An Evaluation of Boar Pheromone Spray to Aid the Stimulation and Detection of Estrus in Small Farms in Nepal

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ABSTRACT : A prolonged farrowing interval is common on small farms in Nepal and may be attributable to the absence of boar contact at the time of weaning. To examine whether synthetic boar pheromone spray might be of value to aid the stimulation and detection of estrus, 30 village farms, each with a single sow, were recruited into a field study. All sows entered the study on final weaning from their first lactation at 56 days post partum. For 13 treatment sows, a boar pheromone spray (SOA, Intervet, Boxmeer, The Netherlands) was applied each day after weaning whilst 17 other sows did not receive any stimulus (negative control). When estrous was detected by the farmer, sows were taken to the nearest boar for service. There was a significantly shorter weaning to re-mating interval for treatment sows (42.9 V 82.2 day, $p<0.05$), with a significantly higher proportion of treatment sows rebred by day 60 after weaning ($p=0.024$, Fishers Test). It is concluded that use of boar pheromones can improve reproductive efficiency of sows kept under Nepalese village conditions. *(Asian-Aust. J. Anim. Sci. 2001. Vol. 14, No. 5 : 697-700)*

Key Words : Boar Pheromone Spray, Estrus, Re-Mating, Puberty

INTRODUCTION

The keeping of single sows without a boar to stimulate estrus and help with estrus detection is an important factor responsible for reduced reproductive efficiency. Hemsworth, Cronin and Hansen (1982) reported that exposure of gilts to boars significantly improved mating rate from 50 to 90 per cent. Several studies have also demonstrated that boar exposure has an advantage in reducing the interval from weaning to re-mating (Signoret, 1970; Stevenson and Davis, 1984; Petchy and English, 1980). However, in the Nepalese rural situation it is unusual for farmers to maintain both male and female pigs at their farm because of limited feed resources. A survey conducted by Shrestha (2000) showed that less than 52% of the farmers had a boar present with the sow. This figure would have been even lower if the survey had incorporated sites other than Outreach sites, where breeding boars had previously been donated. Poor reproductive performance, characterized by very long farrowing intervals, is a major source of inefficiency in pig production in these areas (Gatenby et al., 1990). This may reflect health problems and/or poor nutrition, but it is also likely that lack of boar stimulation is a major contributory factor. Synthetic boar pheromone spray is commercially produced in some western countries as an aid to estrus detection and sow stimulation under intensive management conditions (Reed et al., 1974; Krzymowski et al., 1999). This experiment was therefore designed to assess the possible beneficial effect of boar pheromone spray on estrus stimulation and detection of sows under Nepalese village conditions where a boar is not available in the immediate vicinity.

MATERIALS AND METHODS

A total of 30 farms in villages in the eastern region of Nepal, each with a single sow, were recruited into a field study. All sows were of the Nepalese Pakhribas synthetic genotype developed from three way crossing between Saddleback, Tamworth and Fa Yuen and were housed and fed according to normal village practice. The reproductive performance of Pakhribas genotype is presented in table 1. Animals entered the study on final weaning from their first lactation at 56 days post partum. Their litters had previously been progressively weaned, with removal and sale of the larger piglets starting from 42 days after farrowing, according to normal village practice.

For 13 treatment sows, a boar pheromone spray (SOA, Intervet, Boxmeer, The Netherlands) was applied daily from weaning until first detected estrus, whilst 17 other sows did not receive any stimulus (negative control). Each day SOA was sprayed for three seconds onto the snout of the treatment sows. When estrus was detected by the farmer, sows were taken to the nearest boar for service.

Records of lactation performance, litter size and weight, were taken from each sow at farrowing, 42 and 56 days of lactation. The backfat thickness of the sow was measured using ultrasonic equipment (Meritronics Livestock Grader) at these times, and her weight estimated using measurement of girth circum-

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Table 1. The reproductive performances of Pakhribas pigs at on station (1981-1997)

Parameters	Range	Mean ± SE of the mean	Number of Observations
Age at first service (days)	215-312	251 ± 3.51	30
Age at first farrowing (days)	329-463	368 ± 4.79	30
Mature live weight (kg)	107.8-154.8	126.77 ± 11.10	30
Gestation period (days)	107-120	113 ± 0.11	267
Live born piglets per litter (No)	0-18	9.46 ± 0.17	267
Piglets born dead per Litter (No)	0-11	0.41 ± 0.07	267
Birth weight of piglets (kg)	0.34-1.7	1.05 ± 0.01	2627
Weaned weight of piglets at 6 weeks (kg)	2.3-12	6.6 ± 0.10	2627
Weaned number	0-15	8.45 ± 0.16	264
Growth rate (g/day) up to six weeks	29-278	132 ± 0.00	2627
Pre-weaning mortality (%)	0-100	9.6 ± 0.90	263
Farrowing interval (days)	150-442	178 ± 1.8	239
Litter size per sow per year	4.6-46	20.7 ± 0.42	267
Number of litters per sow per year	0.82-2.4	2.08 ± 0.01	267
Number of piglets weaned per sow per year	0-31	17.5 ± 0.35	267

ference relative to a previous calibration scale (Shrestha, 2000).

