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**EFFECT OF
EARLY WEANING ON THE REPRODUCTIVE PERFORMANCE
OF SOWS**



By
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THESIS

Submitted in partial fulfilment of the
requirements for the degree

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Mannuthy Trichur

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DECLARATION

I hereby declare that the thesis entitled " EFFECT OF EARLY WEANING ON THE REPRODUCTIVE PERFORMANCE OF SOWS" is a bona fide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship, or other similar title of any other University or Society.



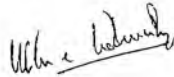
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CERTIFICATE

Certified that the thesis entitled "EFFECT OF EARLY WEANING ON THE REPRODUCTIVE PERFORMANCE OF SOWS" is a record of research work done independently by Sri. E. Madhavan, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship, or associateship to him.



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INTRODUCTION

INTRODUCTION

In a review of the world agricultural developments, FAO, has projected an estimated increase of 166 per cent in the global demand for meat from 1965 to 1985 (FAO, 1971). To meet this exuberant increase in the requirement of meat and meat products, concerted efforts have to be made to improve the production potential of meat producing animals. The role of pigs in this regard needs no special emphasis because of the undisputed position pork occupies as a food rich in animal protein. Unfortunately pig rearing in India, until recently, has been the traditional occupation of only the weaker sections of the community, who, due to their low economic status and other reasons, have not been able to provide necessary inputs like improved breeding, feeding and management for making swine industry an economic enterprise. It has, therefore, become imperative that due attention is given and all possible avenues explored to improve the productive capacity of pig. While this could be achieved to a very great extent by proper genetic selection and scientific breeding, it is worthwhile to remember that improved managerial practices do play a vital role in accelerating the rate of production.

As in other livestock enterprises, the viable swine industry also leans heavily on the reproductive efficiency

of the adult females. An important criteria to measure the reproductive efficiency of swine is the number of piglets produced per sow per year which could be increased either by reducing the farrowing interval or by increasing the number of piglets per farrowing. There are several reports to indicate that weaning of piglets early in lactation is beneficial for the over-all reproductive efficiency of sows (Rognoni and Ferrari, 1964; Smidt et al. 1965; Korniewicz, 1969; Aumaitre and Rettagliate, 1972; Majerciak and Kaldarkar, 1972 and France, 1972). Dinu and Carbasu (1971) recommended 14-16 days as the optimum age for weaning piglets. Cole et al. (1975) contributed a highly informative monograph on the reproductive performance of sows, weaned early in lactation. According to them maximum productivity could be achieved by weaning piglets at 20 to 28 days after farrowing. Aumaitre et al. (1976) found that weaning practiced less than 10 days and more than 45 days after parturition disturbed the reproductive activity of sow. Hirokazushimizu and Takeuchi (1969) noted better feed utilization by piglets weaned early in lactation.

Perusal of the available literature shows paucity of informations from India on the subject. Investigations on

how early a sow could be bred after farrowing with maximum advantage would be useful to fix a norm for weaning time. The present work was therefore taken up with a view to study the effect of early weaning on the reproductive efficiency of sow on one hand and the post-weaning performance of piglets on the other.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Post partum oestrus was reported to occur in sows within 60 hours of parturition (Warnick, Casida and Grummer, 1950; Burger, 1952). However, distinct heat symptoms might not be visible in all cases. Warnick et al. (1950) could observe only about 50 per cent of the sows exhibiting oestrous signs shortly after farrowing. On the other hand, Burger (1952) reported that more than 90 per cent of the Large Black and Large White sows showed the characteristic heat symptoms within a short period of parturition. According to Day (1968) post partum oestrus without sexual receptivity was a common feature in swine.

It is generally agreed that the first heat after farrowing is not a fertile one as it is not associated with follicular growth and ovulation. Burger (1952) observed sows to be anovulatory throughout lactation. According to Lauderdale et al. (1965) and Peteres et al. (1969), follicular growth was very much suppressed in suckled sows. It has been pointed out that the inhibition of follicular growth was due to inadequate synthesis of gonadotropins (Rowlinson et al. 1975). However, attempts to induce follicular growth and ovulation in lactating sows by injecting gonadotropins before 40 days post partum

have been seldom successful. (Cole and Hughes, 1946; Heitman and Cole, 1956; Allen et al. 1957). Peteres et al. (1969) also failed to recover fertilized ova from sows treated with gonadotropins during early lactation. Smith (1961) has been able to induce ovulation and improve fertility in lactating sows by temporarily keeping the piglings away from the dam. By keeping together a group of 2 to 8 sows with their litters, Rowlinson et al. (1975), not only could induce heat in all the sows during early lactation but also get them successfully mated with a high degree of predictability.

The onset of post-weaning heat has been the subject of study since long. Self and Grummer (1958) showed that when litters were weaned at 10, 21 and 56 days of age, post-weaning oestrus occurred at 9.4 days, 6.2 days and 4.0 days respectively. It was further observed that the difference in the onset of post-weaning oestrus between the three groups was significant. Smidt et al. (1965) reported that the length of lactation had a significant influence on the occurrence of post-weaning oestrus. Svajgr (1972) observed that post-weaning oestrus occurred at 10.1, 8.2, 7.1 and 6.8 days respectively when piglets were weaned at 2nd, 13th, 24th and 35th day after farrowing.

