GENETIC AND PHENOTYPIC CORRELATIONS FOR SEVERAL PRODUCTIVE TRAITS ON MADURA CATTLE

HUBUNGAN GENETIK DAN FENOTIPIK TERHADAP BEBERAPA SIFAT PRODUKTIF SAPI MADURA

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ABSTRACT

The objective of this research was to investigate the genetic and phenotypic correlations for several productive traits on Madura cattle. The results were expected as a fundamental consideration in selection programme. The research was conducted in Bangkalan Madura for a year. Hundred and eighty calves were analysed from 9 sires sampled using stratified random analysis. At the end of the research 3 bulls were sold thus in the final analysis 120 calves from 6 sires were analysed using resemblance between relatives. The results indicated that genetic and phenotypic correlations between birth weight and weaning weight were $0.43 \pm 0.31$ and $0.32 \pm 0.18$, respectively. Genetic and phenotypic correlations between birth weight and pre weaning gain were $0.38 \pm 0.28$ and $0.32 \pm 0.18$, respectively. Genetic and phenotypic correlations between weaning weight and yearling weight were $0.59 \pm 0.11$ and $0.31 \pm 0.27$, respectively, and finally genetic and phenotypic correlations between weaning weight and post weaning gain were $0.43 \pm 0.13$ and $0.47 \pm 0.24$, respectively. Based on the correlations, a selection will be able to be conducted based on birth and weaning weight.

Key words: genetic and phenotypic correlation, productive straits, Madura cattle

INTRODUCTION

Various efforts to improve livestock productivity, especially Madura cattle, have been conducted by Indonesian government. The results, however, have not shown a desirable performance. One of the problems might be due to a decrease in genetic potential as well merited bulls are usually slaughtered for meat production. Decline in genetic potential is observable with decreases in body weight, calving rate, body measurements and service per conception (Suhadji, 1991).

Traits can be independent or correlated. In additive genes, there is a positive correlation between genes, thus phenotype of genes is able to be a fundamental consideration in selection programmes. However, in dominant and epistatic genes have not been investigated in addition. In addition, genetic correlation results from pleytropy or linkage genes.

The statement above indicates that selection can be conducted based on genetic correlation, instead of heritability. If genetic correlation between two traits are positive and have high heritabilities, selection based on the first trait will be effective.

Reality showed that estimates of genetic and phenotypic correlation between productive traits are of interest in selection programmes. However, lack of information concerned on productive traits on Madura cattle. It will be useful to investigate such correlation on Madura cattle. The purposes of this research, therefore, were to investigate genetic and phenotypic correlations on Madura cattle.

MATERIALS AND METHODS

The research used 180 calves from 9 bulls owed by farmers in Bangkalan Madura. Inbreeding was avoided in this study. After estimation of birth heritability, three bulls...
were sold, thus only six bulls and 120 dams were left for the rest of the study. The calves were weighed using electronic measurement with the capacity of 1 500 kg.

The research used survey study and was conducted for a year. Data were stratifiedly sampled as the location of the research was heterogeneous. Number of samples taken was based on interval estimation (Supranto, 1992). Traits observed were birth weight, pre weaning weight, pre weaning gain and yearling weight. Gain was measured every two weeks referring to Hamadjji (1992).

Birth weight of heifer was corrected to bull based on a formula by Scott (1971):

\[ WW_c = WW x CF; \quad CF = \frac{x_l}{x_b} \]

\( WW_c \) = corrected weaning weight
\( WW \) = weaning weight of heifer
\( CF \) = correction factor
\( x_l \) = mean of young bulls
\( x_b \) = mean of heifer

Weaning age was standardised to 205 days (Hardjosubroto, 1994): 

\[ WW_{205} = \frac{(WW - BW)}{t_2-t_1} x 205 + BW \times CF_d \]

\( WW_{205} \) = weaning weight at 205 days
\( WW \) = weaning weight
\( BW \) = birth weight
\( t_2-t_1 \) = weaning weight in a day
\( CF_d \) = correction factor for dams

Correction factors for dam age were as follows:

<table>
<thead>
<tr>
<th>Ages of Dam (year)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>1.07</td>
</tr>
<tr>
<td>3.0</td>
<td>1.03</td>
</tr>
<tr>
<td>4.0</td>
<td>1.03</td>
</tr>
<tr>
<td>5.0 - 9.0</td>
<td>1.00</td>
</tr>
<tr>
<td>5.0 - 10.0</td>
<td>--</td>
</tr>
<tr>
<td>( \geq 10.0 )</td>
<td>1.03</td>
</tr>
<tr>
<td>( \geq 11.0 )</td>
<td>--</td>
</tr>
</tbody>
</table>

Source: Pane (1986)

Heifers at age of 205 days were corrected to weaning weight of bulls, referring to Scott (1971):

\[ WW_{ch} = WW_{205h} x CF; \quad CF = \frac{x_l}{x_b} \]

