

## Effect of single Vs double insemination on farrowing rate and litter size in sow

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### ABSTRACT

Semen was collected from Hampshire boar by gloved-hand technique twice weekly and extended in Beltsville Thawing Solution (BTS) at the rate of 1:4 to 1:5 depending upon concentration. Seventy to eighty ml of extended semen (2-3 billion sperm) was packed in the sachet and preserved at 17°C. In group I (No = 25), sows were given single insemination, while Group II (No = 27) received double insemination during standing estrus at 24 h interval. Sows in group III (No =20) were allowed for natural service (NS) and served as control. The farrowing rate with single insemination was 68% with an average litter size of 7.6±0.3. Whereas in double insemination group, the farrowing rate was 77% with an average litter size of 9.2±0.2. There was significant (P≤0.05) difference between single and double insemination groups on the farrowing rate and litter size. Similarly, the farrowing rate (80%) and litter size (9.4±0.2) in NS group were significantly (P≤0.05) higher than that in single insemination group. However, there was no significant difference between double insemination group and NS group on farrowing rate and litter size. It was concluded that inseminating estrus sows twice at 24h interval would favour the farrowing rate and litter size, which is more or less equal to single natural mating.

**Key words:** Single Vs double insemination, farrowing rate, litter size, sow

Artificial Insemination (AI) in swine has attained wide acceptability throughout the world and its use is increasing greatly over the past 20 years. For producers to gain the greatest benefits from AI programs, insemination schedules must be optimized. An optimal schedule is one that will result in a high conception rate and litter size. Though, many factors contribute to the failure of an AI program, a common cause of failure is inaccurate timing of insemination. In pigs, high variation has been observed in the duration of estrus and in the time of ovulation after the onset of estrus (Almeida *et al.*, 2000). Successful fertilization depends mainly on the time of insemination or mating relative to ovulation. As the time of ovulation varies considerably within the period of estrus, the fertilization rate will be compromised if the number of mating per sow is restricted (Foxcroft and Vande Wiel, 1982). Few authors reported an increased farrowing rate and size after a second insemination (Reed, 1982; Clark and Leman, 1986) during same oestrus. But, Gooneratne *et al.* (1989) did not find an effect of single or double insemination with a 16-20h interval on farrowing

rate and litter size. However, Flowers and Esbenshade (1993) concluded that insemination frequency is of importance in sow production. In this context, the increasing number of insemination during the same estrus is one of the insemination strategies to obtain higher conception rate and litter size. Hence, the present study was undertaken to investigate the effect of single versus double insemination during estrus on farrowing rate and litter size in pigs.

### MATERIALS AND METHODS

The present study was conducted in Animal Production Division of ICAR Research Complex for NEH Region, Umiam, Meghalaya. A total of 72 crossbred sows (Hampshire x Kashi local) with an age group of 2-4 years, maintained under same managerial conditions were utilized for the study. Semen was collected from Hampshire boar by gloved-hand technique twice weekly. Good quality semen was extended in Beltsville Thawing Solution -BTS (Pursel and Johnson, 1975) at the rate of 1:4 to 1:5 depending upon concentration and preserved at 17°C. Seventy to eighty ml of extended semen (2-3 billion sperms) was packed in the sachet by filling and ceiling machine (IMV).

Weaned sows were divided into three groups and subjected to estrus detection twice a day and inseminated during standing estrus with stored semen up to 48h by

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Golden pig catheter (IMV). In group I (No = 25), sows were given single insemination, while Group II (No = 27) received double insemination during standing estrus at an interval of 24h. Sows in group III (No = 20) were allowed for natural service (NS) and served as control. Parameters like farrowing rate, litter size at birth, number of live born and litter weight at birth were studied in all groups.

Data were analyzed using standard statistical methods given by Snedecor and Cochran (1989).

### RESULTS AND DISCUSSION

Effect of single versus double insemination on farrowing rate and litter size are shown in table 1.

