, the farrowing rate of examined gilts was within the range as same as untreated gilts that reported in the literature (King et al., 1982; Love, 1979; Tantasuparuk et al., 2000). Thus, laparoscopic examination in early pregnancy did not affect farrowing rate. This supported the finding of Paterson et al. (1980).

Ovulation rate in the present study was considered low when compared with the data of the same breed reported in the literatures (Blasco, et al., 1996; Paterson et al., 1980). Since the average litter size will, on average, be higher in populations with a high ovulation rate than in populations with a low ovulation rate (van der Lende and Schoenmaker, 1990). Thus, the low ovulation rate is one of the reasons for the low litter size found in tropical area.

The total prenatal loss from ovulation to farrowing in the present study was 31.0% and 37.5% (in Landrace and Yorkshire, respectively), which was in the range of 30 to 40%, generally reported in the literature (Bennett and Leymaster, 1989; Gama and Johnson, 1993; Irgang, et al., 1993; Madsen and Greve, 1990). However, the mean of prenatal loss was in the very high group and was calculated base on lower ovulation rate compared with those studies. Thus, the total prenatal loss under tropical climate condition might contribute the cause of low litter size at birth (number of total pigs born).

In summary: the present study showed that Yorkshire gilts have a higher ovulation rate and higher prenatal loss compare with Landrace gilts. Both the low ovulation rate and the high prenatal loss were contributed in the low litter size in gilts raised under tropical climate condition.

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