PRODUCTIVE PERFORMANCE, SOME HEMATOLOGICAL TRAITS AND GENETIC RELATIONSHIP IN DIFFERENT LOCAL QUAIL AFFECTED BY DIETING THE RAPESEED (CANOLA) SEEDS POWDER

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ABSTRACT

The impact of dietary supplementation with (2) levels of canola seed powdered and the effect of different local quails' lines and the influence of diet × line on the productive performance, Some hematological traits and genetic relationship, has to be investigated in this study. A total of 162 laying quail in three lines color white; black; and yellowish-brown were randomly distributed to (3) treatment groups with (3) replicates/treatment/line T0: control (standard diet); T1 and T2 were standard diets supplemented with 1% and 3% canola seeds powder (CSP) respectively. The results of Genetic relationship using RAPD-PCR marker, noted that genetic similarity values range between 0.5 to 1. The highest number of bands was 28 among all groups used. The highest percentage of Polymorphisms observed in the primer OPA-14. The highest range of the molecular weight was (200 - 1500 bp). The basal diet supplemented with 3% of (CSP) had higher final body weight. There was a significant (P≤0.05) difference between line groups, as the brown line exhibited higher values for final body weight. It can be noted that T2 (3% CSP) the white line had a higher Feed intake. 1% and 3% (CSP) provided best feed conversion ratio. T1 (1% CSP) had higher egg mass, egg weight and hen-day egg production. T2 recorded highest levels since hematocrit level influenced. Generally, can be concluded and recommended that using 1%, 3% (CSP) had helped improve body metabolism and satisfactorily impacts performance and health in different local quail lines.

Keywords: RAPD - PCR, hematocrit, laying quail

INTRODUCTION

The latest and smallest domesticated poultry species is quail. In all of the world 131 species are found and 17-18 varieties of wild quail. (Hashanuzzaman, 2013). Local quails are a natural inhabitants of Iraq. A recently introduced economic species and is suited for meat and egg under intensive management due to their low servicing cost, rapid sexual maturity, higher growth exponential, higher tolerance to heat, suitability for higher density rearing, higher resistance to disease and higher production for egg than other poultry species. They have a shorter life cycle and less land requires for production. The quail farming as a complement to chicken and duck farming of tapping the growing market request for poultry products (Sultana et al., 2007). Moreover, the quail is an efficient converter of feed with each egg a female deposits an edible package of 8% of her body weight as compared to 3% in the case
of chicken. The important price contributing factor in the table and hatching eggs are egg quality (Kocevski et al., 2011). Thus the economic success of a laying flock depends on the total number of eggs produced.

Canola crop originally derived from rapeseed varieties and it’s a winter crop. Altered by the genetic selection that has markedly reduced its detrimental components, glucosinolate and erucic acid to a less than 20 μg g-1 which is negligible level (Harker et al., 2015). An excellent source of monounsaturated acids and linolenic acid is canola oil. The increase omega-3 amount in eggs and tissue of broiler, so it is beneficial for human health (An, Guo, Ma, Yuan, and Liu, 2010).

The genetic relationship can be check by RAPD assay, it’s fast, low-cost and simple. Method of genotype identification, analysis of population and pedigree, the studies of phylogenetic and genetic mapping. Genetic variability in the 17th generation of Japanese quail selected for high eggs and meat production by RAPD assay (Ali et al., 2002). The genetic variability evaluated in five breeders of local chicken using random amplification of polymorphic DNA (RAPD-PCR) (Abdalrazaq, and Suliaman, 2016). It has been used to detect specific markers in poultry, to estimate genetic relatedness among various poultry species, as well as for genome mapping (Levin et al., 1993; Ali and Ahmed, 2001), and the use of RAPD markers for a wide range of applications in poultry breeding. Howard and Moore, (1991) used various lines of commercial quails well-developed to enhance selection and breeding, there are needed more studies to characterize these strains genetically and to estimate the genetic variability. Therefore, in this study conducted to check the effects of dietary supplementation with two levels of ground Canola seed and the impact of different local quails’ lines and the interacted influence of diet × line on the productive performance, some hematological traits and use RAPD-PCR as a tool in local quail to detecting polymorphism between lines and establishing genetic relationships among the quail lines.

