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GENETIC ASPECTS OF IMMUNE RESPONSE AND SOME OTHER PRODUCTION TRAITS IN JAPANESE QUAILS.

(With 2 Tasbles)

By

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(Received at 12/9/1992)

النواحي الوراثيه للاستجابه المناعيه وبعض الصفات الانتاجيه في السمان الياباني.

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أجرى هذا البحث على سلالتين من السمان اليابانى (البنى والأبيض) لدراسة تأثير السلاله والجنس كلا على حده وتأثيرها معاً على تكون الاجسام المضاده بعد حقن كرات الدم الحمراء للأغنام (كأنتيجن) وكذلك معرفه مستوى الجاماجلوبيولين وعلاقه ذلك لبعض الصفات الانتاجيه الاخرى واظهرت النتائج ما يلى :-

وجد للسلاله تأثير معنوى على معدل الاجسام المضاده بعد ١٤ يوم من التحصين حيث كانت السلاله البيضاء ذات استجابه مناعيه اعلى منها فى السلاله البنيه.

لوحظ ان متوسط وزن الجسم تأثر معنويا بالسلاله حيث كان وزن الجسم اعلى فى السلاله البنيه عنه فى البيضاء من ناحيه اخرى لم يكن للسلاله تأثير معنوى على انتاج البيض ووزن البيض

كان للجنس تأثير معنوى على مستوى الاجسام المناعيه المتكونه بعد سبعه ايام من التحصين حيث وجد ان الاناث كان مستوى الاجسام المناعيه فيها اعلى من الذكور.

وجد لكل من السلاله والجنس معاً تأثير معنوى على مستوى الاجسام المناعية بعد سبعة واربعه عشر يوما من التحصين. حيث كانت الاناث البنيه لها على استجابه مناعيه. بينما الذكور البنيه كانت هى الاقل استجابه مناعيه.

لوحظ وجود علاقه ارتباط موجبه بين الزياده فى وزن الجسم بعد ١٤ يوم من التحصين ومستوى الاستجابه المناعيه بعد ٧ ايام من التحصين، والعلاقه بين وزن الجسم وعدد البيض علاقه ارتباط سالبه وقريبه للمعنويه بينما كان هناك علاقه ارتباط موجبه بين وزن الجسم ووزن البيضه.

اظهرت النتائج السابقه ان الانتخاب لزياده انتاج البيض ربما يؤثر على معدل الاستجابه المناعيه للافرلد المنتخبه.

CENETIC ASPECTS, IMMUNE RESPONSE & JAPANESE QUAILS

SUMMARY

Genetic variations in immune response to sheep red blood cell (SRBC), gamma-globulin level and some productive traits as well as the phenotypic correlations between these traits were studied in two strains of Japanese Quails. The strain of Quails was found to have a significant effect on antibody titer at 14-dsys of vaccination. The white strain have the higher response (2.32). Gamma-globulin level was also higher (1.06) in white strain, although the differences was not significant. The antybody titer at 7-days after vaccination was significantly affected by sex in favour of female (3.56) than male (2.98). Moreover, the brown female Quails had the highest immune response titer (3.93) at 7 day, while the brown male Quails had the lowest titer (2.75). A significant positive phenotypic correlation was found between body weight at 14-days after vaccination and 7-days antibody titer. Moreover highly significant positive phenotypic correlation was found between antibody titer at 7-days and 14-days post vaccination with SRBC (0.46). On the hand, negative but non significant phenotypic correlations were observed between egg number with each of egg weight and immune response titer at 7 and 14-days post vaccination (-0.21, -0.14, -0.24 respectively).

INTRODUCTION

A number of genetic and nongenetic factors have been found to influence either directly or indirectly the immune system of the Quails. Recent selection research based on antibody producing ability *(BIOZZI et al., 1980)* demonstrated that this ability was controlled by multiple genes and could be correlated with other immune abilities such as antibody producing ability to unrelated antigens or resistance to several diseases. Genetic variation in resistance to disease has long been noticed *(HUTT, 1958)*. Utilization of this genetic variation has not been frequently applied, due to easy access of vaccines and the random nature of infections.

Genetic differences in antibody response have been reported in experimental random bred populations of poultry *(SIEGEL and GROSS, 1980; VANDER ZIJPP and LEENSTRA, 1980; PEVZNER et al., 1981)*, between experimental strains *(GROSS and*

COLMANO, 1971), among inbred lines *(BALCAROVA* et al., *1973)*, as well as between commercial strains *(HELLER* et al., *1981)*. Further evidence on the relationship between antibody producing ability and natural resistance is required in order to determine the feasibility of selecting animals with high genetic resistance to pathogenic microbes without inducing prophylactic infections by such organisms.

