Genetic evaluation for glutathione peroxidase and productive traits of chickens in crossbreeding experiment with an approach to genetic distance.

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SUMMARY AND CONCLUSIONS

This work was conducted during the period from June 2007 to February 2009 at El-Takamoly project belonging to Fayoum Governorate. Prior to study, 17 breeds or strains were screened according to their performance as a preliminary stage. Then ten genotypes were chosen based on their productivity (WL and RIR as standard foreign breeds, GM, Gimmizah, Salam and Mamorah as developed strains, Fay, BB and Dand, as indigenous breeds and naked neck Sharkasi chickens). Two hundred blood samples were collected from the ten genotypes at 56 days of age, ten chicks per each sex within each genotype were randomly chosen to study the effect of genotype and sex on GSH-Px in the washed RBCs, BW, hematology and some plasma metabolites (Stage 1).

Six genotypes: BB, Dand WL and RIR, Gimmizah and GM were used to confirm relationships between each of genotypes, sex and age with GSH-Px and BW, hematological, plasma constituents and Alb/Glob (Stage 2).

Two genotypes were chosen showing the highest GSH-Px activity at 56 days of age (RIR) and the lowest enzyme activity (Gimmizah). In this stage, two crosses were made: RIR x Gimmizah and its reciprocal cross (Gimmizah x RIR dams) to study the phenotypic variation in the activity of GSH-Px in RBCs in the parental breeds and their crosses, study the crossing effects on variance components of the studied traits with an approach to both potence ratio and genetic distance (Stage 3).

The following results were obtained:

1. Both genotype and sex significantly influenced GSH-Px activity, $BW_{56,}$ MCV, WBCs, H%, L%, H/L, eosinophils%, TP, Alb, Glob concentrations and Alb/Glob at 56 days of age (Stage 1).

2 Both Pearson and Spearman correlation estimates were significant between GSH-Px activity at 56 days of age and each of the MCV, TP, Alb and Glob, regardless of sex or genotype (Stage 1).

3. GSH-Px activity at 56 days of age for Gimmizah was significantly correlated with each of WBCs, eosinophils%, TP and Glob . Also, it was significantly correlated with WBCs, H%, L% and H/L for RIR (Stage 1).

4. Results of the second stage were confirmed those obtained from the first stage that the RIR had higher GSH-Px than other genotypes. However, Gimmizah showed lower GSH-Px and Alb.

5. GSH-Px activity at 56 days of age had positive correlations with EN_{364}, EW, mortality during egg production period and hatched chicks number in the first stage. Therefore, it may be used as an important criteria since it had significant correlations with most studied traits of productive performance, fitness, hematological and plasma constituents (Stage 3).

6. The RIR x Gimmizah and its reciprocal crosses had the lowest GSH-Px compared to their parents. The RIR x Gimmizah cross had higher MCV, monocyte, TP, Alb and Glob than other genotypes. The Gimmizah x RIR cross had significantly higher Hct%, Hgb, RBCs, WBCs and Alb/Glob than other genotypes (Stage 3).

7. The Gimmizah x RIR cross had lower EN_{90}, $EN_{180,}$ EM_{90} and EM_{180}. Each of RIR x Gimmizah and Gimmizah x RIR crosses had later ASM than their parents (Stage 3).

8. Either Pearson or Spearman correlations between GSH-Px activity and both ASM and EW were negative. Whereas, positive Pearson or Spearman correlations between GSH-Px activity and each of EN_{90}, EN_{180}, RL%, EM_{90}, EM_{180}, fertility%, hatchability%, abnormal chicks% and mortality% were positive ranging from 0.369 to 0.521 ($P \leq 0.001$) for Pearson and from 0.432 to 0.492 ($P \leq 0.001$) for Spearman (Stage 3).

9. There were positive phenotypic correlations (Pearson and Spearman) between GSH-Px activity and each of albumen height, HU, shell% and yolk height.Whereas, negative correlations between GSH-Px activity and each of yolk weight, yolk diameter, albumen weight, shell weight were found (Stage 3).

