EVALUATION OF PROGENY TESTING VERSUS INDIVIDUAL TESTING EFFICIENCY ON SELECTION INDEX OF SWINE PERFORMANCE REGISTRATION IN TAIWAN

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SUMMARY

The efficiency of progeny testing vs individual testing on selection index of swine performance registration in Taiwan was evaluated. Prediction of the efficiency of indirect selection boar vs direct individual selection was derived from Pirchner's formula $b_{BV.PA}$ per h^2. Data on relationships between testing boars on Central Testing Station (CTS) and Progeny Testing Station (PTS) were used. The $b_{BV.PA}$ were estimated for various h^2 values from 0.1 to 0.9 and showed that prediction of the efficiency of a boar performance selected on progeny average was quite accurate in Taiwan.

INTRODUCTION

The pure breed registry, performance testing, national nuclear herd and elite herd evaluation were four parts of swine improvement in Taiwan (Chyr, 1980): performance testing was, however, the most important for providing accurate information in practice. In addition, there were CTS in Chunan and on farm testing to take over the performance testing for meat productivity registration since the CTS can provide a uniform environment for growing and it was possible to improvement estimation of its genotype. So, only the results of CTS were registered by Council of Registry, China Swine Production Association; meanwhile the results of on farm testing were used only as reference (Sung, 1975). The regulations of the meat productivity performance register have two categories: (1) Pigs which passed the performance testing of CTS (individual testing, direct) and (2) Stock boars whose three progenies derived from three different sows passed the performance testing of CTS (progeny testing, indirect). In 1989, the first Progeny Testing Station (PTS) was established in Sinhua and opened to increase the testing capacity. We just obtained the first testing results in February 1990. It was convenient to evaluate the efficiency of progeny testing vs individual testing on selection index of swine meat productivity register regulation in Taiwan.

MATERIAL AND METHODS

(1) Results of relationship on both CTS and PTS testing boars: Not more than 2 full-sib or 4 half-sib litter-mate boars sent to CTS for testing at the same time. Twenty to twenty-five kg body weight pigs were fed *ad libitum* in a pen to test their average daily gain, feed conversion and backfat thickness. The grades of tested boars were based on a selection index of these three traits. The PTS for first progeny testing was opened in September 1989 and finished in February 1990. In PTS, each testing group consists of three litter-mates: two boars and one gilt. The traits tested for meat productivity performance were measured as in CTS but carcass traits were graded by the gilt of their litter-mate. Assessment of stock boars was based on the performance of three testing groups of their progeny. The results of the selection index were conducted to evaluate which efficiency of progeny test or individual test was available to

predict their breeding value. The relation data of selection index on both CTS and PTS litter-mate were as Table 1.

Table 1 The Results of Selection Index of Relationship Between CTS and PTS

Sire	Dam	Testing Station	Selection Index of Progeny		
Longwei (R 76788)	Newchu	PTS	139	119	126
	Jonkwei	PTS	117	78	91
	Fuse	CTS	104		
Tenglong (R 71363)	Yulin	PTS	109	97	100
	Sinchen	PTS	115	93	
	Fangyu	CTS	103		

(2) Heritability values used (Pirchner, 1969; Naito, 1970; Mabry *et al.*, 1987 and National Swine Improvement Federation Guidelines, 1987) gave some heritability values (h^2) of economic traits of swine, however h^2 values of selection index were quite rare. In this study we simulated its h^2 from 0.1 to 0.9.

(3) The regression coefficient of the parent breeding value on the progeny average was derived from Pirchner (1969),

$$b_{BV.PA} = 2kIh^2/[4+h^2(kI+k-2)+4c^2(k-1)].$$

The accuracy of the efficiency of progeny testing vs individual testing was computed by the $b_{BV.PA}/h^2$ ratio in this study.

RESULTS AND DISCUSSION

According to the selection index of performance testing in Table 1, the stock boar Longwei (R76788) and Tenglong (R71363), and nine of their progenies shown underlined with selection index over 100 were registered and the diploma of meat productivity performance registration will be handed over after application by their owner. These results were the first practical progeny tests taken over by PTS with CTS at the same time. The long time since the meat productivity performance registration was carried out in accordance with their pedigree which was searched by large computer and it was more accurate than the direct selection of individual testing boars. However, the efficiency of family selection was generally increased for low heritability traits.

The regression coefficient of breeding value on average of progeny group consisting of 1 full-sib family of k individuals is given by the formula,

$$b_{BV.PA} = 2kIh^2/[4+h^2(kI+k-2)+4c^2(k-1)]$$

from Pirchner (1969), was set on our register regulation in this study that l=3, k=1, to get

$$b_{BV.PA} = 2*1*3h^2/(4+h^2(1*3+1-2)+4c^2(1-1)) = 6h^2/(4+2h^2) = 3h^2/(2+h^2).$$

It was clear that $3h^2/(2+h^2) > h^2$ for $0 < h^2 < 1$. The various h^2 values used to assess the $b_{BV.PA}/h^2$ ratio are given in Table 2. However, the difference between $3h^2/(2+h^2)$ and h^2 became small when the h^2 value increased. It seemed to be that prediction of the efficiency of a boar performance on progeny average was more accurate than individual selection, especially when h^2 was low.

Table 2 $b_{BV.PA}/h^2$. The Efficiency of Predicting Performance of Stock Boar Ratio for Various h^2 Values

Sire's Breeding Value and Efficiency	Heritability 0.1	0.3	0.5	0.7	0.9
$b_{BV.PA} = 3h^2/(2+h^2)$	0.14	0.39	0.60	0.78	0.93
$b_{BV.PA}/h^2$	1.40	1.30	1.20	1.11	1.03

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