APPARENT INVOLVEMENT OF DAYLENGTH IN SEASONAL INFERTILITY OF PIGS

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From late-spring to mid-autumn, reproductive efficiency in the Australian pig herd declines (Hennessy and Williamson 1984). This seasonal infertility is a major constraint to profitability. Its cause has generally been ascribed to stress imposed by high summer temperatures. More recently, it has been postulated (Greer 1986) that daylength is involved in seasonal infertility. Reproductive data collected during summer/early-autumn were examined to determine the involvement of daylength in this infertility and its importance relative to temperature.

Information was collected from five farms in the Central West of N.S.W. (latitude 33°17'S) between week 44 of 1978 and week 15 of 1979. Records on 203 sows were used, covering the period from the week in which a sow became available for mating to the week in which she mated successfully, for a total of 1285 weekly observations. The weekly matings were classified as to whether they related to the same week as the sow became available (waiting class 1, WC 1), the week after (WC 2), the period 3 to 6 weeks (WC 3), or more than 6 weeks after becoming available (WC 4): e.g., a sow becoming available in week 1 and mating in week 8 contributed a zero (no mating) to WC 1 and 2, 4 zeros to WC 3 and a zero and a one (mated) to WC 4. The probability that a sow would mate in any given week was determined by probit analysis, fitting weekly average minimum and maximum temperature (maxT), daylength (DL), daylength 3 and 6 weeks before the current week, farm (F), WC, quadratic terms for the climatic variables, and all first order interactions.

After dropping non-significant terms, the model describing the probability of successful mating reduced to

\[
\text{Probit} = 46.529 + Fi + WC_j + 0.850 \text{maxT} - 8.408 \text{DL} + 0.349 \text{DL}^2 - 0.057 \text{maxT.DL}
\]

where the farm effects (Fi) were 0.435, -0.345, 0.291, 0.006 and -0.387 and WC effects (WCj) were -0.230, 0.834, -0.092 and -0.512.

Daylength and maximum temperature were both correlates of successful mating and interacted with each other. The model accounted for 15.6% of the deviance in the data, with the climatic variables removing 2.9% of the deviance vs 3.7% for farms. The probability of mating successfully in the same week as sows became available was low (13.8%). If sows did not mate in the week after they became available (probability, 41.5%), the probability of mating was greatly reduced (16.3 and 9.5% in WC 3 and 4). From the ratio of the \text{maxT} and \text{maxT.DL} co-efficients in the model a critical daylength of about 14.9h was indicated. At DL above this, \text{maxT} had an inverse effect on mating probability which agrees with other reports that high ambient temperatures depress reproduction. During the 9 week period when DL > 14.9h, \text{maxT} appeared to be the major correlate of mating success. When DL dropped below 14.9h, mating probability increased while \text{maxT} remained high (although declining in concert with DL and the waning season). Decreasing DL thus appeared to be the predominant climatic factor in mating success when DL <14.9h.

These data support the suggestion that daylength is involved in seasonal infertility. Analysis of data collected over at least 12 months is needed to confirm the present results.


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