Ordinal data were analysed by one-way analysis of variance, with treatment as factor, using the software package Minitab release 12. The proportion of sows showing estrus by specified times after weaning was compared between treatments using the Fisher Exact Probability Test (Siegel, 1956).

RESULTS

Lactation performance of sows

Table 2 summarises the lactation performance of the sows prior to entering the experiment. Sows did not differ between treatments in litter size, weight or fat loss.

Weaning to re-mating interval

The mean weaning to re-mating interval was 42.9 for the treatment of use of boar pheromone spray and 82.2 days for no use of boar pheromone after weaning at 56 days after farrowing (sed 25.4, $p<0.05$). The testing of litter size, weight loss in lactation, backfat loss in lactation, absolute weight at weaning and absolute backfat thickness at weaning as possible covariates in the analysis showed that there were no significant effects of these covariates except for absolute weight at weaning.

The cumulative frequencies of sows served by different days after weaning are presented in the figure. 1.

The Fishers exact probability test was carried out for the proportion of sows remated by different intervals after final weaning. The result showed that there were no significant differences between treatments before 50 days after weaning, but there were significantly more sows re-mated with the SOA pheromone treatment at day 60 ($p=0.024$).

DISCUSSION

The stimulus of synthetic boar pheromone was found to be very effective in reducing the weaning to conception interval and hence improving reproductive efficiency in pigs maintained under the conditions typical in village farms in Nepal. This could have resulted from one or more different physiological influences of boar stimulation.

Table 2. Comparison of lactation performance of experimental sows

	SOA treatment	Control	SED	Sig.
Litter size at birth	7.4	8.5	1.21	ns
Litter size at 42 days	6.8	8.2	1.34	ns
Mean weaned weight of piglet (kg)	5.7	5.6	0.79	ns
Weight at farrowing (kg)	86.4	84.5	7.29	ns
Weight at final weaning (kg)	73.3	72.3	8.10	ns
Backfat at farrowing (mm P_2)	15.2	14.5	2.84	ns
Backfat at final weaning (mm P_2)	8.9	8.0	2.34	ns
Weight loss in lactation (kg)	13.0	11.8	2.59	ns
Backfat loss in lactation (mm P_2)	6.3	6.4	2.2	ns

The role of the boar is to both stimulate estrus and to facilitate detection of estrus. The major stimulatory effects of boar presence on female reproduction are well documented (Signoret, 1970). The boar can stimulate the early appearance of estrus in the prepubertal gilt, the lactating sow and the weaned sow. There are several reports available regarding use of a boar as stimulus for the timely attainment of puberty and short weaning to estrus interval (Tilbrook and Hemsworth, 1989; Patterson and Pearce, 1989; Hughes and Pearce, 1989). Additionally, boar presence may influence the exhibition and detection of estrus (Hemsworth and Barnett, 1990).

Boar presence confers a number of different stimulus dimensions, only one of which is replicated by a pheromone spray. However, experimental evidence would suggest that it is this component of the boar effect which is most effective in its influence on female reproduction. Booth (1990) reported that the androgenized castrate boar closely resembles the appearance of the intact male, and emits normal auditory cues. An early study by Kinsey et al. (1976), suggested that contact of prepubertal gilts with a castrated male provided as effective stimulation of puberty as exposure to an intact boar. However, Pearce and Hughes (1987) clearly demonstrated that visual cues presented by a castrated male without other exogenous boar stimuli were considerably less effective in stimulating gilt puberty. Similarly, Signoret (1970) reported that simply broadcasting of tape-recorded boar 'courting' grunts induced a standing reaction in over 50% of gilts that were negative in the absence of the male. Kinsey et al. (1976) further suggested that recorded boar chants in isolation were equivalent to contact with a mature boar for puberty stimulation in the gilts. In contrast, Pearce and Hughes (1987) suggested that auditory stimuli are, at most, a minor part of the boar effect.

From the above discussion it can be concluded that visual, auditory and tactile stimuli from the boar are not the primary component of the boar effect. The two known boar pheromones (5 α-androstenone and 3 α-androstenol) are principally found in the urine and saliva of boars, and are recognised to have signalling pheromone properties (Reed et al., 1974). The application of synthetic pheromone spray, even in the absence of visual, auditory and tactile cues, may therefore be sufficient to elicit the responses normally induced in the presence of a boar. Under these circumstances, the full benefits which would be obtained from the presence of a mature boar on the farm can be achieved using boar pheromone spray, without the associated feed maintenance cost.

