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Studies on the Production Characters of Kadaknath and Rhode Island Red Breeds and Their F1 Progeny of Reciprocal Matings and Black Cross in a Trial Involving Dihalel Matings

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SUMMARY

The present experiment was undertaken to study the production characters of Kadaknath and Rhode Island Red breeds and their F₁ progeny of reciprocal matings and back crosses in a trial involving diallel matings. It included study of the specific combining ability (SCA), general combining ability (GCA) and reciprocal effects (RE). Average body weights at 0, 4, 8, 12, 20, 24 and 40 weeks of age were recorded in females. In males, body weights were recorded up to 24 weeks of age. Carcass evaluation studies were carried out by selecting two birds from each sex per group when they were approximately 1 kg in body weight. Age at first egg in days, age at sexual maturity in days (50 per cent production), age at the peak production in days, hen-day and hen-housed production up to 280 days (part year production), average feed consumption during laying stage at 4 weekly intervals (i.e. on 24, 28, 32, 36 and 40 weeks), weekly average egg weight and FCR/dozen of eggs were the parameters studied in the present study. The statistical analysis revealed that the differences in different genetic groups were significant hence the diallel analysis was carried out.

For the statistical analysis, GCA and SCA of parents and their crosses were tested by using analysis variance.

It was observed that GCA for the body weights in females from 0 to 40 weeks was significantly higher in line G3, i.e. the genetic group R X R, whereas the SCA was significantly higher in combination S14 obtained from cross of
K X RK and the RE was significantly higher in combination R14 obtained from cross of RK X K.

The mean body weights between genetic groups from 0 to 40 weeks revealed significant (P≤0.01) difference. The differences for body weights between GCA (additive gene effects), SCA (non additive dominant gene effects) and RE (non additive recessive effects or effects due to epistatic combination) were highly significant (P≤0.01) except for SCA at 40 weeks (P≤0.05).

In both males and females, the GCA from 0 to 24th week for body weights was significantly higher in line G3 (R X R cross). It was found to have a superior additive gene effects for the female and male body weights. The SCA was found to be significantly higher in combination S14 (K X RK) throughout the period of 24 weeks. The RE value was significantly higher in R14 (RK X K combination).

Analysis of variance for genetic groups showed highly significant (P≤0.01) differences for the body weights of both sexes. The mean value of the female body weights from 0 to 40 weeks and male body weights from 0 to 24 weeks revealed significant (P≤0.01) difference.

Analysis of variance for combining abilities in female body weights from 0 to 40 weeks revealed highly significant differences (P≤0.01) for GCA, SCA and RE. Where as, SCA at 40 weeks, was significant (P≤0.05).

Analysis of variance for combining abilities in male body weights revealed highly significant differences for GCA and RE from 0 to 24 weeks. The SCA of male body weights at 0, 4 and 8 weeks showed significant (P≤0.01) differences.
Similarly, SCA at 12, 16 and 20 weeks showed significant (P≤0.05) difference. However, the difference was non-significant at 24 weeks of age.

The mean values of egg weights for genetic groups showed highly significant (P≤0.01) differences. The GCA estimate of G3 line (R X R) was significantly higher than the other lines. There was no significant difference between the lines G1 and G2 for GCA effects. The SCA estimate of the egg weight was significantly higher in combination S13 (R X RK) where as, the same trait did not show the same significant differences amongst the combinations S12, S14, S23 and S24. The RE estimate for egg weight was significantly higher in combination R34 (R X K) than other combinations. Analysis of variance for combining ability for egg weights between GCA, SCA and RE were significant (P≤0.01). For the trait egg weights it was observed that the line G3 (R X R), combination S13 (R X RK) and combination R34 (R X K) was significantly higher, than other lines / combinations.

The means of carcass evaluation for liver, heart and dressing percentage in females showed significant (P≤0.01) difference. However, non-significant differences were observed for gizzard and edible carcass weight percentages among genetic groups.

The means for carcass evaluation in males showed highly significant (P≤0.01) difference for heart and gizzard weight percentage but non-significant differences in dressing, liver and edible weight percentage in genetic groups.

The GCA estimate for age at first egg was significantly higher in line G4 (K X K). The SCA for the same was observed significantly higher in combination
S24 (K X KR) than the others. The RE in combination R24 (KR X K) was significantly higher than the others.

The GCA estimate for 50 per cent egg production was significantly higher in line G4 (K X K). The SCA for combination S24 (K X KR) showed significantly higher value than the others. The RE was significantly higher in R14 (RK X K).

It was observed that GCA estimates for the age at peak production was significantly higher in line G4 (K X K) than the others. The SCA for combination S24 (K X KR) was significantly higher than others. The RE was significantly higher for R34 (R X K).

The GCA estimate for hen-day egg production was significantly higher in line G3 (R X R) than the others. The SCA for the same was significantly higher in combination S34 (K X R) than the others. The RE for the same was higher in R24 (KR X K) than the other combinations.

The GCA estimate for hen-housed egg production was significantly higher in line G3 (R X R) than others. The SCA was significantly higher in combination S34 (K X R). The RE was higher in R 34 (R X K) than the other combinations.

The means in genetic groups for age at first egg, hen-day production and hen-housed production showed highly significant ($P \leq 0.01$) differences, similarly age at 50 per cent production and age at peak production showed significant ($P \leq 0.05$) difference. Among replicates, age at first egg, age at 50 per cent production and hen-day production revealed highly significant ($P \leq 0.01$) differences, however, age at peak production indicated significant ($P \leq 0.05$) difference.
The means for combining abilities in GCA and SCA indicated highly significant difference for all the parameters. Whereas, for RE, the differences at peak production, hen-day and hen-housed production were significant. However, non-significant differences were observed for age at first egg and 50 per cent production, which may be due to the effect of environment rather than that of genetic origin. Similarly, the results obtained indicated that age at first egg and 50 per cent production are related and affect each other.

The GCA estimate for feed intake did not show any significant difference within the lines G1, G2, G3 and G4. The SCA for the same was higher in combination S13 (R X RK). The RE was significantly higher in combination R24 (KR X K).

The GCA estimate for FCR / dozen of eggs was significantly higher in line G4 (K X K) than the others. The SCA for the same was significantly higher in combination S24 (K X KR). The RE was significantly higher in combination R14 (RK X K).

The means for feed consumption showed significant (P≤0.01) difference for weeks and replicates but the differences were non-significant for the genetic groups. For FCR/dozen of eggs, highly significant (P≤0.01) differences were noted in genetic groups and weeks.

The means of GCA, SCA and RE for feed consumption indicated non-significant differences. Whereas, FCR/dozen of eggs revealed significant (P≤0.01) differences for GCA and SCA, but non-significant differences for RE.
In general, the line G3 (R X R) dominated growth and egg production related traits throughout the experiment. Non-significant differences for GCA among the different lines for related traits are also indicative of uniform control over managemental practices during the period of study. Superiority of the over dominating line G4 involving K X K for efficiency of converting feed in to eggs could be the direction for future studies.