A COMPARATIVE STUDY ON CONCEPTION RATE IN LWY PIGS BY ARTIFICIAL INSEMINATION AND NATURAL SERVICE IN KERALA

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ABSTRACT

Pig rearing is the fastest growing component of animal husbandry, which provides livelihood and nutritional security to the rural sector in Kerala. But, the lack of availability of superior quality germplasm remains as one of the challenges in this sector. Artificial insemination (AI) is the most established scientific procedure to disseminate superior germplasm. The present study was conducted in Large White Yorkshire (LWY) pigs maintained at the Centre for Pig Production and Research, Mannuthy for a period from March 2015 to August 2016 to evaluate the success rate of AI. During this period, 90 weaned sows and five LWY boars were identified for the experiment. The breeding boars were trained for semen collection using females in heat and semen was collected twice in a week, regularly by gloved hand technique into conical flask with Buchner's funnel. A total of 108 ejaculates were obtained from each boar. After preliminary examination, the neat semen was diluted (1:15) with commercial extender (NBSE, NRC on pigs, ICAR, Goa) and stored at 17°C. The sows with standing heat were inseminated (100 ml) using pig catheter consecutively for three days. The non-cycling pigs were diagnosed for pregnancy after 35-45 days by Doppler method. The study recorded 92.22 per cent conception rate for AI 91.35 per cent for natural service. The conception rate, litter size at birth, litter weight at birth and litter size at weaning were also recorded and the parameters did not differ significantly between AI and natural service. The results reiterate the importance of AI technique and it can be extended to the field levels which in turn contribute to the economic benefit of farmers.

Keywords: Large White Yorkshire, artificial insemination, natural service

INTRODUCTION

Livestock farming plays an important role in the rural economy and generates gainful employment in the rural sector, particularly among the landless labourers, small and marginal farmers and women. The popularity of pig production increases tremendously due to its high fecundity, high feed conversion efficiency, early sexual maturity, short generation interval and relatively small space requirement. Moreover, pigs are multipurpose animals providing about 40 per cent of meat

consumed in the world market, by-products like pig dung as manure and bristle for brush industry.

The lack of availability of superior quality germplasm remains as one of the challenges in this sector. Using artificial insemination (AI), the genetic potential of the best germplasm can be transferred to a large number of females which leads to overall genetic improvement. Though the technology is not advanced as in case of bovines, AI is widely applied in organized commercial pig farms throughout the developed world. The pregnancy rate obtained with AI is equal to or better than those with natural service (Lamberson and Safranski 2000; Am-in *et al*. 2010). Visalvethaya *et al*. (2010) reported a model of AI technology transferable to backyard pig farmers for strengthening pig productivity in rural areas of Thailand. The impact of AI on genetic improvement and monetary benefit was studied by Kadirvel *et al*. (2013) under smallholder pig production system in north-eastern India.

Pig rearing is the fastest growing component of animal husbandry, providing livelihood and nutritional security to the rural sector in Kerala. Most of the farmers in the region are engaged in fattener pig production, which demands early castration of male piglets leading to shortage of breeding boar. Supply of superior breeding male requires intensive managerial practices, which is practically impossible. Thus, artificial insemination with semen from superior boar is the most suitable and viable option for genetic improvement of pigs reared in the small holder pig production system. However, the AI has not been a practice in Kerala. It is in this regard the present study was undertaken to compare the conception rate by AI and natural service in Large White Yorkshire (LWY) pigs.

MATERIALS AND METHODS

Semen collection, evaluation and preservation

The present study was conducted in Large White Yorkshire (LWY) sows for a period from March 2015 to August 2016 at Centre for Pig Production and Research, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala. To evaluate the success rate of artificial insemination (AI), 90 weaned sows and five LWY boars were identified. The conception rate obtained by AI technique was compared with the results of natural service of 104 LWY sows in the Centre.

The growing pigs were selected for breeding at the time of weaning (42 days) itself based on the records. After attaining seven months of age, LWY boars were trained for semen collection using females in heat. When the boar did not show any interest to mate, the dummy was smeared with the urine of oestrus female to enhance the libido and quick ejaculations. The procedures of semen collection and insemination followed in the present study are illustrated along with accessories required in the Figure 1 to 5. After training, semen was collected once in a week and then twice in a week, regularly by gloved hand technique. A total of 108 ejaculates were collected from each boar into sterilized plastic bottles under hygienic conditions.

The gel fraction was strained using Buchner funnel with gauze. The gel-free semen was used for further processing

and preservation. The volume of the semen ejaculate was assessed by gently transferring the semen into graduated glass cylinder and the colour was assessed directly by viewing against a white background in the glass cylinder. The mass activity was studied by examining the semen on a warm slide (30 to 35°C) immediately after collection using the low power objective (10X) of a microscope. Sperm motility was recorded as percentage of progressively motile spermatozoa after diluting the semen. The concentration of spermatozoa (millions per millilitre) in the semen was evaluated by haemocytometer method adopting the RBC counting procedure (Salisbury *et al.* 1985).

After preliminary examination, the neat semen was diluted (1:15) with commercial extender with antimicrobial agents (NBSE, NRC on pigs, ICAR, Goa) and stored at 17°C. Semen preserved in the commercial extender up to three days was used for insemination.

Heat detection and artificial insemination

The sows with standing heat were inseminated (100 ml) using pig catheter consecutively for three days. Similarly, natural mating was allowed in the other group. In the present study, a total of 90 sows were artificially inseminated and 104 sows were bred naturally. The animals were maintained at optimal managerial conditions after breeding.