A negative curvilinear relationship between lactation length and post-weaning oestrus was recorded by Cole et al. (1975). According to them, the period of weaning to oestrus was increased by 4.2 days on average when lactation length was reduced from 42 to 4 days. In marked contrast, Rognoni and Ferrari (1964) found that duration of suckling had no significant influence on the onset of post-weaning oestrus in sows. Aumaitre and Rettagliate (1972) also reported that the average interval from weaning to the first heat was not significantly influenced by the time of weaning. France (1972) found that the length of interval between weaning and subsequent oestrus was not significantly affected when piglets were weaned at 5th and 8th week. Studies conducted at Nutritional Research Institute, Surrey; revealed that the post-weaning oestrus occurred respectively at 12.3 days and 9.9 days when piglets were weaned at 3 to 6 days and 42 days after farrowing (Pay, 1973). The difference, however, was found to be not significant. Heyde and VanDer (1972) opined that the onset of post-weaning oestrus was influenced by the nutritional status of the dam; a low level of feeding during lactation producing delayed oestrus in some sows. Brooks et al. (1975) and Varley and Cole (1976) however, reported that the appearance of post-weaning oestrus was not influenced by post-weaning feed level.

Moody and Speer (1971) obtained a conception rate of 66.7%, 83.3% and 90.9% when piglets were weaned respectively at 2nd, 3rd and 4th week after farrowing. Heyde and VanDer (1972) got a conception rate of 75-93% when weaning age averaged 13 days. Svajgr (1972) studied the conception rate in sows when piglets were weaned at 2nd, 13th, 24th and 35th day of farrowing. It was observed that conception rate of the sows was significantly reduced when weaning was done at 2nd and 13th day. Aumaitre and Rettagliate (1972) reported 88.5%, 94% and 97.5% conception rate when pigs were weaned at 10th, 21st and 35th day of farrowing. France (1972) and Cole and Varley (1975) found that the conception rate was not significantly affected by the time of weaning. Myers and Speer (1973) reported that the conception rate of early weaned sows could be improved by administering antibiotics through feed.

Bellis (1964) reported 146 days on average as the farrowing interval when piglets were weaned at 3 weeks. Weaning litters at 22.9 days and 19.89 days, Banjac et al. (1968) obtained farrowing interval of 179.93 days and 169.63 days respectively. An inter-farrowing period of 159.7 days was recorded by Hirokazushimizu and Takeuchi (1969) when weaning was done at 31.5 days, Majerciak and Kaldarkar (1972)

found farrowing intervals of 163.7 days with 2.23 litters per year and 186.8 days with 1.95 litters per year for those which were weaned at 29 days and 56 days of age respectively. Sukarnikova (1976) reported that farrowing interval could be reduced by 25 days by weaning baby pigs at 35 days instead of 60 days.

Effect of early weaning on the litter size at the subsequent farrowing was studied by several workers. Smidt et al. (1965) reported that reduced lactation length adversely affected the number of piglings born in the subsequent farrowing. Hirokazushimizu and Takeuchi (1969) analysed the data from a small herd in which early weaning was practiced. The litter size at the following farrowing was found to be 10.7 when the mean duration of suckling was 31.5 days. Korniewicz (1969) observed a reduction of 1.9 piglets born when weaning was done at 4th week. Majerciak and Kaldarkar (1972) compared weaning at 29 days and 56 days of age over 13 production cycles and found the litter size at the next farrowing to be 10.8 and 12.6 in the two groups respectively, Aumaitre and Rettagliate (1972) noted that the average litter size at the following farrowing was approximately reduced by 0.5 and 0.6 in sows weaned at 10 days than those weaned at 21 and 35 days. Cole and Varley (1975) weaned piglets at 2 days interval to

give a range of lactation length from 4-42 days. It was shown that very short lactation was associated with reduction in the size of the litter at the next farrowing. Sows from which piglets were weaned at a lactation length of 4-21 days had an average litter size of 9.6 at the following farrowing whereas sows from which piglets were weaned after a lactation length of 21-42 days had an average of 12.7 piglets born at the next farrowing. It was further observed that reduction in the litter size was particularly noticeable when weaning took place before 3 weeks. Brooks et al. (1975) suggested that the cause for reduction in the litter size of the very early weaned sow might be attributed to the poor survival rate of the embryos rather than the rate of ovulation. Cole and Varley (1975) showed clearly that there was no difference in the ovulation rate following different lactation period. But the number of live embryos recovered per sow was found to be 9.2, 10.8, 13.1 for the 7th, 21st and 42nd day weaned pigs respectively. It was further observed that when the lactation length was reduced from 42 days to 7 days, the embryo survival dropped from 81.7% to 59.2%. It was thus concluded that decrease in embryo survival might be very largely responsible for the eventual drop in the litter size of very early weaned sow. Varley and Cole (1976)^b also opined that high rate of embryonic death was responsible for the

reduction in the litter size of very early weaned sow. Delmonte et al. (1968) did not observe any significant variation in the litter size at the next farrowing when pigs were weaned at 27-41 days. Korniewicz (1969) found that there was no difference in the litter size when weaning was done at 6th and 8th week of farrowing. France (1972) studied the litter size at the subsequent farrowing in sows weaned at 5th and 8th week and reported that litter size did not differ significantly between the two groups. Varley and Cole (1976)³ found that the level of feeding had no influence on the subsequent litter size of early weaned sow.

Moody et al. (1966) noted that when weaning took place at a lactation length of 20 days the birth weight of piglets at the next farrowing was 1.44 kg. Hirokazushimizu and Takeuchi (1969) observed that when weaning was done at an average age of 31.5 days, the mean birth weight of piglets at the subsequent farrowing was 1.74 kg.

