ARTIFICIAL INSEMINATION OF PIGS IN NIGERIA:

A Preliminary Report:

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SUMMARY

The beneficial effects of the use of AI and the stage of development in pigs in Nigeria were reviewed. A method for the training of the boars to mount an artificial dummy sow for the collection of semen for an AI programme has been modified for the Nigerian situation. A simple method of semen collection was adopted and perfected for this purpose. The normal procedure for the evaluation of semen samples have been used as one of the various methods for the selection of desirable sires for an AI programme.

INTRODUCTION

Artificial insemination (AI) of farm animals has been used to increase the efficiency of controlled mating of farm animals in various parts of the world. Method of controlled mating play a very minor role in both the Nigerian Cattle and the Nigerian pig industry. Most of the herds employ natural mating and there is hardly any selection for the improvement of economic trait in these herds.

The technique of AI has not been very practicable in Nigeria as results since its application for the cattle in the mid 1950's have not been too encouraging, several problems in the field of organisation, insemination practices and fundamental knowledge about the technique are yet to be properly identified and solved not only for the cattle industry but more so for the pig industry where the potential for this technique should be very high.

THE NIGERIAN LOCAL PIGS:

The Nigerian indigenous pigs adapted to the local conditions are of no specific breed and are characterised by slow growth, small litter size, high mortality rate and carcass of high fat percentage (F.A.O., 1966). To upgrade these discrete types of pigs with exotic breeds would yield no favourable progenies and it is suggested that the exotic breeds, if well managed, despite the stressful climatic conditions of the tropics, perform better than the progenies of the crossbred (F.A.O., 1966).

Vohradsky (1968) in Ghana, using local breeds of pigs, observed that the reciprocal crossing of Large White and Local Black sows by the boars of both breeds, did not bring the expected effect of higher weights at birth, weaning and lower death rate. Cameron *et al.* (1969), also working in Ghana with the local pigs, suggested that in any programme of intensive swine production, the Local Black pig should not be given any consideration. Therefore, unlike the practice in cattle AI which aims at upgrading the indigenous cattle with the exotic breeds, pig AI should aim at increasing the number and the level of general performance of the exotic breeds already available in the country.

Like in countries of Western Europe, U.S.S.R., U.S.A., Japan and the Philipines, AI in the Nigerian livestock industry could be used for the improvement by sire testing and rapid production of stock.

In pigs, attention should be given to the problems associated with the treatment of the semen during the collection, the dilution and the storage processes. The medium and temperature of storage (Ito *et al.*, 1948; Polge, 1956a; Blackshaw *et al.*, 1957b; Normal *et al., 1964)* are very important factors in semen storage. The

storage of boar semen *in vitro* has progressed to such extent that 1—3 day old boar semen can now be used at full fertilization capacity (Bennett and O'Hagan, 1964; Eibl *et al.*, 1964; Boender, 1966) with storage temperatures above the freezing point.

Although the initial trials with deep-frozen boar semen met with failures (Polge, 1956; Holts, 1959; Aamdal, 1964) recently successful results were reported of no loss of fertilizing capacity with frozen boar semen after seven months of storage in egg-yolk-milk diluent (Vicente, 1972).

The advantages and the possibilities of pig AI

The merits and the demerit of pig AI are evident and they include:-

(i) The transportation of the boar to the sow or vice versa becomes unnecessary thereby preventing stress associated with transportation. A stress condition in either the sire or the dam adversely affects the fertilization process.

(ii) A number of hygienic advantages can be expected by the exclusion of the boar thereby cutting down epidemics and other infectious diseases which may be contacted when boars are transported to the sows on heat or vice versa.

(iii) Economic success in pig breeding is highly likely as the pig breeder will not care for unwanted boars on the farm, and so increase the stock for slaughter.

(iv) Better use of spermatozoa production of a valuable boar is achieved than could be obtained through natural mating.

However, AI in pigs has been very slow compared with AI in cattle, due partly to the following reasons:

(i) The initial results in practice have not been satisfactory although at present conception rate averages 60-70 percentage after a single insemination and so, AI with the pig is as efficient as AI with the cattle.