The objective of this study was to examine the effect of breed, sex and breed X sex interaction on antibody producing ability against Sheep Red Blood Cell (SRBC) antigen and Gamma-globulin level as well as the correlation between these traits and some production traits in two strains of Japanese Quails, namely Browen and White.

MATERIAL and METHODS

Quails: Two lines of Japanese Quail (Coturnix coturnix Japonica), the brown and white lines, were kept in electrically heated battaries until the age of 3 months. Quail tested in this study were from a random bred population reared at the Poultry and Rabbit Project, Department of Animal Husbandry, Faculty of Veterinary Medicine, Alexandria University.

SRBC Immunization and Serum Collection:

The SRBC were obtained in 3.8% sod. citrate solution as anticoagulant and were washed three times in phsphate buffer saline (PBS). Quails were injected i.m. with 0.5 ml of packed SRBC at three months of age. A control group from each strain of Quails, not injected with SRBC was used. The Quails were bled from the wing vein on the day of injection, and then at 7 days and 14 days later. The blood samples collected were allowed to clot at room temperature, refrigerated for clot contraction and centrifugugated at 3.000 r.p.m. for 15 min. to obtain clear serum. After centrifugation the serum was harvested and stored at -20 °C until assay.

Determination of antibody titer to SRBC and Gamma-globulin:

Heamagglutinin assay was used to determine total antibody titer to SRBC at both 7 and 14 days of injection *(VANDER ZIJPP, 1988)*. A V-shaped microtiter plates having a total of 96 wells arranged in 8 rows and 12 columns were used. Serum gammaglobulin was determined according to the method of *WALFSON* et al. *(1948)*.

Fitness parameters:

Comparison between the two Quail lines was also made for body weight, and egg production. Body weights at the day of vaccination and after 14 days of vaccination were recorded.

Moreover, eggs producd on day of vaccination and 14 days later were collected, weighed, and recorded.

Statistical methodology:

The SAS general linear model procedure (1987) was used for the application of least squares analysis to examine the effect of breed, sex and their interaction on the phenotypic variation in immune response and some other traits.

Yijk = u+ Bi +Sj + (BS) ij + Eijk

were

u = population mean for the trait.

Bi = effect due to line (brown and white)

Si = effect due to sex

(BS)ij = effects due to interaction between Quail line and sex.

Eijk = a random residual error term.

RESULTS and DISCUSSION

A- Effect of Quail strain on different traits:

The least square means and standard errors of the effect of strains of Quail on antibody titer, serum gammaglobulin level, body weight, egg number and egg weight, after 7 and 14 days of SRBC injection are presented in Table (1).

The strain of Quail showed a significant effect on antibody titer at 14 days of vaccination, the white strain have a higher response (2.32) than the brown (1.88). Gamma-globulin level was also higher (1.06) in the white than the brown (0.81) strain, but the deference did not reach statistical significance.

The effect of strain of Quail on antibody response is inclose accordance with the results reported by many authors *(SANG & SOBEY, 1954 and REY, 1979* in rabbits; *HUGH* et al., *1965* in mice; *VAN DER ZIJPP 1983 and GYLES* et al., *1986* in poulyty; *ROTHCHILD* et al., *1984* in fihs; and *TAKAHASHI* et al., *1984* in Japanese *QUAIL and SHARAF* et al., *1988* in Turkeys). Since the Quails are raised under the same nutritional and managerial condition, the differences are mainly due to genes controlling the immune response. Moreover, the body weight was found to be significantly affected by the strains, where the Brown one have the higher body weight than the White strain. On the other hand there was no significant effect of Quail strain on egg production or egg weight.

B- Effect of sex of Quails on different traits:

The sex of quails was found to have a significant effect on antibody response to SRBC on the 7th day after vaccination. The female Quails showed higher titer (3.56) than males (2.98).

According to *MALLARED (1989)*, the effect of male is mainly genetic, the female may involve both genetic and other possible effect such as mothering ability, which may influence Quails immune response and may or may not be heritable. There was no significant sex effect on either antibody response at day 14 after vaccination, or on gamma-globulin level although the female continued to have higher level of antibody on the 14th day, and gammaglobulin level (2.19 and 1.07) than male (2.01 and 0.81). The significant sex effect on immune response (on the 7th day) is in agreement with the findings of *GRUNDBACHER and SHERFFLER (1970), BLAZKOVEC* et al. *(1973) and VANDER ZIJPP* et al. *(1980)*. Moreover, body weight was found to be significantly affected by sex in favour of female (194.48 and 204.84 gm) than male (158.05 and 171.03 gm) at day of vaccination and 14 days after vaccination respectively.