MATERIAL AND METHODS

Conducted this study in the rule of following Ethics and Animal welfare committee guidelines at Animal Resource, College of Agricultural Engineering Sciences, Salahaddin University-Erbil, Iraq. 162 laying quails from three different color lines' were: white (W); black (B); and yellowish-brown (Y) at 10th week of age. Were obtained from a commercial farm (Quail Farming, Qushtapa), Erbil-Kurdistan Region of Iraq. distributed randomly to (3) treatment groups with (3), replicates/treatment/ line. From each replicate contains six (6) quails, birds' sex ratio was 2 females :1 male. The birds reared in battery cages (50*30*30 cm). The quails fed for (5) weeks (including one week as adaptation period). The dietary treatments were as follows: T0 (control) = basal diet without addition (CSP), T1 = basal diet with 1% of canola seed powder inclusion and T2 = basal diet with 3% of canola seed powder inclusion. Table (1) showed the composition of the basal diet. Throughout the study Feed and freshwater were provided ad libitum. The floor feeders and nipple drinkers were used for feeding and drinking. Lighting plan 16 hours was applied by using fluorescence lights. A temperature of (20 – 24 °C) with relative humidity between (50 and 60 %) was preserved throughout the experimental period. During the
experiment, period recorded initial body weight (IBW) (g), final body weight (FBW) (g), weekly and overall feed intake (FI) (g/bird/period), egg weight (g) and produced eggs. The hen day egg production (HDEP%), egg mass (g/ hen/ day), and feed conversion ratio (FCR) as (g feed:g egg), were calculated.

**Blood samples**

Blood samples were collected in anticoagulant tubes to determine some hematological traits. Blood samples were used for RAPD-PCR. All laboratory work was done in a medical research center in Erbil / University of Hawler Medicine, by method of (Sharma et al.2000), the DNA extraction was carried out. This study used (15) RAPD Primers (GenScript USA company). (11 Primers) of them gave results to find a complementary DNA Genomic sites are Series in Table (2). The DNA samples purity were ranged 1.8 to 1.9 after the DNA quality isolated by the Nano Drop® spectrometer. Samples were diluted to (30 ng/ μl) for use of RAPD PCR, in the Salahaddin Research Center / University of Salahaddin Erbil. The mixture (25 μl) of polymerase chain reaction (PCR) and contained (30 ng) of genomic DNA, each primer (10 μM). The program of PCR included an initial denaturation step at (94 C°) for (5) minutes followed by (4) cycles with (94 C°) for 60 seconds for DNA denaturation, annealing as mentioned with each primer, extension at (72 C°) for 1 minutes and a final extension at (72 C°) for (5) minutes were carried out. The amplified DNA fragments were separated on (2%) agarose gels in 1x TBE buffer (Promega, USA) and stained with ethidium bromide. The amplified pattern was visualized on a UV trans illuminator and photographed.

**Statistical analysis**

The statistical analysis was done according to a factorial experiment in Completely Randomized Design (CRD) (3×3) using (GLM) General Linear Models procedure of SAS software program package (SAS, 2012). Duncan’s multiple range test was used to identify significant differences between means (Duncan, 1955). Data recording and statistical analysis RAPD patterns were recorded because of (1) or absence (0). The similarity index between each group was calculated using the formula: similarity = 2nxy / nx + ny. and used, genetic distance = 1- (2nxy / nx + ny). The polymorphism of each primer was calculated basis on the following formula:-

\[
\text{polymorphism} = \left( \frac{\text{Np}}{\text{Nt}} \right) \times 100, \quad \text{NP} = \# \text{ polymorphic forms of random primer}
\]