(ii) Insemination costs are high and have to be subsidized in some form, so that total costs are not exclusively charged to the sow keeper.

(iii) The accuracy of detecting oestrus in sows.

Present day knowledge indicates that the problems which confront the proper application of pig AI are not insurmountable. Several media have been proposed and used in an attempt to extend the fertile storage life of boar spermatozoa. The fertilizing capacity of boar spermatozoa was reduced after storage for 24 hours or longer (Child *et.al.*, 1947) and the number of sows conceiving and their litters decreased markedly as the length of time between storage and insemination was increased (Ito *et al.*, 1948). Clamohoy (1962) stated that one of the obstacles in the widespread use of AI was that of maintaining motility and fertilizing capacity of the spermatozoa.

That AI was slowest to develop in the tropics not only in the pig industry but also in the cattle industry, is evident from the lack of data from tropical countries during several world-wide surveys of the use of AI (Nishikawa, 1964; Bonadonna, 1969; Nishikawa, 1972). This should not be a surprise as the systems of animal husbandry in the tropics vary from a trans-humance to a semi-normadic to normadic type, none of which encourages the intensive system of animal husbandry where the use of AI in the farm animal is most desirable.

The Need for Pig AI Services

By the early 1970s, the urgent need for a model AI centre for pigs to serve the increasing need for pig breeders of Ibadan and the environs, became apparent to the reproductive physiology unit of the Department of Animal Science of the University of Ibadan. This unit approached the problem in the following ways:-

(a) **Boar Selection and Housing**

Twelve mature large White and Landrace boars were selected

from a large stock of boars on the basis of high libido and body conformation and were housed on concrete floored-pens in an open house. Each pen measures 2.5 x 4.5m and was allocated three boars. In addition, each pen contains a 90 x 170 x 24cm wallow space which can be filled with water during the very hot months of the year for the thermal comfort of the boars or can be used as a feeding trough during the wet months when the need for a wallow is minimal. The provision of wallow is considered to be beneficial during the hot months (Steinbach 1970).

(b) **Semen Collectior**

(i) **The dummy sow and the training of the boars**

The construction of an artificial dummy is very important in an AI programme for not all boars may be willing to mount one. After a few trials one model seemed to meet the demand of the unit as regards the durability, ease of handling and the comfort of the boars. It is 0.77m wide and 1.4m long at the base and 1.10m along the top of fig. 1. It is made up of iron pipes and the edges are bent. A thick layer of rubber is first wrapped around it before it is finally covered by the skin of a sow. The dummy is fastened to a board so as to make it very steady for mounting and for the collection of semen (Fig.2).

Boars at puberty and which have been observed to be mounting each other in their pens, were selected for training. The mature animals mounted the dummy much more easily. Less than two weeks of training was required for them to successfully ejaculate on the dummy. Sometimes, it was necessary to smear the dummy with ejaculates from mature animals before the young boars could be stimulated to mount the dummy.

Pre-mating activities included the biting of the dummy, vocalization, salivation, lifting the dummy with the snout, mounting and dismounting. It was necessary occasionally to let in some younger boars when a more matured boar was already ejaculating. This encouraged the younger ones to mount the other side of the dummy and they were ejaculated immediately.

(ii) **Semen Collection**

Two methods of semen collection were tried in the unit. The first method was the artificial vagina method (McKenzie 1931; Ito *et al.*, 1948) in which pressure is applied between a rubber liner of the artificial vagina and the penis of the boar. This method was cumbersome as it was not easy to ejaculate young boars with it.

The second method was the gloved hand technique (Herrick and Self, 1962) in which the gloved hands were washed with soap and water containing anticeptic (Dettol or cetavalon). The hands were rinsed with water and then with 70% alcohol. The prepuce of the boar was aslo washed with water and anticeptic so as to reduce bacterial contamination of the semen sample through this source. The gloved hand was used to exert the required