Strain X sex interaction was found to have a significant effect on antibody titer to SRBC at 7 and 14 days after vaccination. Brown females had the highest immune response titer (3.93) at 7 days while the brown male quails had the lowest titer (2.75). In addition, brown female Quails and both white males and females, at 14 days, had the highest responses of 2.13, 2.40, and 2.24, respectively, while the brown males continued to have the lowest response. This may indicate that the crossing of brown female and white male may improve the immune response. The effect of strain X sex on gamma-globulin was nonsignificant, while the strain X sex effect was significant. The brown female Quails had heavier weight at the day of vaccination and 14 days after vaccination (196.38 and 218.52 respectively). On the other hand, white male Quails had lighter weight at both times (147.96 and 159.28 respectively) as shown in Table 1.

C- Phenotypic correlation among different traits:

A significant positive phenotypic correlation was observed between body weight at 14 days after vaccination and 7 days antibody titer (0.31) table (2) indicating that increasing the immune response tends to be correlated with heavier body weight. Similar results were reported by *VANDER ZIJPP (1984)*, who reported a positive correlation between immune response to New castle disease vaccine in chicken and body weight. Moreover, highly significant phenotypic correlation was found between titer at 7 and 14 days post vaccination with DRBC (0.46) (Table 2). on the other hand, there was a positive but nonsignificant phenotypic correlation between immune response titer at 14 days and gammaglobulin level (0.13) (Table 2). negative but non significant phenotypic correlations were observed between egg number with each of egg weight, and immune response titer at 7 and 14 days (-0.12, -0.14, -0.24) respectively (Table 2). Moreover, the phenotypic correlation between body weight and egg number was negative and approach significant (signicant at 0.07), while correlation between body weight and egg weight was positive. *SHARA* et al. *(1988)* reported a negative correlation between high egg production and immune responsiveness to new castle disease and pasteurella multocida vaccine in Turkey. these results indicate that selection for increased egg production may influence the immune ability, therfore the two traits must be kept in mind in selection programs.

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Table (1) Least square means and stander errors of different traits studies

Items	No.	7 days anti-body titer	14 days anti-body titer	gamma-globulin	body weight before SRBC injection	body weight after SRBC injection	egg weight	egg number
Breed								
brown	28	3.35^{a} ±0.15	1.88^{b} ±0.13	0.81^{a} ±0.14	182.26^{a} ±5.39	200.65^{a} ±5.24	9.61^{a} ±0.14	12.30^{a} ±0.15
white	31	3.20^{a} ±0.17	2.32^{a} ±0.15	1.06^{a} ±0.14	170.27^{a} ±6.13	180.22^{b} ±5.95	9.74^{a} ±0.12	11.71^{a} ±0.36
Sex								
male	18	2.98^{b} ±0.19	2.07^{a} ±0.17	0.81^{a} ±0.15	158.05^{b} ±7.02	171.03^{b} ±6.82		
female	41	3.56^{a} ±0.11	2.19^{a} ±0.10	1.07^{a} ±0.14	194.48^{a} ±4.16	204.84^{a} ±4.04		
Breed X Sex								
Brown								
male	13	2.75^{b} ± 024	1.63^{b} ±0.21	0.76^{a} ±0.22	168.14^{b} ±8.70	182.79^{b} ±8.46		
female	20	3.93^{a} 0.17	2.13^{a} ±0.16	0.86^{a} ±0.19	196.38^{a} ±6.36	218.52^{a} ±6.18		
White								
male	10	3.20^{b} ±0.30	2.40^{a} ±0.29	0.86^{a} ±0.19	147.96^{b} ±11.01	159.28^{c} ±10.7		
female	26	3.19^{b} ±0.15	2.24^{a} ±0.13	1.27^{a} ±0.19	192.59^{a} ±5.37	207.16^{b} ±5.22		

Means within each class with different superscripts are significantly different (p >0.05)

Table (2) Phenotypic correlation among different traits :

Traits	weight at 14 days of vaccination	egg NO.	egg weight	titer at 7 days of vaccination	titer at 14 days of vaccination	gammaglobulin
body weight at vaccination	0.84**	-0.12	0.23	0.17	0.17	-0.10
bady weight at 14 days of vaccination		-0.30	0.10	0.31*	0.18	-0.22
egg NO.			0.21	-0.14	-0.24	0.23
egg weight				-0.05	0.09	0.09
titer at 7 days from vaccination					0.46**	0.09
titer at 14 days from vaccination						0.13

** Highly significant differances
* Significant differances