Nt = total number of sample primer domains (Bowditch *et al.*, 1993).
### Table 1: Ingredients and analyzed composition of diet that fed to the local quails

| Ingredients (%) | Control diet (T0) | Analyzed Feed Composition |
|-----------------|-------------------|---------------------------|
| Wheat           | 175               | Crud protein (%)          | 22.91 |
| Corn            | 200               | Energy metabolism (Kcal)  | 2930  |
| Wheat flour     | 250               | Lipid (%)                 | 3.32  |
| Soya bean Meal  | 290               | Fiber (%)                 | 3.11  |
| Protein Concentrate (Fish Meal Concentrate) | 50 | Calcium (%)               | 1.00  |
| Di-Calcium Phosphate | 6    | Total phosphorus (%)      | 0.511 |
| Methionine      | 0.9               | Available phosphorus (%)  | 0.270 |
| Lysine          | 0.5               | Salt (%)                  | 0.212 |
| Cholin Chloride | 0.5               | Arginine (%)              | 1.21  |
| Salt            | 0.85              | Lysine (%)                | 1.08  |
| Oil (vegetable oil) | 13       | Methionine + Cystine (%)  | 0.633 |
| Feed toxic      | 1                 | Methionine (%)            | 0.382 |
| Lime stone      | 10                | Threonine (%)             | 0.681 |
| Vitamin premix  | 0.5               | Tryptophan (%)            | 0.234 |
| Antioxidants    | 0.25              | ---                       | ---   |
| Feed Sterilizes | 1                 | ---                       | ---   |
| Anticoccidia    | 0.5               | ---                       | ---   |
| Total           | 1000              | ---                       | ---   |

### Table 2: Sequence, operon codes and GC content of random primers

| Primer Name | Sequence 5' to 3' | %GC Content |
|-------------|-------------------|-------------|
| OPQ-01      | GGGACGATGG        | 70%         |
| OPA-15      | TTCCGAACCC        | 60%         |
| OPA-12      | TCGGCAGATAG       | 60%         |
| OPA-20      | GTTGCGATCC        | 60%         |
| OPQ-15      | GGACGCTTCA        | 60%         |
| OPA-03      | AGTCAGCCAC        | 60%         |
| OPA-04      | AATCGGGCTG        | 60%         |
| OPQ-12      | TCTCCGCAAC        | 60%         |
| OPQ-10      | GGCTAAACCGA       | 60%         |
| OPA-19      | CAACGCTCGG        | 60%         |
| OPA-14      | TCTGTGCTGG        | 60%         |
RESULTS AND DISCUSSION

Genetic relationships
Data presented in Table (3) shows the highest number of bands was 28 bands among all groups used and which were created by the OPA-04 Primer, and the lowest number of bands were 6 band, which were created by OPA-12 Primer. The total number of bands 80 which created by all Primers and the total number of polymorphic were 29 bands. The highest percentage of the Polymorphisms observed in the primer OPA-14, 22.22 as compared with other primers in present study, while the lowest percentage of Polymorphisms were obtained by the primer of OPA-3 as 4.35. These findings are in agreement with the report of (Abdulrazaq, and Suliaman, 2016) who found that RAPD profiles of five local chicken populations were compared, the highest number of polymorphic bands were 23, while the lowest number of polymorphic bands were 7. The highest percentage of the Polymorphisms 19.77, while the lowest were 9.48. At the similar study, (Singh and Sharma, 2002) used 12 primers and found 22% Polymorphisms which sourced from high homology between genotypes. The highest range of the molecular weight was (200 - 1500 bp) is primer OPQ-1, and was least for primer OPA-12 which showed (600 - 800 bp).

Table (3): Total number of bands, polymorphic band, mono band, and monomorphic band, % of polymorphism and their size ranges from random primers.

| Primer number | Total number of bands | Polymorphic band | Mono band | Monomorphic band | % Polymorphism | Size (bp) |
|---------------|-----------------------|------------------|-----------|------------------|----------------|----------|
| OPQ-01        | 26                    | 3                | 6         | 23               | 11.54          | 200 – 1500 |
| OPA-15        | 16                    | 2                | 3         | 14               | 12.50          | 500 – 1500 |
| OPA-12        | 6                     | 1                | 1         | 5                | 16.67          | 600 – 800  |
| OPA-20        | 23                    | 4                | 4         | 19               | 17.39          | 300 -1500  |
| OPQ-15        | 18                    | 3                | 3         | 15               | 16.67          | 400 -1500  |
| OPA-03        | 23                    | 1                | 6         | 22               | 4.35           | 200 – 900  |
| OPA-04        | 28                    | 5                | 6         | 23               | 17.86          | 300 – 1200 |
| OPA-12        | 11                    | 2                | 3         | 9                | 18.18          | 400 – 800  |
| OPQ-10        | 10                    | 2                | 2         | 8                | 20.00          | 400 – 700  |
| OPA-19        | 13                    | 2                | 3         | 11               | 15.38          | 300 – 700  |
| OPA-14        | 18                    | 4                | 2         | 14               | 22.22          | 100 – 800  |
|               | 80                    | 29               | 16        | 51               |                |          |