Smith and Lucas (1956) suggested that piglings weaned early must be fed very acceptable highly nutritious diet to prevent stunting. Mc Grea and Tribe (1956) noticed better growth rate in pigs weaned at 72 hours with 22% protein diet. Bellis (1967) remarked that the feed of early weaned piglets should be higher in protein and more digestible than creep

feed of later weaned piglets. Meade et al. (1969) showed that piglings fed on 20% protein diet had greater feed conversion ratio than those fed on 17% protein diet.

Several workers investigated the influence of age at weaning on the growth rate of piglets. Hanson (1954) compared 3 week weaning with 8 week weaning under excellent conditions of feeding and management. In the first week of the test the piglings weaned at 3 weeks fell behind to those not weaned but they caught up by 8 weeks. Sewell and Maner (1960) showed that with proper feeding and management, the performance of piglets weaned at 3 weeks could excell that of pigs weaned at 8 weeks. The study clearly indicated that pigs could be weaned at 3 weeks of age without retarding their growth provided they are given a good quantity of an adequate palatable ration. Feher (1964) found that the average body weight of piglings weaned at 30 days and 60 days was 14.6 kg. and 14.8 kg. respectively at 70 days. The average daily gain in the respective groups was found to be 187 gm. and 193 gm. Vanschow Brook and Vanspanen Donck (1967) found that at 10 weeks of age, the piglings weaned at 6 and 8 weeks weighed 22.42 kg. and 25.1 kg. respectively. It was also observed that 6 weeks weaned piglets needed further 5 days growth to reach 25.1 kg. Effect of early weaning on

the growth rate of piglets was studied by Stankovic and Anastasijevic (1968). When the mean age at weaning was 33.9 days and 32.8 days, daily gain from weaning to 56 days was observed to be 0.483 gm. and 0.419 gm. respectively. Smutin (1970) found that when piglets were weaned at 35 days and 56 days of age, the body weight at 60 days averaged 17.9 kg. and 19.3 kg. respectively. Iepatnikov (1970) noticed that when weaning was practiced at 45 and 60 days, the weight of piglets at 60 days averaged 20.9 kg. and 21.1 kg. in the two groups respectively. Maljavin (1970) also studied the effect of different ages at weaning of piglets on their growth upto 60 days. Three groups each with 16 piglings were weaned at 20, 30 and 60 days of age. At 60 days of age, body weight in the three groups were 15.1 kg., 14.9 kg. and 13.8 kg. respectively. Similar studies were carried out by Aumaitre and Rettagliate (1972). They noticed an average weight of 15.2 kg., 17.0 kg. and 16.5 kg. at 8 weeks when piglets were weaned at 10, 21 and 35 days respectively. France (1972) reported that for pigs weaned at 5 and 8 weeks the body weight averaged 19.20 kg. and 19.91 kg. respectively at 9 weeks. Leibbrandt et al. (1975) made a detailed study on the effect of weaning and age at weaning on the rate of gain by weaning pigs from 20 littermates in groups of three, weaned at 2, 3 and 4 weeks

of age. Pigs weaned at 2 or 3 weeks were equal in weight to pigs weaned at 4 weeks when all pigs reached 6 weeks of age. Bogner (1976) after studying the growth rate of early weaned piglets recommended the optimum age of weaning as 3 weeks.

McCrea and Tribe (1956) reported that the mortality rate of early weaned piglets till 56 days of age was only 15 per cent and the over-all mortality did not go beyond the permissible limit of 20 per cent. Smith and John (1958) investigated the effect of early weaning on rearing losses in 5 farms in North Scotland. Pigs were weaned at 16-17 days of age when they weighed 10 lbs. Mortality varied from 16.2% to 29.3% between farms. Sewell and Maner (1960) reported that mortality of piglets weaned at 3 weeks was slightly less than piglets weaned at 8 weeks. Feher (1964) noticed a mortality rate of 2.27% and 10.04% when weaning was done at 30 and 60 days, respectively. Vanschou Brook and Vanspanen Donck (1969) studied the mortality rate of piglets upto 10 weeks when piglings were weaned at 6th and 8th week. The rate of mortality was found to be 1.4% and 1.7% respectively in the two groups, eventhough the piglets weaned at 6th week were poorer in condition than those weaned at 8th week. Smirmova (1972) observed reduction in the mortality rate of piglets when the age at weaning was reduced from 50 to 35 days. In contrast,

Zebrowski and Ryszkowski (1976) recorded higher rate of mortality in piglets weaned early in lactation.

Dinu and Carabasu (1971) concluded that from economic point of view the piglets should be weaned at 14-16 days after farrowing, Cole et al. (1975) opined that best results could be obtained when weaning was practiced at 20-28 days. Aumaitre et al. (1976) noted that weaning practised less than 10 days or more than 45 days after parturition would retard the reproductive efficiency of sow. Bogner (1976) considered the weaning of piglets before 21 days as uneconomical.

MATERIALS AND METHODS

MATERIALS AND METHODS

Twenty four Large White Yorkshire Gilts of the same age group were selected at random from the Pig Breeding Farm, attached to the Kerala Agricultural University, Mannuthy, Trichur. The Gilts were healthy and free from any systemic diseases throughout the period of study. They were maintained under identical conditions of feeding and management. All the Gilts were bred between 8 to 9 months of age.

After farrowing, the sows (with their litters) were allotted at random into four groups of six animals each viz., Group I, II, III and IV. The piglets in groups I, II, III and IV were weaned at 15th, 30th, 45th and 60 th day of farrowing. A dose of Imferon (100 mg. of iron) was given intramuscularly to each piglet immediately after birth to prevent piglet anaemia. No additional diet was given to the piglets till weaning. The weaned piglets were maintained upto 60 days on creep feed (adlibitum) constituted of:-

Groundnut cake	-	30%
Tapioca	-	30%
Unsalted dried fish	-	15%
Rice polish	-	24%
Mineral mixture	-	1%

Salt 2.5 kg./ton of feed
Vit. A 30 lakhs/ton of feed
Aurofac 40 gm./ton of feed

The water was provided ad libitum. The sows were maintained on farm ration.

