

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

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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 ± 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 , respectively. Genetic and phenotypic correlations between weaning weight and yearling weight were 0.59 ± 0.11 and 0.31 ± 0.27 , respectively, and finally genetic and phenotypic correlations between weaning weight and post weaning gain were 0.43 ± 0.13 and 0.47 ± 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 traits, Madura cattle

ABSTRACT

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Penelitian ini bertujuan untuk mempelajari korelasi genetik dengan fenotipik beberapa sifat produktif sapi Madura. Penelitian dilakukan di Bangkalan, Madura dengan mempergunakan 180 ekor sapi betina dari 9 ekor induk. Hasil penelitian menunjukkan bahwa korelasi genetik dengan fenotipik diantara berat lahir dan berat masa sapih masing-masing adalah $0,43 \pm 0,31$ dan $0,32 \pm 0,18$, sedangkan diantara berat lahir dan berat sebelum masa sapih masing-masing adalah $0,38 \pm 0,28$ dan $0,32 \pm 0,18$. Korelasi genetik dengan fenotipik diantara berat sapih dengan berat umur satu tahun masing-masing adalah $0,59 \pm 0,11$ dan $0,31 \pm 0,27$; sedangkan diantara berat sapih dengan berat setelah lepas sapih masing-masing

adalah $0,43 \pm 0,13$ dan $0,47 \pm 0,24$. Atas dasar korelasi tersebut, dapat dilakukan seleksi berdasarkan berat lahir dan berat sapih.

Key words: genetic and phenotypic correlation, productive traits, 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 pleiotropy 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 Hamadji (1992).

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

$$WW_c = WW \times CF; \quad CF = \frac{x_i}{x_b}$$

WW_c = corrected weaning weight
 WW = weaning weight of heifer
 CF = correction factor
 x_i = mean of young bulls
 x_b = mean of heifer

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

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

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:

Ages of Dam (year)	Correction factor
2.5	1.07
3.0	1.03
4.0	1.03
5.0 - 9.0	1.00
5.0 - 10.0	--
≥ 10.0	1.03
≥ 11.0	--

Source : Pane (1986)

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

$$WW_{ch} = WW_{205h} \times CF; \quad CF = \frac{x_i}{x_b}$$

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):

$$WW_{365} = \left[\frac{(W - WW)}{t_2 - t_1} \times 160 + BW_{205} \right]$$

WW_{365} = weight at 365 days
 WW = weaning weight
 W = weight when measurement
 $t_2 - t_1$ = interval time between weaning and measurement

Heifers were corrected to bull (Scott, 1971):

$$WW_{c365h} = W_{365h} \times CF; \quad CF = \frac{x_i}{x_b}$$

WW_{c365h} = 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 :

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

Post weaning gain was calculated as follows:

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

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

$$r_g = \frac{COV_g}{\sigma_{g1} \times \sigma_{g2}}; \quad r_p = \frac{COV_p}{\sigma_{p1} \times \sigma_{p2}}$$

Where : p = phenotypic
g = genetik
Cov = covariance
 σ_1 = standard deviation for the first trait
 σ_2 = standard deviation for the second trait

$$cov_p = cov_g + cov_e$$

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

$$r_g = \frac{cov_s}{\sigma_{s1} \times \sigma_{s2}};$$

$$r_p = \frac{cov_s + cov_w}{[\sigma_{s1} + \sigma_{s2}][\sigma_{w1} + \sigma_{w2}]}$$

Standard error was calculated with the formula written by Warwick, et al. (1990):

$$SE(r_{Gxy}) = \frac{1 - r_{G2xy}}{\sqrt{2}} \times \sqrt{\frac{(\sigma_{h_x}^2 \cdot \sigma_{h_y}^2)}{(h_x^2 \cdot h_y^2)}}$$

Where : h_x^2 = estimate of heritability
 $\sigma_{h_x}^2$ = 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

- Allen, D. and B. Kilkeny. 1980. Planned Beef Production. Granada Publishing, Ltd., London.
- Becker, W.A. 1975. Manual of Quantitative Genetics. 3rd edition. Washington State University Press, Washington.
- Blakely, J. and D.H. Blade. 1991. The science of Animal Husbandry. Prentice Hill Press, New York.
- Hardjosubroto, W. 1994. Aplikasi Pemuliaan Ternak di Lapangan. P.T. Gramedia Widiasarana Indonesia, Jakarta.
- Hamadji. 1992. Prospek Pengembangan Sapi Madura. Prosiding Pertemuan Ilmiah Hasil Penelitian dan Pengembangan Sapi Madura. Sumenep, 11-12 Oktober 1992.
- Martojo, H. 1990. Peningkatan Mutu Genetik Ternak. Pusat Antar Universitas dan Biologi, IPB, Bogor.
- Pane, 1986. Pemuliabiakan Ternak Sapi. Penerbit PT Gramedia, Jakarta.

- Scott, G.E. 1971. The Sheepman's Production Handbook. 1st edition. Abberg Printing, Denver, Colorado.
- Soehadji. 1992. Kebijakan Pengembangan Sapi Potong di Indonesia. Tinjauan Khusus Sapi Madura. Pros. Pertemuan Ilmiah Hasil Penelitian dan Pengembangan Sapi Madura, Sumenep.
- Supranto, J. 1992. Teknik Sampling untuk Survei dan Eksperimen. Penerbit Rineka Cipta, Jakarta.
- Tulloh, N.M. 1978. Short Course Beef Cattle Management and Economic. Hasanudin University, Ujung Pandang.
- Van Vleck, L.D., E.J. Pollack, and E.A.B. Oltenacu. 1987. Genetic for the Animal Science. W.H. Freeman and Co., New York.
- Warwick, E.J. and J.E. Legates. 1979. Breeding and Improvement of Farm Animal. Tata McGraw-Hill Publishing Co., New Delhi.
- Warwick, E.J. J.M. Astuti, dan W. Hardjosubroto. 1990. Pemuliaan Ternak. Gajah Mada University Press, Yogyakarta.