Genetic similarity
Data presented in Table (4) shows the Genetic similarity using RAPD - PCR marker resulted in 11 primers, noted that genetic similarity values range between 0.5 to 1. These genetic variations refers to the good genetic resources in the local quail and that information about genetic differences in the current study will be useful for breeders to improve local quail. Detecting similarity between chicken breed the RAPD markers are effective and they provide a potential tool for studying the inter-
breed genetic similarity and the establishment of genetic relationships (Ali, et al., 2003).

Table. (4): similarity of RAPD profile generated through 11 primers on three lines local quail

| Lines                  | white (W) | black (B) | yellowish brown (Y) |
|------------------------|-----------|-----------|---------------------|
| white (W)              | 1         | 0.551     | 0.55                |
| black (B)              | 0.551     | 1         | 0.716               |
| yellowish brown (Y)    | 0.55      | 0.716     | 1                   |

**Initial and final body weight (g)**

Data presented in Table (5) shows the impact of dietary (CSP) supplementation on initial and final body weight (g) of three local quail lines. Local quails fed supplemented with (3%) of (CSP) had higher final body weights as compared with those fed the basal diet with no (CSP) containment. These results are in agreement with the report of (Veras, et al., 2019). The differences between line groups were significant (P≤0.05) as the brown line exhibited higher values for final body weights than the white and black lines. These findings, disagree with (Moraes et al. 2015) because the level of canola meal was increased, a linear decrease was observed for body weight (P≤0.05). In the other study was conducted the effect of different levels of full fat (CS) low in glucosinolate and erucic acid on the performance of quail. The experimental treatment included 5 and 10 % (CS) in diet and fed to quail from (1 to 42) days of age. The mean total body weight was not significantly affected by (CS) inclusion levels (Vargas-Sánchez et al. 2019).

**Feed intake**

Data presented in Table (6) shows the effect of dietary (CSP) supplementation on feed intake (g/bird/day) of three local quail lines. It can be noted that T² (3% CSP) and the white line had a higher Feed intake than both Control and T¹ groups during the overall period of experiment. However, In this study, significant line × dietary interaction occurred for T²W in FI. Poultry have limited capability to handle fiber and better quality off grade (CS) should be used. However, the value in poultry diets is higher than other animals and can be a bargain. In general for poultry were found the seed of canola to be acceptable in feeding trials at the Guelph University (1977). When canola seed oil is added to the diet the fatty acid synthesis is reduced and the poultry has more energy for productive performance (Costa et al., 2008). However, despite of that the levels of methionine, linoleic acid and oil have increased with the canola meal inclusion in the diet, increasing quadratic egg weights are response up to the level of (30%) of canola meal, with subsequent lowering. This fact may be associated with both glucosinolate and sinapine give a bitter taste and may be responsible for the reduction in voluntary feed intake (Mailer et al., 2008).
Table (5): Effect of adding canola seed powder on initial and final body weight (g) in different lines of local quails (Mean + SE).

| Treatments (T) | Initial body weight (g) | Final body weight (g) |
|----------------|-------------------------|-----------------------|
| **T0** Control | 184.17±8.99             | 210.61±6.45           |
| **T1** +1% CSP | 186.61±6.74             | 206.94±8.85           |
| **T2** +3% CSP | 194.39±8.21             | 232.67±6.06           |

| Lines (L) | W   | B   | Y   |
|-----------|-----|-----|-----|
| **W**     | 184.39±7.96 | 187.17±8.35 | 193.61±7.83 |
| **B**     | 184.39±7.96 | 187.17±8.35 | 193.61±7.83 |
| **Y**     | 184.39±7.96 | 187.17±8.35 | 193.61±7.83 |

