GENETIC RESPONSES IN THE EARLY YEARS OF SELECTION. PROGRAMMES

UTILIZING GENETIC DIFFERENCES BETWEEN AGE GROUPS

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Hill (1974) developed methods to describe the variable genetic gains in the early years of a selection programme. However, he assumed that replacements were selected in equal proportions from all parental age classes of progeny, and did not deal -explicitly with the effects of initial conditions. If replacements are selected at a single stage the mean breeding values of each age-sex class in any year can be expressed in terms of corresponding breeding values in the previous year and the mean genetic selection differentials within parental-age classes. The contributions of each parental age-sex class to male and female replacements are required and, together with elements specifying ageing,. form a matrix P similar to that of Hill (1974). If μ is a vector of mean breeding values of age-sex classes and i a vector of genetic selection differentials within parental age-sex-classes, and subscripts denote time, the basic recurrencerelation is $\mu = P\mu_{t-1} + i$. If s denotes a vector of genetic contributions of age-sex classes to new-born progeny the mean of the new-born progeny is $M_t = s'\mu_t$.

To evaluate this selection programme we need to consider these means in relation to the means which would have occurred with no selection. **The selection response, therefore, is given by**

$$M_t - M_t^\star = s'[(P^{t+1} - F^{t+1})\mu_{-1} + (P^t + P^{t-1} \ldots + I)i],$$

where F is the matrix corresponding to P for completely random selection and M* the resulting mean. Thus, even if replacements are select-ed randomly within parental age classes, non-random selection between parental age classes constitutes a selection if the age class means differ. As t increases $M_t - M_{t-1}$ approaches $\bar{i}/L_p$ where $\bar{i}$ is the mean genetic selection differential within parental age classes and L_p is the mean age of parents of selectedreplacements.

If there are genetic differences between age groups before the programme begins, annual means will fluctuate even in large control lines. Further, if the relevant P matrices for selected and control lines are different this difference should be taken into account in interpreting responses in selection experiments. Since economic returns from selection should be measured in terms of $M_t - M_t^\star$, careful definition of alternatives isessential to evaluation of breeding programmes.

HILL, W.G. (1974). Anim. Prod. 18:117.

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