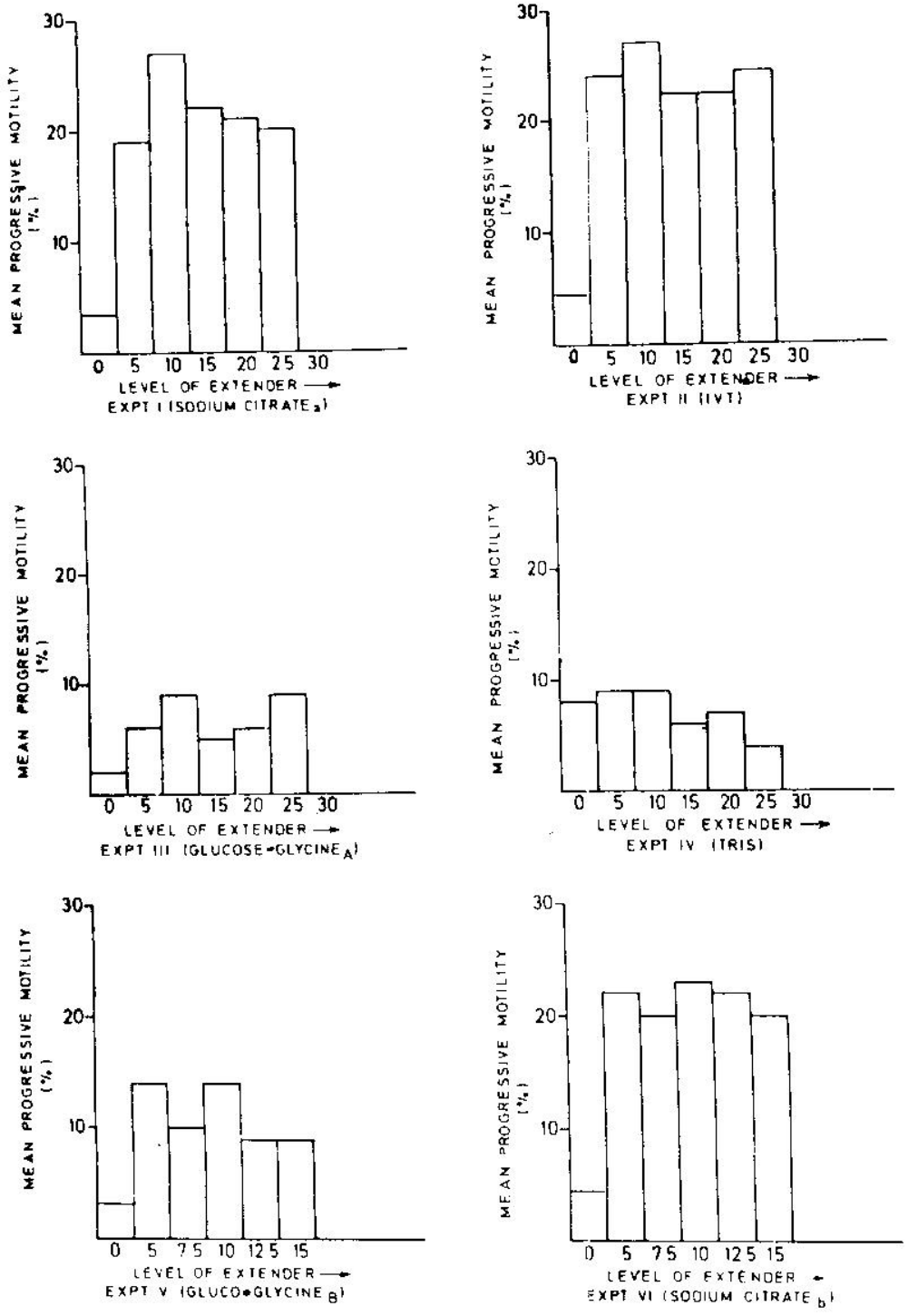

Fig 3

HISTOGRAMS OF THE MEAN PROGRESSIVE MOTILITIES FOR THE DIFFERENT LEVELS OF EXTENDERS IN THIS STUDY

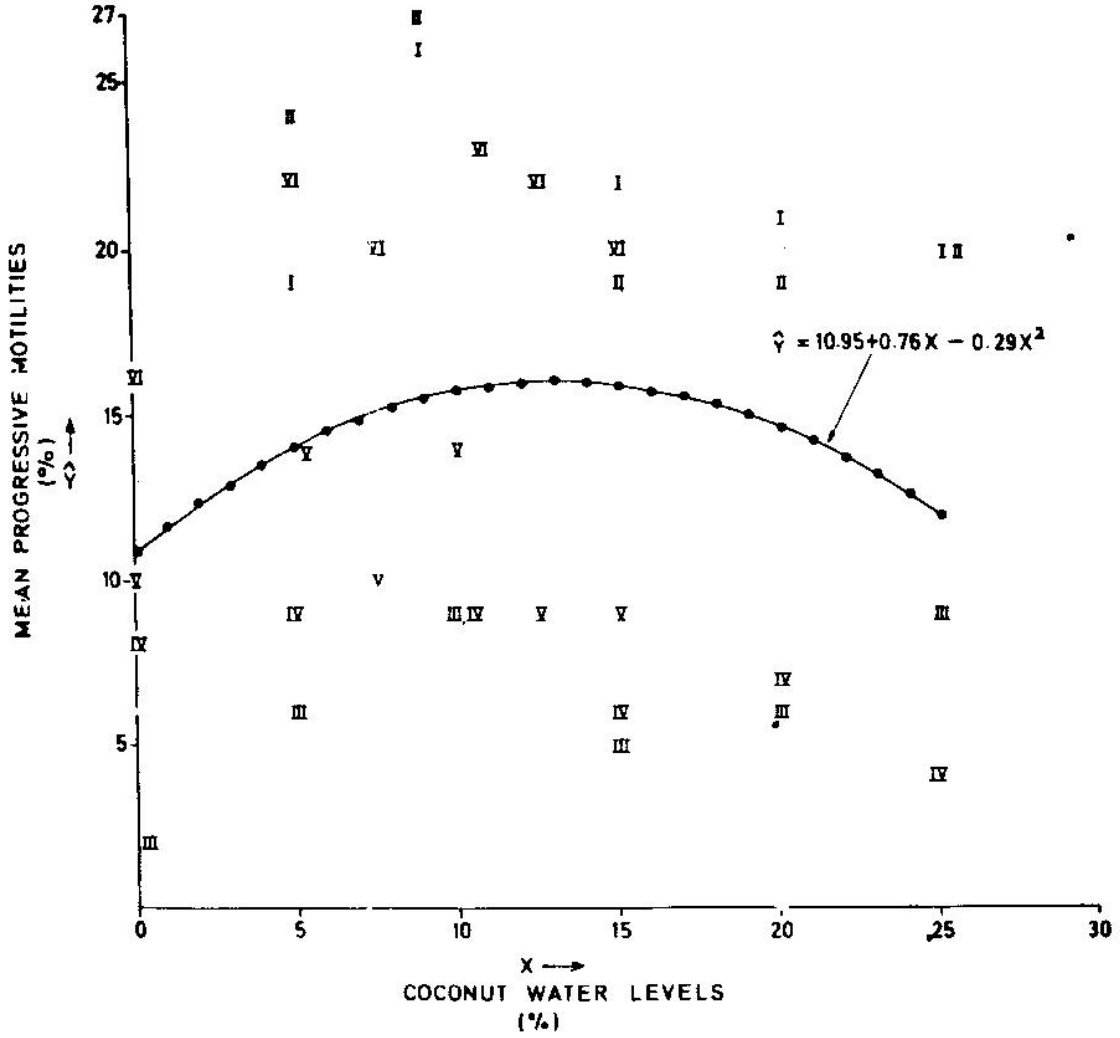

Fig. 4. A curvilinear response between progressive motility and coconut water.

pressure at the glans penis of the boar to effect ejaculation. This method was simple and fast and young boars could be ejaculated immediately.
During the time of collection, care was taken to prevent the preputial secretions from contaminating the semen which was collected directly into sterilized bottles.

(c) **Semen Assessment**
The semen samples collected from the boars were evaluated for:-

(i) **Motility**

A small drop of semen sample was placed on a pre-warmed slide at 37°C. This was covered by pre-warmed cover-slip and the progressive motility was estimated microscopically with a 10 x 40 magnification. Motility score was rated subjectively between 0 and 100 percent in a 10 unit interval. Boars having average progressive motilities less than 60 per cent were discarded.