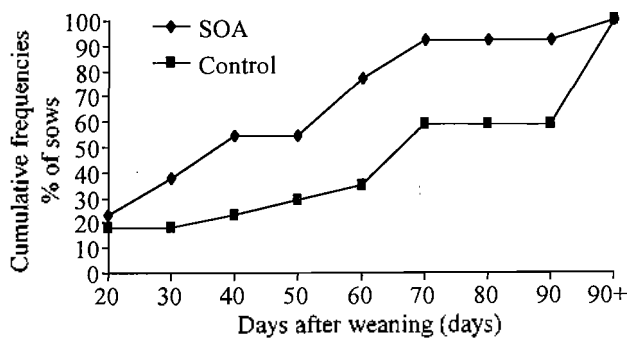

Figure 1. The cumulative frequencies of sows served by different days after weaning in relation to estrus stimulation treatment

CONCLUSIONS

The pig rearing system in the small scale sector of farming in Nepal is very different to commercial pig farming in industrialised countries. The breeding female pig is typically maintained individually without any boar presence nearby. Under these circumstances, the use of a boar pheromone spray can confer major advantage in the stimulation and/or detection of estrus and the improvement of reproductive efficiency.

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REFERENCES

Booth, P. J. 1990. Metabolic influences on hypothalamic-pituitary-ovarian function in the pig. J. Reprod. Fertil. (Suppl.). 40:89-100.

Gatenby, R. M., P. B Chemjong, B. Pakhrin, and S. K. Chimariya. 1990. The reproduction of pigs in the Koshi hills. PAC Technical paper 125. Pakhribas Agricultural Centre, Dhankuta, Nepal.

Hemsworth, P. H. and J. L. Barnett. 1990. Behavioural responses affecting gilt and sow reproduction. J. Reprod. Fertil. (Suppl.). 40:343-354.

Hemsworth, P. H., G. M. Cronin, and C. Hansen. 1982. The influence of social restriction during rearing on the sexual behaviour of the gilt. Anim. Prod. 35:41-48.

Hughes, P. E. and G. P. Pearce. 1989. The effect of group size and exposure pen area on boar - induced puberty in the gilt. In: Manipulating Pig Production II. (Ed. J. L. Barnett and D. P. Hennessy). Werribee, Victoria, Australia.

Kinsey, R. E., R. Carlson, C, Proud, and D. R. Zimmerman. 1976. Influence of boar component stimuli on age at puberty in gilts. J. Anim. Sci. 42:1362(Abstr.).

Krzymowski, T., W. Grzegorzewski, S. Stefanczykkrzymowska, J. Skiper and B. Wasowska. 1999. Humoral pathway for transfer of the boar pheromone, androstenol from the nasal mucosa to the brain and hypophysis of gilts. Theriogenology, 52:1225-1240.

Paterson, A. M. and G. P. Pearce. 1989. Long days delay

puberty in the gilt. In: Manipulating Pig Production II. (Ed. J. L. Barnett and D. P. Hennessy). Werribee, Victoria, Australia.

Pearce, G. P. and P. E. Hughes. 1987. The influence of male contact on plasma cortisol concentrations in the prepubertal gilt. J. Reprod. Fertil. (Suppl.). 80:417-424.

Petchy, A. M. and P. R. English. 1980. A note on the effects of boar presence on the performance of sows and their litters when penned as groups in late lactation. Anim. Prod. 31:107-109.

Reed, H. C. B., D. R. Melrose, and R. L. S. Paterson. 1974. Androgen steroids as an aid to the detection of estrus in pig artificial insemination. Br. Vet. J. 130:61-67.

Shrestha, N. P. 2000. Factors affecting reproduction in pigs in the small scale farming sector in the hills of Nepal. Ph. D. Thesis. University of Aberdeen. Aberdeen, UK.

Siegel S. 1956. Non parametric statistics for the behavioural sciences. McGraw Hill Book Company Ltd, Tokyo.

Signoret, J. P. 1970. Reproductive behaviour of pigs. J. Reprod. Fertil. (Suppl. 11). (1970), pp. 105-117.

Stevenson, J. S. and D. L. Davis. 1984. Influence of reduced litter size and daily litter separation on fertility of sows at 2 to 5 weeks postpartum. J. Anim. Sci. 59:284-293.

Tilbrook, A. J. and P. H. Hemsworth. 1989. Estrus detection in gilts exposed to exogenous boar stimuli. In: Manipulating Pig Production II. (Ed. J. L. Barnett and D. P. Hennessy), Werribee, Victoria, Australia.