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Reproductive and Dairy Performances of Thai Swamp Buffaloes under Intensive Farm Management

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Abstract

In this study the reproductive and dairy performances of swamp buffaloes under intensive farm conditions were evaluated. The data of reproduction and milk production were collected from forty-eight swamp buffaloes during the period of 2001 to 2010. The reproductive and dairy performances were analyzed as mean±SD of each index. The age at first calving was 47.1±8 months and the gestation period was 321.4±11.3 days. The service per conception was 3.5±2.5, with insemination by both natural and artificial mating. The calving interval and the days open were 486.2±75.02 and 166.2±69.7 days (n=99), respectively. Additionally, there was a large increase in primiparous and aging cows. The number of conceptive cows rose significantly in November of every year, which reflects a similar period of peak milk production. The dairy performance index such as the lactation period (127.5±104.6 days), the milk production (2.0±0.9 kg/cow/day) and the milk yield (255±209 kg/lactation) were quite low. In conclusion, postpartum cows in this study had low reproductive performances which could indicate that the age at first calving, service per conception and days open in primiparous cows should be improved. Moreover, the low milk production and short lactation period found in this study suggest that swamp buffalo may not be suitable for milking.

Keywords: dairy, performance, reproduction, swamp buffalo

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บทคัดย่อ

ประสิทธิภาพการสืบพันธุ์และผลผลิตน้ำนมของกระบือปลักภายใต้การจัดการระบบฟาร์ม

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การศึกษานี้ประเมินประสิทธิภาพการสืบพันธุ์และผลผลิตน้ำนมในกระบือปลักภายใต้การจัดการระบบฟาร์ม โดยเก็บข้อมูลทางการสืบพันธุ์ และผลผลิตน้ำนมจากกระบือปลักจำนวน 48 ตัว ระหว่างปี พ.ศ. 2543 ถึง ปีพ.ศ. 2553 จากการศึกษาวิเคราะห์ข้อมูลเพื่อหาค่าดัชนีประสิทธิภาพการสืบพันธุ์และผลผลิตน้ำนมโดยแต่ละค่าเป็นค่าเฉลี่ยและค่าเบี่ยงเบนมาตรฐาน พบว่า อายุเมื่อคลอดลูกตัวแรกเท่ากับ 47.1 ± 8 เดือน ระยะการตั้งท้องเท่ากับ 321.4 ± 11.3 วัน จำนวนครั้งที่ผสมต่อการผสมติดทั้งผสมเทียมและผสมด้วยพ่อพันธุ์ขึ้นทับเท่ากับ 3.5 ± 2.5 ครั้ง จากข้อมูลจำนวนลูกคลอด 99 ตัว พบว่า ระยะห่างระหว่างการคลอดเท่ากับ 486.2 ± 75.0 วัน จำนวนวันท้องว่างเท่ากับ 166.2 ± 69.7 วัน ซึ่งมีค่าสูงในกลุ่มแม่กระบือคลอดลูกครั้งแรกและกลุ่มแม่กระบือที่มีอายุมาก จำนวนกระบือผสมติดและปริมาณน้ำนมเพิ่มขึ้นอย่างชัดเจนในเดือนพฤศจิกายนของทุกปี ส่วนค่าดัชนีประสิทธิภาพผลผลิตน้ำนม ได้แก่ ระยะการให้น้ำนม (127.5 ± 104.6 วัน) ปริมาณน้ำนม (2.0 ± 0.9 กก./ตัว/วัน) และปริมาณน้ำนมต่อระยะการให้นม (255 ± 209 กก./ระยะการให้นม) มีค่าค่อนข้างต่ำ การศึกษาครั้งนี้สรุปได้ว่า แม่กระบือหลังคลอดลูกมีสมรรถภาพทางระบบสืบพันธุ์ต่ำ อายุเมื่อคลอดลูกตัวแรก จำนวนครั้งที่ผสมต่อการผสมติด และจำนวนวันท้องว่างในกลุ่มแม่กระบือคลอดลูกครั้งแรกควรได้รับการปรับปรุงให้ดีขึ้น นอกจากนี้มีประสิทธิภาพในการให้ผลผลิตน้ำนมที่ค่อนข้างต่ำ และระยะการให้นมที่สั้นมาก อาจทำให้กระบือพันธุ์ปลักไม่เหมาะกับการเลี้ยงเพื่อรีดนม