The following observations were made:-

I. The effect of early weaning on the subsequent reproductive performance of sows.

(a) Post-weaning oestrus: All the sows in the respective experimental groups were closely watched for observable signs of heat on every day both in the morning and evening. Heat was detected by the characteristic symptoms exhibited by the sows and confirmed by introducing a boar.

(b) Conception rate: The sows showing distinct heat symptoms were bred by a known fertile boar. The number of services required for conception in respect of each sow was recorded.

(c) Farrowing interval: The interval between two successive farrowing was noted.

(d) Litter size: The number of piglets born at the subsequent farrowing in respect of each sow in each group was recorded separately.

(e) Birth weight: The birth weight of piglets at the subsequent farrowing was recorded by means of a spring balance.

II. The growth and mortality rate of early weaned piglets.

(a) Growth rate: The weights of piglets were taken at birth and at 60th day. From the data the gain in weight of piglets in each group was calculated.

(b) Mortality rate: Mortality of piglets during the period from the day of weaning to 60th day was recorded. The data were analysed as per Snedecor & Cochran (1967).

RESULTS

RESULTS

I. The effect of early weaning on the subsequent reproductive performance of sows.

(a) Post-weaning oestrus: The data on the onset of post-weaning oestrus are furnished in Table 1. The mean interval from weaning to first heat was found to be 6.83 ± 0.75 days (5 to 9 days), 5.33 ± 0.41 days (4 to 7 days), 5.00 ± 0.44 days (4 to 7 days) and 5.50 ± 0.62 days (4 to 8 days) respectively in sows weaned at 15 days, 30 days, 45 days and 60 days after farrowing. Analysis of the data revealed that there was no significant difference in the onset of post-weaning oestrus between groups (Table 2).

(b) Conception rate: The number of services required for conception in sows weaned at 15th day and 30th day was noted to be 1.50 ± 0.34 (range 1-3), 1.17 ± 0.16 (range 1-2) respectively. All the sows weaned at 45th day and 60th day after farrowing conceived with one service (Table 3). From the analysis of the data presented in Table 4, it could be seen that the differences in the conception rate of the sows between groups were not significant.

(c) Farrowing interval: The farrowing interval of the sows in different groups are consolidated in Table 5. The interval between two successive farrowings was observed to be in the

range of 134 to 180 days with a mean 146.16 ± 7.764 days in 15th day weaned sows, 148 to 170 days with a mean of 153.83 ± 3.380 days in 30th day weaned sows, 163 to 166 days with a mean of 164.50 ± 0.430 days in 45th day weaned sows and 177 to 185 days with a mean of 180.33 ± 1.310 days in 60th day weaned sows. Analysis of the data (Table 6) showed that the difference in the farrowing interval between sows of different groups was highly significant. It was also observed that there was highly significant reduction in the farrowing interval in sows weaned at 15th day when compared to that of sows weaned at 45th day and 60th day. Highly significant variation in the farrowing interval was also observed between sows weaned at 30th day and 60th day and those weaned at 45th day and 60th day. However, the difference in the farrowing interval between 15th day weaned group and 30th day weaned group was not significant. Similarly no variation in the inter-farrowing period was observed between sows weaned at 30th day and 45th day.

(d) Litter size: The litter size of the sows weaned at 15th day, 30th day, 45th day and 60th day was found to be 6.83 ± 1.47 pigs (3 to 11 pigs), 7.17 ± 1.08 pigs (3 to 10 pigs), 7.33 ± 0.41 pigs (6 to 9 pigs) and 8.67 ± 0.80 pigs (5-10 pigs) respectively (Table 7). The analysis of the data revealed that there was no significant difference in the

litter size at the subsequent farrowing between groups (Table 8).

(e) Birth weight of piglets: The birth weight of piglets at the following farrowing was found to be in the range of 1.06 to 1.50 kg. with a mean of 1.26 ± 0.03 kg. in the 15th day weaned group, 1.06 to 2.06 kg. with a mean of 1.30 ± 0.04 kg. in the 30th day weaned group, 1.16 to 1.80 kg. with a mean of 1.33 ± 0.03 kg. in the 45th day weaned group and 1.13 to 1.30 kg. with a mean of 1.20 ± 0.03 kg. in the 60th day weaned group (Table 9). The analysis of the data presented in Table 10 showed that birth weight of piglets at the following farrowing between groups was not at variance.

II. The growth and mortality rate of early weaned piglets.

(a) Growth rate: The mean weight gain from birth to 60 days of piglets weaned at 15th day, 30th day, 45th day and 60th day was observed to be 7.04 ± 0.05 kg. (5.34 to 8.75 kg.), 9.09 ± 0.16 kg. (7.01 to 12.33 kg.), 12.08 ± 0.08 kg. (11.02 to 13.98 kg.) and 10.14 ± 0.17 kg. (8.85 to 12.62 kg.) respectively. The difference in the gain in weight of piglets between groups was found to be highly significant (Table 12). It was also found that the weight gain of piglets weaned at 45th day was significantly higher than that in the other three

groups. It was also revealed that there was significant difference in the weight gain between 15th day and 30th day weaned piglets and 15th day and 60th day weaned piglets. However, the variation in the weight gain between the piglets weaned at 30th day and 60th day was found to be insignificant.