(ii) **Density**

The colorimetric method was preferred to the haemocytometer method because the latter was laborious and tedious. The former method involves the standardization of the Gallenkamp photo-electric colorimeter using normal saline or a 2.9 percent sodium citrate buffer. Semen is mixed with either of the solutions in the ratio of 0.4ml semen to 7.6ml of solution.
A calibration of the colorimeter establishing a regression equation between optical density (O.D.) and spermatozoan density was calculated for subsequent estimation of semen density. The density of the samples tested ranged from 88—246 $\times$ 10^6 spermatozoa cells per millilitre of ejaculate.

(iii) **pH** The pH of the samples were determined immediately after collection with a Radiometre type 25 glass electrode pH meter. pH values ranged from pH 7.3 to pH 7.7, with a mean pH value of 7.5.

(d) **Storage of boar semen**
Semen samples from the boar trained to mount the artificial dummy sow, were extended in four storage media (Tables 1&2).

TABLE 1
Composition of the Various Buffers for the Experiment

Ingredients	*Sidium Citrate-Glycine*	*Glucose Glycine*	*IVT*	*Tris*
Sodium Citrate (g)	10.0		20.50	
Glycine (g)	5.0	6.0		
Sulphanilamide (g)	3.0		3.0	
Glucose (g)		45.0	3.0	
Sodium Bicarbonate (g)			2.10	
Postassium Chloride (g)			0.40	
Tris (g)				23.0
Citric Acid (g)			1.0	12.0
Fructose (g)				13.0
Boiling Distilled Water (ml)	1000.0	1000.0	1000.0	1000.0

The extended semen samples were stored at room temperature of 18°—21°C and the samples were evaluated for progressive motility on days 2, 4 and 6. Eight levels of coconut water were tested for semen storability under this temperature (Table 2).

TABLE 2

Composition of the Various Extenders for the Experiment

	Sodium Citrate-Glycine Extension	*Glucose-Glycine Extender*	*IVT Extender*	*Tris Extender*
*Buffer (ml/100ml)	variable*	variable	variable	variable
Egg Yolk (ml/100ml)	10.0	10.0	10.0	10.0
**Coconut water (ml/100ml)	variable	variable	variable	variable
Penicillin (iu/100ml)	10^5	10^5	10^5	10^5
Streptomycin (mg/100ml)	100.0	100.0	100.0	100.0

Buffer makes up the 100ml mark after the addition of the appropriate coconut water level.
**Coconut water levels used are 0, 5, 7.5, 10, 12.5, 15, 20, 25ml. per 100ml.

Smaller aliquots of coconut water were tested (experiments v & vi) in order to monitor the optimal level of coconut water for boar semen storage (Fig. 3).

RESULTS

The results indicate that the addition of coconut water to the storage media was beneficial for the spermatozoan survival in the Sodium-Citrate-Glycine-Yolk (SCY) extended and in the Illionis-Variable-Temperature-Yolk (IVT) extender. The beneficial effect of the coconut water was negligible in the Glucose-Glycine-Yolk (GGY) extender and in the Tris-Yolk (Tris) extender (Fig.3), even when the GGY was tested a second time (Expt. iii).

The 10 percent coconut water level was superior to the other levels tested. The regression coefficient fitted into a graph (Fig. 4) showed a curvilinear relationship between the motility of the spermatozoa cells stored in these media and the amount of coconut water added to the media of storage. This response shows that the survival of spermatozoa in these storage media was best within the 10 percent to the 15 percent coconut water level in the media (Fig. 4).

Norman *et.al.* (1958a), had observed that coconut water enhances the lifespan of bovine spermatozoa stored at room temperature of several days.

Steward, 1959; Clamohoy, 1962, have in their studies with plants and animal tissues, confirmed that coconut water supported the livability of tissues cultured in it.

CONCLUSION

The collection of semen from the boars using the gloved hand technique has been used to train young boars and the method is recommended for use in Nigeria. The addition of coconut water to storage media showed beneficial effects on boar spermatozoa survival and storability even at room temperature of 18°—21°C, for more than six days. This augurs well for the future as it will be possible to collect semen from well proven boars for use within two days of collection in neigbouring piggeries near a model pig AI centre.

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