10. Most estimates of direct additive effect were positive and significant therefore, RIR as a sire was superior than Gimmizah for GSH-Px at 56 and 84 days of age, $BW_{5\%}$, ASM, EN_{90}, EN_{180},EW, EM_{90}, EM_{180}, yolk weight, shell weight, Hctat 5% of egg production, Hgb at 56 days of age and at 5% of egg production, RBCs at 5% of egg production, lymphocytes at peak of egg production, TP at 84 days of age, 5% and peak of egg production, Alb at 28 ,56, 84 days of age and at 5% of egg production, Glob at 5% and peak of egg production and Alb/Glob at 28 and 56 days of age (Stage 3) .

11. While, those pullets mothered by Gimmizah were superior than RIR as a dam for each of BW_{112}, yolk color, MCV at 28 days of age, H% at peak of egg production, H/L at peak of egg production, basophils at 5% of egg production, TP, Glob at 28 days of age, Alb at 5% of egg production and Alb/Glob at one day of age (Stage 3).

12. There were significant cross differences for most studied traits indicating that crossing between RIR as a sire and Gimmizah as a dam was favored than its reciprocal and had positive and high percentages of heterotic effects on most studied traits which may be due to hybrid vigor. Positive heterotic effects in the first generation may have resulted from two possible causes : Firstly, direct individual heterosis which resulted from uniting pairs of somatic genes. Secondly, the intra or inter allelic interactions (Stage 3).

13. Estimates of PR showed that over-dominance for the dominant high parent (RIR) of GSH-Px at 5% of egg production, BW_{56}, EN_{90}, RL%, EW, fertility, hatchability, mortality, HU, yolk%, shell weight, Hct at 28 and 84 days of age, Hgb at 56 and 84 days of age, MCV, WBCs at 28, 84 days of age and at peak of production, RBCs at peak of egg production, monocytes at 28, 56 and 84 days of age, basophils at 56 days of age, TP at 56, 84 days of age and at 5% of egg production, Alb at 28, 56 days of age and at 5% of egg production and Alb/Glob at 28, 56 days of age and peak of egg production (Stage 3).

14. There were over-dominance effects for the low parent (Gimmizah) of GSH-Px at 28, 56, 84 days of age and peak of egg production, BW_1, BW_{84}, BW_{peak}, ASM, EN_{180}, EM_{180}, abnormal chicks%, SI, yolk weight, yolk color, shell%, Hct at 56 days of age and peak of egg production, Hgb at 28 days of age and peak of egg production, MCV at 5% of egg production, RBCs at 84 days of age, WBCs at 56 days of age and MCV at 5% of egg production, H% at 56, 84 days of age and at 5% of egg production, L% at 28, 56, 84 days of age and at 5% of egg production, H/L at 56, 84 days of age and at 5% of egg production, monocyte at 5% and peak of egg production, eosinophils at 28 and 56 days of age, TP at one and 28 days of age, Alb at 84 days of age and at peak of egg production, Glob at one, 28,56 days of age and 5% of egg production and Alb/Glob at 84 days of age (Stage 3).

15. Most genetic distance estimates were low which may be due to the lack of additive genetic variation and insignificant differences between parental genotypes in GSH-Px at 28 days of age and peak of egg production, BW_1, BW_{56}, BW_{84}, and BW_{Peak}, EW, fertility, abnormal chicks%, albumen%, HU and yolk% traits resulted in somewhat lack in genetic divergence that expressed in small genetic distances (Stage 3).

16. Based on the previous results, crossing among more than two genetically diversed genotypes, concerning the GSH-Px , will be more useful to determine the general and specific combining abilities and increase the chance of choosing the best hybrid produced. Moreover, estimation of the genetic parameters (heritability and genetic correlation) for GSH-Px of different genotypes will be needed, since the phenotypic correlation between GSH-Px and most traits studied in the present study were significant and had high magnitude**,** to use in the future selection studies.