(b) Mortality rate: The rate of mortality of piglets from the day of weaning till 60th day are presented in Table 13. The mortality (4.08%) was observed only in 15th day weaned group.



T A B L E S

Table 1. Onset of post-weaning oestrus

Sl. No.	15 days weaned group		30 days weaned group		45 days weaned group		60 days weaned group	
	Sow No.	Onset of post-weaning oestrus in days	Sow No.	Onset of post-weaning oestrus in days	Sow No.	Onset of post-weaning oestrus in days	Sow No.	Onset of post-weaning oestrus in days
1	6/66	9	5/49	7	5/54	5	8/69	8
2	9/65	5	4/47	5	11/60	5	4/51	4
3	3/54	5	11/46	6	8/45	7	6/82	5
4	8/80	7	10/57	5	10/47	4	5/65	4
5	9/47	9	7/47	5	7/52	4	8/53	6
6	4/54	6	6/47	4	9/77	5	5/47	6
Total	6	41	6	32	6	30	6	33
Mean		6.83		5.33		5.00		5.50
S.E.		0.75		0.41		0.44		0.62

Table 2. Onset of post-weaning oestrus - Analysis of variance.

Source	df	SS	MSS	F
Due to difference in weaning days	3	11.66	3.89	1.961
Error	20	39.67	1.983	
Total	23	51.33		

Inference: The difference in days in the onset of post-weaning oestrus between groups is not significant.

Table 3. Conception rate.

Sl. No.	15 days weaned group		30 days weaned group		45 days weaned group		60 days weaned group	
	Sow No.	No. of services required for conception	Sow No.	No. of services required for conception	Sow No.	No. of services required for conception	Sow No.	No. of services required for conception
1	6/66	2	5/49	1	5/54	1	8/69	1
2	9/65	1	4/47	1	11/60	1	4/51	1
3	3/54	1	11/46	1	8/45	1	6/82	1
4	8/80	1	10/57	1	10/47	1	5/65	1
5	9/47	3	7/47	2	7/52	1	8/53	1
6	4/54	1	6/47	1	9/77	1	5/47	1
Total	6	9	6	7	6	6	6	6
Mean		1.50		1.17		1.00		1.00
S.E.		0.34		0.16				

Table 4. Conception rate - Analysis of variance.

Source	df	SS	MSS	F
Due to difference in weaning days	3	1.00	0,33	1.53
Error	20	4.33	0.216	
Total	23	5,33		

Inference: The difference in the conception rate between groups is not significant.

Table 5. Farrowing interval.

Sl. No.	15 days weaned group		30 days weaned group		45 days weaned group		60 days weaned group	
	Sow No.	Farrowing interval in days	Sow No.	Farrowing interval in days	Sow No.	Farrowing interval in days	Sow No.	Farrowing interval in days
1	6/66	158	5/49	153	5/54	165	8/69	183
2	9/65	134	4/47	148	11/60	164	4/51	178
3	3/54	134	11/48	149	8/45	166	6/82	185
4	8/80	135	10/57	154	10/47	164	5/65	177
5	9/47	180	7/47	170	7/52	163	8/53	178
6	4/54	136	6/47	149	9/77	165	5/47	181
Total	6	877	6	923	6	987	6	1082
Mean		146.16		153.83		164.50		180.33
S.E.		7.764		3.380		0.430		1.310

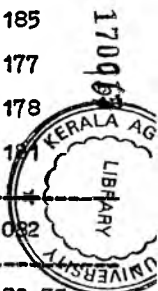


Table 6. Farrowing interval - Analysis of variance

Source	df	SS	MSS	F
Due to difference in weaning days	3	3943.49	1314.49	11.9**
Error	20	2208.51	110.42	
Total	23	6152.00		

Inference: The difference in the farrowing interval between groups is highly significant.

Comparison: Group I Vs. II : $t = 7.67$ (Not significant)
 Group I Vs. III : $t = 18.34$ (Significant)
 Group I Vs. IV : $t = 34.17$ (Significant)
 Group II Vs. III : $t = 10.67$ (Not significant)
 Group II Vs. IV : $t = 26.50$ (Significant)
 Group III Vs. IV : $t = 15.83$ (Significant)

Table 7. Litter size at subsequent farrowing.

Sl. No.	15 days weaned group		30 days weaned group		45 days weaned group		60 days weaned group	
	Sow No.	Litter size	Sow No.	Litter size	Sow No.	Litter size	Sow No.	Litter size
1	6/66	5	5/49	5	5/54	7	8/69	8
2	9/65	3	4/47	8	11/60	7	4/51	5
3	3/54	11	11/46	8	8/45	7	6/82	10
4	8/80	3	10/57	9	10/47	6	5/65	10
5	9/47	9	7/47	3	7/52	9	8/53	10
6	4/54	10	6/47	10	9/77	8	5/47	9
Total	6	41	6	43	6	44	6	52
Mean		6.83		7.17		7.33		8.67
S.E.		1.47		1.08		0.41		0.80

Table 8. Litter size at subsequent farrowing.

	15 days weaned group	30 days weaned group	45 days weaned group	60 days weaned group	Total
Observed litter size	41	43	44	52	180
Expected litter size	45	45	45	45	180

Chi square = 1.55 with df 3

Inference: There is no significant difference in the litter size between groups.

Table 9. Average birth weight of piglets at subsequent farrowing.