\( WW_{ch} \) = corrected weaning weight of heifer to bull
\( WW_{205h} \) = weaning weight of heifer at 205 days
\( CF \) = correction factor

Yearling weight was corrected to 365 days referring to Hardjosubroto (1994):

\[ WW_{365} = \left( \frac{(WW - BW)}{t_2-t_1} \times 160 + BW \right) \times CF \]

\( WW_{365} \) = weight at 365 days
\( WW \) = weaning weight
\( BW \) = weight when measurement
\( t_2-t_1 \) = interval time between weaning and measurement

Heifers were corrected to bull (Scott, 1971):

\[ WW_{365h} = W_{365h} x CF; \quad CF = \frac{x_l}{x_b} \]

\( WW_{365h} \) = corrected weight at 365 days of heifer to bull
\( W_{365h} \) = weight of heifer at 365 days
\( CF \) = correction factor

Pre weaning gain was calculated by the formula of:

\[ G_{pre} = \frac{WW_{205} - BW}{205} \times 1 kg \]

Post weaning gain was calculated as follows:

\[ G_{post} = \frac{W_{365} - WW_{205}}{160} \times 1 kg \]

Data were analysed using analyses of covariance with half-sib method on sires (Backer, 1975). Genetic and phenotypic correlations were estimated with the formula:

\[ r_g = \frac{\text{cov}_g}{\sigma_{g1} \times \sigma_{g2}}; \quad r_p = \frac{\text{cov}_p}{\sigma_{p1} \times \sigma_{p2}} \]

Where: 
\( p \) = phenotypic
\( g \) = genetik
\( \text{cov} \) = covariance
\( \sigma_{1} \) = standard deviation for the first trait
\( \sigma_{2} \) = standard deviation for the second trait

\( \text{cov}_p = \text{cov}_g + \text{cov}_e \)

Referring to analyses covariance, the correlations could be written as follows:

\[ r_g = \frac{\text{cov}_g}{\sigma_{s1} \times \sigma_{s2}} \]

\[ r_p = \frac{\text{cov}_p + \text{cov}_w}{\sigma_{s1} \times \sigma_{s2} \times (\sigma_{w1} \times \sigma_{w1})} \]
Standard error was calculated with the formula written by Warwick, et al. (1990):

$$SE(r_{Gx}) = \frac{1-r_{Gx}^2}{\sqrt{2}} \sqrt{\left( \frac{\sigma h^2_x; \sigma h^2_x}{h^2_x n_x} \right)}$$

Where: $h^2_x$ = estimate of heritability  
$\sigma h^2_x$ = standard deviation of heritability

RESULTS AND DISCUSSION

1. Genetic and Phenotypic Correlations between Birth Weight and Weaning Weight

Genetic and phenotypic correlations between birth weight and weaning weight were 0.43±0.31 and 0.40±0.21, respectively. The estimates were classified to be moderate (Warwick, 1990), indicating that they were useable to predict the relationship between birth weight and weaning weight. It was also supported by the standard errors resulted in this analysis those were lower than the estimates. Practically, if selection is conducted for birth weight and weaning weight, the animals can be selected based on birth weight.

2. Genetic and Phenotypic Correlations between Birth Weight and Pre weaning Gain

Genetic and phenotypic correlations between birth weight and pre weaning gain were 0.38±0.28 and 0.32±0.18, respectively. The estimates were classified to be moderate (Warwick, 1990) indicating that they were useable to predict the relationship between birth weight and weaning weight. Standard errors resulted in this analysis were lower than the correlations, indicating that the estimates are also useable. Practically, selection for increased pre weaning gain can be based on birth weight.

3. Genetic and Phenotypic Correlations between Weaning Weight and Yearling Weight

Genetic and phenotypic correlations between weaning weight and yearling weight were 0.59±0.11 and 0.31±0.27, respectively. The estimate of genetic correlation was classified to be high, whereas phenotypic correlation was moderate (Warwick, 1990). The estimates also had low standard error, indicating that they were useable to predict the relationship between given traits. Practically, selection for yearling weight can be based on weaning weight.

4. Genetic and Phenotypic Correlations between Weaning Weight and Post weaning Gain

Genetic and phenotypic showed 0.47±0.24 and 0.47±0.24, respectively. The correlations were classified to be moderate. (Warwick, 1990). The estimates also had low standard error, indicating that they were useable to predict the relationship between given traits. Practically, selection for increased post weaning gain can be based on weaning weight.

CONCLUSION

Genetic and phenotypic correlations between birth weight and weaning weight were 0.43±0.31 and 0.32±0.18, respectively. Genetic and phenotypic correlations between birth weight and pre weaning gain were 0.38±0.28 and 0.32±0.18. Genetic and phenotypic correlations between weaning weight and yearling weight were 0.59±0.11 and 0.31±0.27, and finally genetic and phenotypic correlations between weaning weight and post weaning gain were 0.43±0.13 and 0.47±0.24. Based on the correlation above, it is suggested that selection for productive traits on Madura cattle can be conducted at birth and weaning weight.

REFERENCES