Of the 25 sows inseminated once, only 17 sows (67%) have farrowed with an average litter size of  $7.6 \pm 0.2$ , whereas in double insemination group, the farrowing rate was 77% i.e. 21 out of 27 sows have farrowed with an average litter size of  $9.2 \pm 0.2$ . There was significant ( $P \leq 0.05$ ) difference between single and double insemination groups on the farrowing rate and litter size. Similarly, the farrowing rate (80%) and litter size (9.4) in NS group were significantly ( $P \leq 0.05$ ) higher than in the single insemination group. However, the farrowing rate and litter size between double insemination group and NS group did not differ significantly.

respectively in sows inseminated twice. Several authors have been reported an increased farrowing rate and litter size after second insemination (Reed, 1982; Clark and Leman, 1986; Flowers and Esbenshade, 1993) or repeated natural mating (Tilton and Cole, 1982 and O Grady *et al.*, 1983). On contrary, Gooneratne *et al.* (1989) and Slijkhuis and Schneijdenberg (1987) did not find any effect of single or double insemination on farrowing rate and litter size.

Significantly ( $P \leq 0.05$ ) higher farrowing rate and litter size observed in double insemination group than in the single insemination group in the present study might be due to greater variation in the duration of estrus (33-153 h). Also, the interval from onset of estrus to ovulation varies from 19 to 120h (Weitze *et al.*, 1994), which requires longer period of sperm availability for fertilization to occur. Moreover, fertilization depends mainly on the time of insemination relative to ovulation (Waberski *et al.*, 1994). Vesseur *et al.* (1996) concluded that the second insemination 24h after first insemination contributed about 45% of the total piglets born. The time of ovulation varies considerably within the period of estrus and ovulation occurring over a period, the fertilization rate will be compromised if the number of mating per sow is restricted (Foxcroft and Vande Wiel (1982). Reed (1982) also stated that multiple inseminations are required

**Table:1 Farrowing rate and litter size (Mean  $\pm$  SE) after single and double insemination in sow**

S.No	Parameters	Artificial Insemination		Natural Service
		Single	Double	
1	No of Animals Inseminated	25	27	20
2	Farrowing rate (%)	68 <sup>b</sup>	77 <sup>b</sup>	80 <sup>b</sup>
3	Average Litter Size	$7.6 \pm 0.3^a$	$9.2 \pm 0.2^b$	$9.4 \pm 0.2^b$
4	Average No. of Live Born	$7.2 \pm 0.2^a$	$8.7 \pm 0.2^b$	$9.0 \pm 0.2^b$

Figures having different superscript in column varies significantly ( $P \leq 0.05$ ).

The farrowing rate and litter size observed in this study is in agreement with Sohst (1997) who reported farrowing rate and litter size of 65.38% and 10.3 respectively in sows given single insemination. However, higher range of farrowing rate from 78.6 to 82.9% and litter size ranging from 8.9 to 10.5 with single insemination have also been reported (Mestank *et al.*, 1979 and Peter *et al.*, 1988). As regard to the farrowing rate and litter size with double insemination, the results are in agreement with those of Schafer *et al.*, 1999 and Mass and Huhan (1988), who reported 83.3% and 81.5% farrowing rate

during the estrus for optimum conception rate and litter size. Hence insemination twice at an interval of 24h may provide optimum number of spermatozoa in relation to ovulation time ensuring conception.

From this study, it may be concluded that insemination of estrus sows twice at 24h interval would favour the farrowing rate and litter size, which is more or less equal to the single natural mating. Hence, double insemination during same estrus is a practical way to obtain optimal farrowing rate and litter size in AI program of pigs.