คำสำคัญ: น้ำนม ประสิทธิภาพ การสืบพันธุ์ กระบือปลัก

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Introduction

Swamp buffaloes have come to be used potentially for meat and milk as well as for their primary contribution as draught animals (Kanai and Shimizu, 1983). In many Asian countries, the genetics of the swamp buffalo has been improved, for example by creating a cross breed with the river buffalo for increased milk production. The limitations of productive performance in female swamp buffalo include many unique features such as inherent late maturity, prolonged intercalving interval, decreased in ovarian function (especially in summer), poor estrus, and difficulties detecting estrus that cause problems in predicting the time of ovulation for artificial insemination (Chaikhun et al., 2010). Historically, in Thailand buffalo husbandry has been practiced by small family units using free range grazing methods and natural spontaneous mating (Intramongkol et al., 1990). The buffaloes have primarily been used as draught animals and as a form of financial security when they are sold off in times of financial stress. Due to the loss of suitable grazing land because of property development and population growth, intensive farming has become financially viable and an option worth exploring. At

this point, however, only one intensive buffalo farm in Thailand produces dairy products from swamp buffaloes. As a result, there are few reports on the reproductive and dairy performance of swamp buffaloes in Thailand, especially under intensive dairy farm management conditions.

The objective of this study was to investigate the reproductive and dairy performance of swamp buffaloes under intensive farm conditions.

Materials and Methods

The dairy buffalo farm in this study is located in Chachoengsao province in eastern Thailand and has a total of 355 Murrah, swamp and mixed breed buffaloes. The farm has an intensive management system in which the buffaloes are divided into 8 units depending on their status, i.e. new born calves (1st month), calves (between 1-12 months), heifers (13-30 months), heat detection and service cows, milking cows, late gestation period cows, male buffaloes (13-30 months) and bulls. Feeding management is done according to a cut and carry or zero grassing system with concentrate supplements. The buffaloes are fed in mangers in

their barns, with different qualities (percent of protein) and quantities, according to their respective units and milk yield (for milking cows). They are checked for health status and disease annually and are vaccinated for foot and mouth disease and hemorrhagic septicemia by veterinarians in a health monitoring program. The buffaloes at this farm are bred by both natural mating and by artificial insemination.

The data of reproduction and milk production was collected from 48 swamp buffaloes between the year 2001 and 2010. The reproductive performance index (such as age at first calving, gestation period, service per conception, calving interval and days open) and the dairy performance index (such as lactation period, milk production and milk yield) were analyzed as mean \pm SD. The breeding season and milk production during each year were also investigated.

Results and Discussion

The reproductive and dairy performances of the swamp buffaloes under intensive farm management conditions are shown in Table 1. The age at first calving in this study was lower than the report of swamp buffaloes in Surin province in northeastern Thailand (3.8 \pm 0.6, n=25 vs 4.8 \pm 1.1 years) (Bodhipaksha, 2006). The main problems are delayed puberty and conception (influenced by breed, season, climate and nutritional management) which are associated with the age at first calving (Campanile et al., 2001; Barile, 2005; Bodhipaksha, 2006). There are many studies about the variation in the age of puberty and first calving in different buffalo breeds. In the swamp type, the age at puberty of Australian buffalo (14-19 months) was earlier than Thai (24-25 months) and Vietnamese buffalo (34-36 months). In the river type, the age of puberty of Nili-Ravi (30-33 months) was larger than Italian (19.4- 20.7 months), Brazilian (18 months) and Egyptian (9.9-24.7 months) (Barile, 2005). Gogoi et al. (2002) reported on river type buffalo an earlier age of first calving in the Surti (51.5 months) and a later age in Murrah (53.8 months).

Although buffaloes are polyestrous breeders, a displaying of estrus, conception rate and calving rate are influenced by seasonal changing. Some studies in Italy noted that the climate and photoperiod, which influence melatonin secretion, play a pivotal role in the rate of reproductive performance, especially in the short daylight, winter period (Barile, 2005). Campanile et al. (2001) concluded that nutritional management (from the time of weaning and during pre-pubertal period) has a particular influence on the age and body weight at first conception in buffalo heifers in long- term and short- term groups, respectively (age, 543 \pm 16 and 844 \pm 11 days; live weight, 364 \pm 10 and 391 \pm 7 kg). Additionally, feeding level and energy level of diet also have an effect on growth and on body and sexual development and the onset of puberty, as stated by the authors who did research on Nili Ravi in Pakistan (Chaudhary et al., 1983) and on Murrah in India (Kaur and Arora, 1989).

Table 1 Reproductive and dairy performances of swamp buffaloes under intensive farm management.