| Interaction (T*L) | Initial body weight (g) | Final body weight (g) |
|-------------------|-------------------------|-----------------------|
| **T0**            |                         |                       |
| **T1**            |                         |                       |
| **T2**            |                         |                       |

| Lines (L) | W   | B   | Y   |
|-----------|-----|-----|-----|
| **W**     | 184.39±7.96 | 187.17±8.35 | 193.61±7.83 |
| **B**     | 184.39±7.96 | 187.17±8.35 | 193.61±7.83 |
| **Y**     | 184.39±7.96 | 187.17±8.35 | 193.61±7.83 |

*a, b, c means in rows bearing different superscripts differ significantly at P≤0.05.
**a, b, c means in column bearing different superscripts differ significantly at P≤0.05.

**Egg production**

Hen-day egg production (%) results affected by adding CSP in different lines of local quail are showed in Table (7). During the overall period of experiment, the results of hen-day egg production (%) in T1 (1% CSP) was significantly higher than both control (T0) and T2 (3% CSP) groups; also white line had significantly higher than both black and yellowish-brown lines; as well as for the interacted groups T1w provided higher significantly Hen-day egg production (%) than T2B groups provided lowest.

**Feed conversion ratio**

In different local quails lines feed conversion ratio (g feed: g egg) are presented in Table (8). There was a significant effects (P≤0.05) was observed among the diets, in which the inclusion of 1% and 3% (CSP) provided higher feed conversion compared to the Control groups. the differences between line groups were significant (P≤0.05) as the White line exhibited higher values for feed conversion than the black and yellowish brown lines. In this study, significant line × dietary interaction occurred for feed conversion. Then T1Y provided higher feed conversion but with T0B provided lowest. These results are differ from of found by (Moraes et al., 2017) who found that no effect (P≤0.05) on conversion with canola. from those found by (Hameed, Ahmad, and Rabbani, 2002).
Table (6): Effect of adding canola seed powder on feed intake (g/bird/week) in different lines of local quails (Mean + SE).

| Treatments | Periods | T₀=Control | T¹= +1% CSP | T²= + 3% CSP | L.S.* |
|------------|---------|------------|-------------|--------------|------|
| 1st Wk     |         | 24.02a ±0.066 | 20.05c±0.06 | 23.71b±0.091 | *    |
| 2nd Wk     |         | 21.95b ±0.063 | 22.79a ±0.04 | 16.13c±0.093 | *    |
| 3rd Wk     |         | 25.82b±0.058  | 25.50c±0.11  | 32.95a±0.150 | *    |
| 4th Wk     |         | 29.50a±1.11   | 25.35b±0.07  | 29.99a±0.095 | *    |
| Average    |         | 25.32a±0.29   | 23.42b±0.039 | 25.70a±0.051 | *    |

| Lines | Periods | W | B | Y | L.S.* |
|-------|---------|---|---|---|------|
| 1st Wk |         | 22.72a±0.627 | 22.61ab±0.634 | 22.45b±0.659 | *    |
| 2nd Wk |         | 20.45a±1.014  | 20.26b±1.049  | 20.16b±1.078 | *    |
| 3rd Wk |         | 28.14a±1.236  | 28.28a±1.279  | 27.85b±1.139 | *    |
| 4th Wk |         | 28.65a±0.788  | 27.52a±1.180  | 28.67a±0.872 | N.S  |
| Average Period | | 24.99a±0.378 | 24.67at0.417 | 24.78±0.371 | N.S  |

| Periods | Interaction (T*L) | T₀ | T¹ | T² | L.S.* |
|---------|------------------|----|----|----|------|
| Average Period | W | 25.75a±0.045 | 23.48c±0.042 | 25.74a±0.060 | *    |
|           | B    | 24.74b±0.870 | 23.493c±0.051 | 25.78a±0.097 | *    |
|           | Y    | 25.48ab±0.032 | 23.306c±0.053 | 25.57ab±0.078 | *    |

, b, c means in rows bearing different superscripts differ significantly at P < 0.05.
** a, b, c means in column bearing different superscripts differ significantly at P < 0.05.

