ANIMAL GENETICS & BREEDING

UNIT – III

The Principles of Animal Breeding

Theory

Sire evaluation

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Sire evaluation

- The result of PT are expressed in the form of an index which is the index of the genetic worth of the sire and such an index is known as sire index.

- Based on sire index a numerical value is obtained which indicates the production ability of the sire. It help in selection of best sire.

- The biases in obtaining the accurate estimate the sire's BV aries due to genetic and environmental differences.

Methods of indexing sires

- The different indices developed are for two purposes viz. indices simply rank the sire and the indices which provide the estimate of BV of sires.

1. <u>Simple daughter avg. index:</u>

Edwards(1932) proposed this sire index as:

$$I_1 = \overline{D}$$

$\overline{D}$=avg. of all daughter of a sire under test.

It is the simplest measure in a single herd under same environment.

2. Equi-parent or intermediate index:

Hansson given this index and it is also known as yapp's index or Mount hope index because it first used at Mount Hope farm in 1928.

$$I_2 = 2\overline{D} - \overline{M}$$

$\overline{M}$=avg. of the mates of the sire or dam's avg.

This index makes adjustment for the variation in production level of the dam.

3. Corrected daughter avg index :-

Krishan gave this index.

$$I_3 = \bar{D} - b(\bar{M} - \bar{H})$$

b= 0.5h2,the intra sire regression of daughter on dam

$\bar{H}$= herd avg.

This index is superior to I_1 and I_2 as it correct for the production levels of dams allotted to the sire over herd avg.

4.Contemporary daughter avg. index :-

Contemporary comparisons reduce the environmental variation due to herd, year and season.

This sire index proposed by sunderson et al.(1965).

$$I = \bar{H} + \frac{n}{n+k}(\bar{D} - C_D)$$

n= no. of daughters

K=constant based on sire error variance

5. Corrected contemporary daughter avg. index :-

The following 2 sire indices as an extension of the contemporary daughter average indices have been proposed. These indices besides adjusting the no. of progeny and period to period variation also adjust for the differences in production level of dams allotted to different sires.

$$I = \overline{H} + 0.5\,h^2 \frac{n}{1 + (n-1)0.25\,h^2}[(\overline{D} - C_D) - b(\overline{M} - C_M)]$$

$$I = \overline{H} + \frac{n}{n + 12}(\overline{D} - C_D) - b(\overline{M} - C_M)]$$

6. Least square constants :-

The sire constants are obtained by least square tech. which adjust the data for all the environmental effect including the non orthogonality in data.

$$I = \frac{2nh^2}{4 + (n-1)h^2}(s_i)$$

Si =sire constant for i^{th}sire

7. Maximum likelihood method and REML :-

- This method estimate the parameters by maximizing the logarithm of the likelihood function.

- This function is the likelihood of simultaneous occurances of observation and is generally the product of the density function of the observations.

- The ML estimates are biased because no account is taken of the DF in estimating the variance components.

- The ML method is improved by the REML method which takes care of the bias in estimates as well as avoid negative estimation of component of variance.

8. BLUP : Best linear unbiased prediction method ;-

- This method developed by Henderson.
- This method is more powerful than the conventional selection index approach.
- This provide directly comparable estimates of the avg. breeding values of group of animal born in different years.
- It takes into account the complications of non random mating, sire more than one herd, environment trends over time, herd differences for BV of dams and bias due to selection.
- It is applicable when mixed models are used.
- BLUP eliminates the non genetic biases in estimating BV not only but also remove genetic biases.

Efficiency of sire indices

1. Repeatability of the index- taken as the correlation between as index based on n daughter and an index based on n' future daughters.
2. Regression of sire's future daughters on the avg. performance of no. of present daughters.

   b =n h^2 /4+(n-1) h^2

3. Error variance or within sire variance.
4. Rank correlation
5. Cofficient of determination(R^2) of fitting the model.

$$R^2(\%) = \frac{S.S\ of\ fitting\ the\ model}{T.S.S} \times 100$$

THANK YOU