Sl. No.	15 days weaned group			30 days weaned group			45 days weaned group			60 days weaned group			
	No. of piglets	Total birth weight in kg	Average birth weight in kg	No. of piglets	Total birth weight in kg	Average birth weight in kg	No. of piglets	Total birth weight in kg	Average birth weight in kg	No. of piglets	Total birth weight in kg	Average birth weight in kg	
1	5	5.90	1.18	5	10.30	2.06	7	12.60	1.80	8	9.10	1.13	
2	3	3.20	1.06	8	8.50	1.06	7	8.40	1.20	5	6.50	1.30	
3	11	12.30	1.11	8	9.60	1.20	7	9.10	1.30	10	11.60	1.16	
4	3	3.35	1.11	9	9.60	1.06	6	7.40	1.23	10	11.80	1.18	
5	9	13.50	1.50	3	3.90	1.30	9	11.70	1.30	10	11.80	1.18	
6	10	13.60	1.36	10	14.10	1.41	8	9.30	1.16	9	11.70	1.30	
Over-all mean			1.26				1.30				1.33		
S.E.			0.03				0.04				0.03		

Table 10. Average birth weight of piglets - Analysis of variance.

Source	df	SS	MSS	F
Due to difference in weaning days	3	0.443	0.1476	1.96
Error	176	13.230	0.0751	
Total	179	13.673		

Inference: There is no significant difference in the birth weight of piglets between the four groups.

Table 11. Gain in weight of piglets till 60 days weaned at different days.

No.	15 days weaned group			30 days weaned group			45 days weaned group			60 days weaned group		
	No. of piglets	Total gain in weight in kg	Mean gain in wt. in kg	No. of piglets	Total gain in weight in kg	Mean gain in weight in kg	No. of piglets	Total gain in weight in kg	Mean gain in weight in kg	No. of piglets	Total gain in weight in kg	Mean gain in weight in kg
	8	57.50	7.18	7	59.50	8.50	6	69.80	11.63	8	72.30	9.03
	9	48.10	5.34	5	52.80	10.56	5	58.10	11.62	4	50.50	12.62
	11	70.80	6.43	8	56.10	7.01	6	78.10	13.01	8	96.80	12.10
	6	43.70	7.28	6	74.00	12.33	6	83.90	13.98	10	99.80	9.98
	6	52.50	8.75	2	18.30	9.15	9	104.20	11.57	8	78.90	9.86
	7	58.20	8.31	6	48.50	8.08	7	77.20	11.02	10	88.50	8.85
Σ	47	330.80		34	309.20		39	471.30		48	486.80	
-all mean			7.04			9.09			12.08			10.14
			0.05			0.16			0.08			0.17

Table 12. Gain in weight of piglets till 60 days -
Analysis of variance.

Source	df	SS	MSS	F
Due to difference in weaning days	3	570.685	190.228	39.029**
Error	164	799.409	4.874	
Total	167	1370.094		

Inference: The difference between groups is highly significant.

Comparison: Group I Vs. II : $t = 2.940$ (Significant)
 Group I Vs. III : $t = 7.533$ (Significant)
 Group I Vs. IV : $t = 4.858$ (Significant)
 Group II Vs. III : $t = 4.084$ (Significant)
 Group II Vs. IV : $t = 1.506$ (Not significant)
 Group III Vs. IV : $t = 2.890$ (Significant)

Table 13. Mortality rate of piglets weaned at different days.

Crops	No. of piglets born	No. of piglets weaned	Post-weaning mortality till 60 days	Percentage of post-weaning mortality
15 days weaned group	51	49	2	4.08
30 days weaned group	38	34		
45 days weaned group	41	39		
60 days weaned group	50	48		

DISCUSSION

DISCUSSION

Reduction of lactation length offers great scope for improving the reproductive efficiency of sows and thus increasing the total productivity. However, these benefits can be achieved only if the advantage of early weaning is not outweighed by the inferior performance of reproductive traits such as the interval from weaning to re-mating, conception rate and litter size. It should also be ensured that the growth and survival rates of piglets are not adversely affected by early weaning. The present study was taken up to find out the post-weaning performances of the dam on one hand and the young ones on the other, with the ultimate object of recommending the ideal time for weaning the piglets.

Perusal of the data presented in Table 1, revealed that the post-weaning oestrus occurred at 6.83 ± 0.75 days, 5.33 ± 0.41 days, 5.00 ± 0.44 days and 5.50 ± 0.62 days when piglets were weaned at 15th, 30th, 45th and 60th day after farrowing. Analysis of the data showed that the intervals from weaning to first oestrus was not significantly altered by the age of weaning. Observation similar to this has been made by Aumaitre and Rettagliate (1972) on weaning piglets at 10th, 21st and 35th day post partum. France (1972) also reported non-significant variation in the occurrence of post-weaning oestrus when piglets were weaned at 5th and 8th week after farrowing.

On the contrary Self and Grummer (1958); Smidt et al. (1965); Svajgr (1972) and Gole et al. (1975) reported significant increase in the interval from weaning to re-mating on reducing the lactation length.

The number of services required for conception in sows weaned at 15th day and 30th day was 1.50 ± 0.34 and 1.17 ± 0.16 respectively. The sows in the 45th and 60th day weaned groups conceived with one service. However, the difference in the conception rate between the four groups was not significant. This is essentially in keeping with the findings of France (1972) and Gole and Varley (1975) who reported that the age of weaning had no effect on the post-weaning conception rate of the dam. On the other hand, Svajgr (1972) recorded marked reduction in the conception rate on weaning the piglets during early lactation. According to Myers and Speer (1973) the conception rate of early weaned sows could be increased by administering antibiotics. It is worthwhile to study whether the comparatively low conception rate of early weaned sows obtained during the course of the present study could be improved by antibiotic therapy.