Performance index	Mean \pm SD	Number of data
Reproduction		
Age at first calving (month)	47.1 \pm 8	25
Gestation period (day)	321.4 \pm 11.3	99
Service per conception (time)	3.5 \pm 2.5	99
Calving interval (day)	486.2 \pm 75.02	99
Days open (day)	166.2 \pm 69.7	99
Dairy production		
Lactation period (day)	127.5 \pm 104.6	93
Milk production (kg/cow/day)	2.0 \pm 0.9	93
Milk yield (kg/lactation)	255 \pm 209	93

The calving interval in the present study was lower than in other reports which investigated different areas of Thailand, such as in Surin province for 531.14 days (Wongpanich et al., 2003). The days open and the gestation period were average and similar to previous studies (Barile, 2005; Virakul, 2006). However, the calving interval and days open seemed to rise in first parity cows and high parity cows, which may be caused by negative energy balance, inappropriate nutritional status, and poor function of the reproductive system in each group.

Despite the fact that intensive farming allows much more control over the entire operation, there are still some factors which are beyond the control, even of good management. These include: 1) Climate - long periods of hot weather may lead to heat stress in some animals. Moreover, long periods of wet weather may make fodder harvesting more difficult due to inaccessibility of growing areas. 2) Disease - although intensive management severely limits outbreaks of disease, there always remains some risk of unexpected health issues even in healthy and well managed animals. 3) Price and availability of feed - price fluctuations for the supply of fodder and feed supplements have a huge and uncontrollable influence on the quantity and quality of feed that intensive farming operations are able to provide their animals. All of these uncontrollable factors can obviously have an effect not only on milk output, but also the reproductive status, and related data collected on the buffaloes in this study.

The present study found that the period of greatest calving for swamp buffalo was between August and October (rainy season). Their best breeding period and highest milk production was in November, in the winter season (November- February) (Fig 1). Buffalo production is affected by many factors, especially environment and nutrition. Heatstress is one of many environmental factors affecting reproductive performance. The ideal optimum climatic conditions for tropical buffalo are 13-18 $^{\circ}$ C air temperature combined with 55-65% average relative humidity, 5-8 km/hr of wind velocity and a medium level of sunshine (Marai and Haebe, 2010). This information seems to correlate with our study which found the highest conception and dairy production

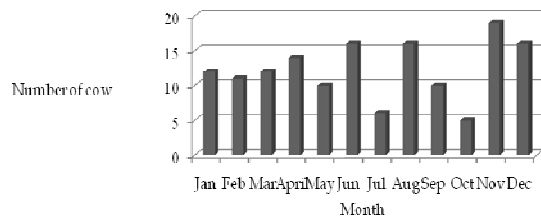


Figure 1 Number of conceptive cows during the period of 2001 to 2010.

was in winter, the season (between mid October and mid February) in Thailand which most closely corresponds to this ideal climatic range (the temperature in the winter season in eastern Thailand were 21.8-31.7°C and 26.4°C in average) (Thai Meteorological Department, 2011). Similarly, Sule et al. (2001) also indicated that winter appeared to be the most favorable season while summer seems to be the most unfavorable season for buffalo production. Additionally, Vale et al. (1990) noted that management factors and unavailability of green fodder in particular seasons could influence the seasonality of buffalo output. This might explain why our study found the most calving in the rainy season, the larger supply of grass at this time provides better nutrition, thus helping periparturient cows to return to estrous cycle and get pregnant in the winter season.

The standard lactation period in the buffalo is 270 days and the milk yield reaches a peak between the fourth and the sixth week after calving (Terramoccia et al., 2006). The dairy performance of the swamp buffaloes in our study was lower than in China (according to the data supplied by the Guangxi Buffalo Research Institute), in which the lactation period, the average milk yield per day, and the milk yield were 280.4±20.2 days, 3.79 kg/cow/day and 1092.8±207.4 kg/lactation, respectively (Bingzhuang et al., 2003). The crossbreeding system has been applied in upgrading the double or triple-crossbred varieties such as crossbred Murrah and crossbred Nili-Ravi, which are higher than local breed swamp buffalo in terms of milk performance (Borghese and Mazzi, 2005)

The evaluation of the reproductive and dairy performance of swamp buffaloes is essential for economic farming analysis and prediction in buffalo industry. This study indicates that the delay in the age of first conception, high service per conception, and long days open are problems which should be resolved by nutritional and environmental management. Moreover, swamp buffalo milk production is low and the lactation period is short which suggests that the swamp type may not be suitable for milking and that their genetics should be improved by cross breed creation.

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