Egg weight and mass

Egg weights (g) and egg mass (g/ hen/ day). Result shown in Table (9, 10). Generally, there were significant differences in egg weight among treatment T¹ (1% CSP) higher Egg weight and egg mass compared other groups. However, The differences between line groups were significant (P≤0.05) as the White line exhibited higher values for Egg weight and egg mass than the black and yellowish-brown lines. The interacted (T*L) groups as they compared to each other T¹w provided higher egg weight and mass but with T²B provided lowest egg weight and mass. Fundamentally egg weight altered mainly by the presence of methionine and linoleic acid in the feed. In the study of (Moraes et al. 2015) the levels of linoleic acid and methionine are increased with the canola meal inclusion. In addition, there was an increase in the level of oil by increasing the level of canola meal in the diets of quail, because of to keep them is energetic. The mass of eggs showed a quadratic response, increasing with 1% CSP in the diet and decreasing afterwards. This showed a similar behavior due to the increase in linoleic acid and methionine levels in the feed, this response is related to egg weight.
Hematological

Determination of hematological traits of local quails is necessary to evaluate the impact of diets in optimizing bird performance without compromising their health. Local quails are resistant to various diseases, easily adapt to different rearing conditions. Including Canola seed powder in poultry diets at different levels may be necessary to ensure adequate digestible amino acids (Khosravi et al., 2016). Table (11, 12) showed differences between groups with 0% CSP, 1% CSP and 3% CSP within differ lines of bird W, B , Y which indicate, that T² refer the highest level but not significantly this may be related to the influence of high metabolic energy in poultry that stimulates the bone marrow to produce more of red blood cells to provide more oxygen’s due to erythrocytes number is a signal of the oxygen transfer capacity in the blood, thus it can be used as an indicator of health in birds, since its contribution in improving the body defense system against disease (Sergent et al., 2004), while T⁰ and T¹ appear the lower level of erythrocyte compare to T² because its production depend on nutrition condition. So it clear that canola seed dose not affect red blood cell count at these level which agree with (Mnisi and Mlambo, 2018) the hematological parameters, the diet had no significant effect on erythrocytes, hemoglobin, hematocrit, MCV, MCH and MCHC of local quails.

Table (7): Effect of adding canola seed powder on hen-day egg production (%) in different lines of local quails (Mean + SE).

| Treatments | Periods | T⁰=Control | T¹= +1% CSP | T²= + 3% CSP | L.S.* |
|------------|---------|------------|-------------|--------------|------|
| 1st Wk     |         | 28.05c±5.766 | 36.61b±9.537 | 57.16a±3.898 | *    |
| 2nd Wk     |         | 71.00a±7.381 | 69.72b±17.543 | 54.72c±5.225 | *    |
| 3rd Wk     |         | 73.11b±10.820 | 94.11a±7.7189 | 67.50b±12.439 | *    |
| 4th Wk     |         | 99.27a±12.484 | 97.22b±8.841  | 77.94c±16.808 | *    |
| Overall period |     | 67.86b±5.0836 | 74.41a±10.398 | 64.33±8.4623 | *    |

| Lines | Periods | W          | B            | Y            | L.S.* |
|-------|---------|------------|--------------|--------------|------|
| 1st Wk |         | 52.44a±10.622 | 37.94b±5.655 | 31.44c±4.652 | *    |
| 2nd Wk |         | 99.55a±11.548 | 42.83c±5.339 | 53.05b±4.436 | *    |
| 3rd Wk |         | 95.94a±7.865  | 46.44b±9.626 | 92.33a±5.973 | *    |
| 4th Wk |         | 99.38b±11.293 | 61.11c±10.835 | 99.94a±9.646 | *    |
| Overall Period |     | 86.83a±7.292  | 47.08c±3.602  | 69.19±5.357 | *    |

| Periods | Interaction (T*L) | T¹ | T¹ | T² | L.S.* |
|---------|-------------------|----|----|----|------|
| Average period | W     | 84.58b±0.033 | 98.95a±4.1043 | 69.208d±0.3004 | *    |
|           | B     | 50.66f±0.150  | 57.37e±0.2602  | 33.208g±0.083  | *    |
|           | Y     | 75.83c±0.083  | 54.66ef±0.041  | 90.583b±4.294  | *    |

*, b, c means in rows bearing different superscripts differ significantly at P≤0.05.