The farrowing interval was found to be 146.16 ± 7.764 days, 153.83 ± 3.380 days, 164.50 ± 0.430 days and 180.33 ± 1.310 days when piglets were weaned at 15th, 30th, 45th and

60th day respectively. A highly significant reduction in the farrowing interval was observed in sows weaned at 15th day compared to those weaned at 45th day and 60th day. It was also found that the inter-farrowing period was significantly reduced in sows weaned at 30th day as compared to those weaned at 60th day. In general, it could be inferred that the reduction in lactation length proportionately decreased the farrowing interval. This is in keeping with the findings of several workers who reported that the farrowing interval of sows could be substantially reduced by adopting early weaning. One of the advantages of early weaning is to reduce the inter-farrowing period and thereby increasing the number of litters per sow per year (Bellis, 1964; Banjao et al. 1968 and Hirokazushimizu and Takeuchi, 1969). Majerciak and Kaldarkar (1972) suggested that it would be possible to get 2.23 litters per year per sow when weaning was done at 29 days of age. The number of litters per sow per year that could theoretically be obtained in the present study was noted to be 2.50, 2.38, 2.22 and 2.03 respectively for sows weaned at 15, 30, 45 and 60 days after farrowing. This tends to indicate that weaning at 15th day offers great scope for increasing the over-all productivity of swine.

The litter size at the subsequent farrowing of sows weaned at 15, 30, 45 and 60 days was noted to be 6.83 ± 1.47 , 7.17 ± 1.08 , 7.33 ± 0.41 and 8.67 ± 0.80 respectively. The variation

in the litter size between groups was not significant. Smidt et al. (1965); Delmonte et al. (1968); France (1972) and Cole and Varley (1975) also did not observe significant variation in the litter size at the next farrowing when piglets were weaned 21 days post partum. However, there are several reports to indicate that short lactation length was invariably associated with reduced litter size at the subsequent farrowing (Smidt et al. 1965; Aumaitre and Rettagliate, 1972 and Cole and Varley, 1975). Korniewicz (1969) reported an average reduction of 1.9 pigs per sow when the age of weaning was decreased from 8 weeks to 4 weeks. The reduction in litter size was attributed to the poor survival rate of embryos, rather than the rate of ovulation (Brooks et al. 1975; Cole and Varley, 1975 and Varley and Cole 1976)^b. The present study reveals that the litter size in the subsequent farrowing is not likely to be affected if weaning is done by 15th day of farrowing.

The mean birth weight of piglets at the subsequent farrowing was noted to be 1.26 ± 0.03 kg. in the 15th day weaned group, 1.30 ± 0.04 kg. in the 30th day weaned group, 1.33 ± 0.03 kg. in the 45th day weaned group and 1.20 ± 0.03 kg in the 60th day weaned group. There is no significant difference in the birth weight between groups. The mean birth weight presently observed is comparable to the farm average

reported by Mathai et al. (1972).

From the foregoing paragraphs it may be concluded that weaning of piglets at 15th day does not, adversely affect the important reproductive traits of the sows. However, in order to recommend early weaning it is also necessary to ensure that the performance of the early weaned piglets particularly with regard to their growth and survival capacity are not deterrently affected. As revealed in the data presented in Table 11 the mean gain in weight of piglets weaned at 15, 30, 45 and 60 days after farrowing was 7.04 ± 0.05 kg, 9.09 ± 0.16 kg, 12.08 ± 0.08 kg and 10.14 ± 0.17 kg respectively. The weight gain of piglets weaned at 45th day was noted to be significantly higher than that of piglets weaned at 15th, 30th and 60th day. Kozlowski (1963) also observed better growth rate waen piglets were weaned at 6 weeks. Conflicting views have been expressed regarding the growth rate of early weaned piglets. Sewell and Maner (1960); Maljavin (1970); Aumaitre and Rettagliate (1972) and Bogner (1976) recorded better growth rate in early weaned piglets. In marked contrast, Feher (1964); Vanschou Brock and Vanspanen Donck (1967); Smutin (1970) and France (1972) observed reduced growth rates in piglets weaned early in lactation. Leibbrandt et al. (1975), on the other hand, reported no significant difference in the weight gain of piglets when weaning was done at 2nd, 3rd and 4th week after farrowing.

Smith and Lucas (1956) suggested that stunting of the very early weaned piglets could be prevented by feeding them with an easily digestible and highly nutritious diet. Sewell and Maner (1960) also opined that early weaning of piglets could be carried out without retarding their growth rate if they were given an adequate quantity of palatable ration. Bellis (1967) remarked that the feed of the early weaned piglets should be higher in protein and more digestible than the creep feed of later weaned piglets. In the present study, all the piglets, irrespective of the age at which they were weaned were given the feed of the same composition. The growth rates of the piglets weaned at 15th day and 30th day probably might have been higher had they been provided with more nutritious ration during the post-weaning period.

Post-weaning mortality of piglets was observed only in the 15th day weaned group. Out of the 49 piglets weaned at 15th day, 2 (4.08%) died before they attained 60 days of age. The mortality rate presently observed is much lower than that recorded for piglets weaned at 16-17 days (Smith and John, 1958). The mortality rate was reported to be more in piglets weaned early in lactation (Zebrowski and Ryskowski, 1976). In contrast, Sewell and Maner (1960); Feher (1964) and Smirnova (1972) found that the rate of mortality of piglets could be substantially reduced by adopting early weaning.