Pregnancy diagnosis, litter size and litter weight

The animals were observed for oestrus signs after 18 to 22 days post-insemination for tentative confirmation of the pregnancy (Aiello *et al.*, 2016). The non-cycling pigs were diagnosed for pregnancy after 6 weeks by Doppler ultrasonography using trans-abdominal probe (Fig. 3). The reproductive traits like litter size and litter weight were recorded at farrowing for artificially inseminated and naturally mated sows. Chi- square test was used to analyze the conception rates among the groups at 5 per cent level of significance using SPSS Version 24.0 (IBM Corp., 2016).

Fig. 1. Pig catheter and accessories for AI

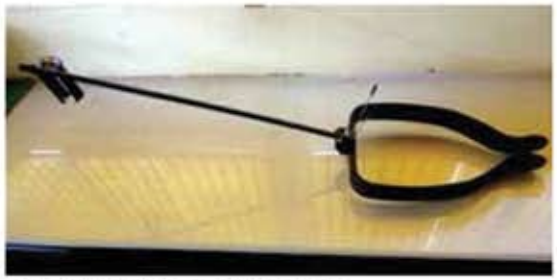

Fig. 2. Holder of AI bottle

Fig. 3. Pregnancy detector with trans-abdominal probe for pigs

Fig. 4. Collection of semen using Buchner's funnel with gauze

Fig. 5. Artificial insemination of sow in standing heat

RESULTS AND DISCUSSION

Table 1. Semen characteristics of Large White Yorkshire boars

Boar No.	Volume (ml)	Concentration (millions/ml)	Motility (%)
LWY-1	223±46	285±33	75
LWY-2	251±32	260±25	78
LWY-3	214±54	293±42	82
LWY-4	270±29	277±37	73
LWY-5	245±48	268±45	80

Table2. Reproductive parameters after artificial insemination and natural service

Parameters	Artificial insemination	Natural service
Number of pigs inseminated/mated	90	104
Number of pigs pregnant	83	95
Pregnancy rate (%)	92.22	91.35
Average litter size at birth (Range)	8-15	8-14
Average litter weight at birth (Kg)	7.0-12.5	7.2-12.0

A survey conducted by Centre for Pig Production and Research, Mannuthy revealed that more than 80 per cent of the pig breeders in Kerala are using the same boar continuously for generations, which end up with lack of genetic improvement and economic loss. In the present study, limited availability of superior germplasm, lack of timely availability of breeding boar, uncontrolled and indiscriminate mating were identified as major breeding constraints. Though, AI is widely applied throughout the commercial pig farms in

the developed countries; it has not been a popular practice in Kerala. Further, AI decreases number of boars needed during peak breeding periods and also controls venereal diseases. The increasing demand for superior breeding boars which is practically impossible to supply, forced the authors to initiate the AI technique in Kerala.

The semen characteristics of Large White Yorkshire (LWY) boars used for artificial insemination in the present study are presented in the Table 1. The average semen volume ranged between 214 ml to 270 ml. The maximum sperm cell concentration recorded among the animals studied was 293 million/ml of ejaculate. The spermatozoa concentration obtained in the present study was in accordance with the previous reports of Strzezek *et al.* (1995), Cerolini *et al.* (2001) and Patra *et al.* (2016). The highest and lowest motility observed in the present study was 82 and 73 per cent, respectively. The aforementioned result was in agreement with Gadea *et al.* (2004) who reported 74.09 per cent motility.

Out of 90 animals inseminated 83 were confirmed for pregnancy by Doppler ultrasonography with a conception rate of 92.22 per cent which was not significantly differed from the corresponding values for natural mating (Table 2). Kadirvel *et al.* (2013) observed no significant difference in the conception rate between AI and NS in small holder pig production systems. Compared with the present results, a lower conception rate was reported by Gadea *et al.* (2004), Apic *et al.* (2015) and Reddy *et al.* (2017) as 85, 83.3 and 80.0 per cent, respectively with artificial insemination using liquid boar semen. Cupps (1990) reported that the pregnancy rates in swine were 85-95 and 65-90 per cent, respectively with natural mating and AI with fluid semen. Ronald *et al.* (2013) reported that the conception rate was 100 per cent in both AI and NS.

The litter size (8-15 and 8-14) and litter weight at birth (7-12.5 kg and 7.2-12.0 kg) were not significantly different between artificially inseminated and naturally mated groups in the present study. Similar observations were made by Behan and Watson (2006) and Patra *et al.* (2016) in gilts and Fitzgerald *et al.* (2008) and Kadirvel *et al.* (2013) in sows. In contrast, Ronald *et al.* (2013) reported significant reduction in litter size in AI group (8.36 ± 0.28) compared to NS group (10.6 ± 0.64). Furthermore, the average number of live-born piglets per litter ranged from 9.85 to 10.27 piglets in intra-cervical insemination and 10.04 to 10.82 piglets in intrauterine insemination.

In contrast to the present results, Amin *et al.* (2010) demonstrated that AI gave significantly better fertility than natural mating in backyard pigs of Thailand. According to Kadirvel *et al.*, (2013) the litter size at weaning was significantly higher in artificially inseminated sows compared to sows mated naturally. This study clearly shows that AI in pigs could be feasible in smallholder traditional pig production system without much reduction of farrowing rate and litter size. The expenditure towards maintenance of boar can be saved besides saving the additional manpower used in management to boar. The farmer gets the long-term benefit of superior crossbred piglets with AI, in addition to save the mating cost.

SUMMARY

In conclusion, the study clearly demonstrated the feasibility and potential benefit of AI in Kerala. AI is better than the natural service for faster dissemination of superior germplasm and genetic improvement of nondescript local pigs to increase productivity. It can also overcome the breeding constraints in the smallholder production systems for increasing the income, food security, and livelihood of farmers.

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