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## REFERENCES

- Almeida, F.R.C.L., Novak, S. and Foxcroft, G.R. (2000). The time ovulation in relation to estrus duration in Gilts. *Theriogenology*, **53**: 1389-1396
- Clark, L.K. and Leman A.D. (1986). Factors that influence litter size in pigs. *Pig News Inf.*, **7**: 303-310.
- Flowers, W.L. and Esbenshade, K.L. (1993). Optimizing management of natural and artificial matings in swine. *J. Reprod. Fertil. Suppl.*, **48**: 217-228
- Foxcroft, G.R. and Vande Wiel.( 1982). Endocrine Control of the Oestrus Cycle. In: *Control of Pig Reproduction*. Cole, D.J.A. and Foxcroft, G.R. (eds). London, Butterworths, pp: 161-177.
- Gooneratne, A.D., Kirkwood, R.N. and Thacker, P.A. (1989). Effects of injection of gonodotropin releasing hormone on sow fertility. *Can. J. Anim. Sci.*, **69**: 123-129.
- Mass, P. and Huhn (1988) Investigation on the biotechnical control of reproductive performance of sows after a 3 week lactation. *Monatshefte-fur-veterinarmedizin*, **43**: 267-270.
- Mestaneck, J., Kristanova,O. and Pacova, J.(1979). The development of the diluent "koncentrat" for the preservation of boar semen. *Biologizacne-a-chemizacne-zivocisime-Vyrobny-veterinaria*, **15**(1): 85-96.Cited in: BEASTED 1973-1988, AN: 790143994.
- O Grady, J.F., Lynch,P.B. and Keanney, P.A. (1983). Mating management of sow. *Ir. J. Agric. Res.*, **22**: 11-19.
- Peter, W., Mudra, K., Conrad,F. and Zeuner, A. (1988). Measures to improve liquid preservation of boar semen. 11th International Congress on Animal Reproduction and AI,
- Pursel, V.G. and Johnson, L.A. (1975). Freezing of boar spermatozoa; Fertilizing capacity with concentrated semen and a new thawing procedure. *J. Anim. Sci.*, **40**: 92-102.
- Reed, H.C.B. (1982) Artificial Insemination. In: *Control of Pig Reproduction*. D.J.A.cole and G.R. Fox Croft (Eds), Butterworth, London. pp:65-90.
- Schafer, S., Holzmann, A.,Wesenawer, G. and Arbeiter, K. (1999). Synchronization of oestrus, ovulation induction and synchronized farrowing in sows. *Tierarztliche-Umschau*, **54**: 33-36.
- Slijkhuis, A. and Schneijdenberg, T.(1987) In : Vesseur,P.C., Kemp, B. and Hartog dem, L.A. (1996) Factor influencing the proportion of offspring from a second insemination in Sows. *Anim. Reprod. Sci.*, **41**: 225-265.
- Snedecor G.W. and Cochran, W.G. (1989). *Statistical Methods*. 8th edn. The Iowa State University Press, Ames, Iowa, USA.
- Sohst, E. (1997). Investigation on factors affecting hera fertility in large pig herds. *Tierarztliche-umschau*, **52**: 203-212.
- Tilton, J.E. and Cole, D.J.A. (1982). Effect of triple versus double mating on sow productivity. *Anim. Prod.*, **34**: 279-282. University College Dublin, Vol.3, communications, paper no : 285.
- Vesseur, P.C., Kemp, B. and Hartog dem, E.A. (1996). Factor influencing the proportion of offspring from a second insemination in Sows. *Anim. Reprod. Sci.*, **41**:225-265.
- Waberski, D., Weitze, K.F., Gleumes,T., Schwarz and willmen Petzoldt. (1994 ). Effect on time of insemination relative to ovulation on fertility with liquid and frozen boar semen. *Theriogenology*, **42**: 831-840.
- Weitze, K.F, Wagner- Rietschel, H., Waberski, D., Richter. L. and Krieter, J (1994). The onset of heat after weaning, heat duration and ovulation as major factors in AI timing in sow. *Reprod. Dom. Anim.*, **29**: 433-443.