The results of the present investigation indicate that weaning of piglets at 15th day after farrowing offer great scope for reducing the farrowing interval and thereby increasing the number of litters per sow per year. The advantage of early weaning is not outweighed by the inferior performance of sows in respect of most of the reproductive traits studied. There is no substantial difference in the interval from weaning to re-mating, in the litter size and litter weight at subsequent farrowing. The only limiting factor that could be pointed out against early weaning is the comparatively low conception rate of sows weaned at 15th and 30th day groups. This low conception rate of early weaned sows, probably could be improved by antibiotics therapy as suggested by Myers and Speer (1973). The low growth rate of early weaned piglets could possibly be corrected by adopting better managerial practices. There are reports to indicate that the growth rate of early weaned piglets could be improved by providing highly nutritious creep feed. The mortality observed in the 15th day weaned piglets cannot be considered 'high' as this comes well below the limits laid down for an ideal farm (McGreea and Tribe, 1956).

S U M M A R Y

SUMMARY

The aim of investigation was to assess how early piglets could be weaned after farrowing without adversely affecting the over-all productivity of sows. Basically two factors were considered while judging the merits of early weaning, viz., the post-weaning reproductive performances of the sows and the growth rate and survival capacity of the weaned piglets.

The material used for the present investigation consisted of 24 Large White Yorkshire gilts of the same age group selected at random from the Pig Breeding Farm attached to the Kerala Agricultural University, Mannuthy. They were maintained under identical conditions of feed and management. On farrowing, the sows (with their litters) were divided into 4 groups of six animals each. The piglets in group I, II, III and IV were weaned respectively at 15th, 30th, 45th and 60th day after farrowing. The weaned piglets were maintained upto 60 days on creep feed of the same composition. The sows were fed on farm ration.

The effect of weaning on the subsequent reproductive performance of the dam was assessed on the basis of the onset of post-weaning heat, conception rate, farrowing interval, litter size and litter weight. The post-weaning oestrus was observed to occur in 6.83 ± 0.75 days, 5.33 ± 0.41 days,

5.00 \pm 0.44 days and 5.50 \pm 0.62 days when weaning was done respectively at 15th, 30th, 45th and 60th day after farrowing. Analysis of data did not reveal any significant variation in the onset of post-weaning oestrus between different groups. The number of services required for conception for the 15th day weaned group and 30th day weaned group was 1.50 \pm 0.34 and 1.17 \pm 0.16 respectively. The sows in the other two groups (45th and 60th day) conceived with one service. However, the variation was not statistically significant. The interval between two successive farrowings was 146.16 \pm 7.764 days, 153.83 \pm 3.380 days, 164.50 \pm 0.430 days and 180.33 \pm 1.310 days when piglets were weaned respectively at 15th day, 30th day, 45th day and 60th day after farrowing. Analysis of the data revealed that the farrowing interval was considerably shortened by reducing the lactation length. Litter size at subsequent farrowing was found to be 6.83 \pm 1.47, 7.17 \pm 1.08, 7.33 \pm 0.41 and 8.67 \pm 0.80 for sows weaned respectively at 15th, 30th, 45th and 60th day after farrowing, the difference between groups being non-significant. The birth weight of piglets at the following farrowing viz., 1.26 \pm 0.03 kg in the 15th day, 1.30 \pm 0.04 kg in the 30th day, 1.33 \pm 0.03 kg for the 45th day and 1.20 \pm 0.03 kg for the 60th day was also not at variance between groups.

The post-weaning performances of piglets were assessed

on the basis of their growth rate and survival capacity. The gain in weight of piglets weaned at 15th, 30th, 45th and 60th day was 7.04 ± 0.05 kg, 9.09 ± 0.16 kg, 12.08 ± 0.08 kg and 10.14 ± 0.17 kg respectively at 60 days. In general, the shortening of lactation length was found to reduce the growth rate of piglets. Post-weaning mortality was observed only in the 15th day weaned piglets and even this (4.08%) was well within the limits recommended for an ideal farm.

To sum up, it appeared that none of the reproductive traits of the dam studied was adversely affected by reducing the lactation length from 60 days to 15 days. On the other hand, early weaning was found useful to bring down the farrowing interval which, in turn may increase the number of litters per sow per year. The only limiting factor that was found to stand in the way of adopting early weaning appeared to be the comparatively low growth rate of early weaned piglets. This can, however, be corrected by providing the piglets with highly nutritious ration during the post-weaning period.

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EFFECT OF
EARLY WEANING ON THE REPRODUCTIVE PERFORMANCE
OF SOWS

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ABSTRACT OF A THESIS

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ABSTRACT

The object of the study was to find out how early weaning of piglets could be practiced for a profitable swine industry. For this, two aspects were investigated: (1) Post-weaning reproductive performance of the sow (2) the growth rate and survival capacity of weaned piglets.

The experiment was conducted on 24 gilts of same age group selected at random from the University Pig Breeding Farm, Mannuthy. On farrowing, the sows (with their litters) were divided into four groups of six animals each. The piglets in groups I, II, III and IV were respectively weaned at 15th, 30th, 45th and 60th day of farrowing. The weaned piglets were maintained upto 60 days on creep feed of the same composition. The sows were fed on farm ration.

The observations made and inferences drawn are summarised below: There was no significant variation in the onset of post-weaning heat, conception rate, litter size and litter weight in sows of different groups. At the same time, there was a significant reduction in the inter-farrowing period when weaning was done during early lactation. This was considered as an important criteria in favour of early weaning. As far as the post-weaning performance of the piglets were concerned, it was observed that the gain

in weight of piglets weaned at 45th day was significantly higher than the other three groups. Probably, the low gain in body weight of the early weaned piglets could be improved by feeding them with creep feed of superior quality. Post-weaning mortality observed in early weaned piglets was well within the permissible limit.

To sum up, it may be stated that weaning of pigl at 15th day of farrowing would be of advantage for the overall increase in the productivity of swine.