**, a, b, c means in column bearing different superscripts differ significantly at P≤0.05.
Table (8): Effect of adding canola seed powder on feed conversion ratio (g feed: g egg) in different lines of local quails (Mean + SE). (*Day)

| Treatments | Periods | T<sub>0</sub>=Control | T<sub>1</sub>= +1% CSP | T<sub>2</sub>= + 3% CSP | L.S.* |
|------------|---------|------------------------|------------------------|------------------------|------|
| 1st Wk     |         | 2.14a±0.189            | 1.90b±0.073            | 1.30c±0.095            | *    |
| 2nd Wk     |         | 0.86b±0.027            | 1.52a±0.139            | 0.83c±0.054            | *    |
| 3rd Wk     |         | 0.88c±0.046            | 1.02b±0.084            | 1.12a±0.068            | *    |
| 4th Wk     |         | 0.77b±0.032            | 0.95b±0.082            | 1.61a±0.121            | *    |
| Average period |   | 1.16b±0.067            | 1.35a±0.075            | 1.22b±0.068            | *    |

| Lines       | Periods | W       | B       | Y       | L.S.* |
|-------------|---------|---------|---------|---------|------|
| 1st Wk      |         | 2.10a±0.187 | 1.65b±0.142 | 1.59c±0.147 | *    |
| 2nd Wk      |         | 0.98c±0.017 | 1.10b±0.174 | 1.14a±0.169 | *    |
| 3rd Wk      |         | 1.05a±0.091 | 0.98b±0.031 | 0.99b±0.089 | *    |
| 4th Wk      |         | 1.03a±0.148 | 1.11a±0.173 | 1.18a±0.134 | N.S  |
| Average Period |   | 1.29a±0.064 | 1.21b±0.074 | 1.22b±0.078 | *    |

| Periods | Interaction (T*L) | T<sub>0</sub> | T<sub>1</sub> | T<sub>2</sub> | L.S.* |
|---------|------------------|--------------|--------------|--------------|------|
| Average period |         | W | B | Y | L.S.* |
|           | W | 1.42b±0.0033 | 1.05d±0.055 | 1.41b±0.060 | *    |
|           | B | 0.97c±0.0230 | 1.46ab±0.018 | 1.19c±0.075 | *    |
|           | Y | 1.09cd±0.001 | 1.53a±0.007 | 1.04de±0.057 | *    |

, b, c means in rows bearing different superscripts differ significantly at P≤0.05.
** a, b, c means in column bearing different superscripts differ significantly at P≤0.05.

Our rating for hg (%)and hematocrit (%) are important to assess the immune status of the bird, so the high level of hg in T2 of white quail (W) group affected by the number of erythrocyte where increase in level of red blood cell coincides by increase in hg amount (Pantaya and Utami, 2018). While the results within group T<sub>1</sub> black (B) and yallow (Y) lines appear the highest rates these may belong to line of the bird.

Hematocrit is the volume of blood percentage made up by red blood cells. The red blood cells are the most numerous blood cells and are critical for oxygen delivery and acid-base balance. That mean the results of hematocrit related to (RBC) count (Song et al., 2010). Because hematocrit in wild birds can decrease under the impact of different environmental stressors, whether the natural or anthropogenic, a possible stress related to capture and handling can be considered as one of the variation determinants. A healthy physiological situation maintenance in an otherwise stressful habitats request an increase in body oxygen capacity and hence a high level of Htc and Hb. However, Htc and Hb can vary autonomously from each other and might be
Table (9): Effect of adding canola seed powder on egg weight (g) in different lines of local quails (Mean + SE).

| Treatments | Periods | T₀=Control | T₁= +1% CSP | T₂= + 3% CSP | L.S.* |
|------------|---------|------------|-------------|--------------|------|
| 1st Wk     |         | 10.01a±0.245 | 9.73a±0.369 | 8.28b±0.197 | *   |
| 2nd Wk     |         | 10.91a±0.245 | 10.82a±0.229 | 9.28b±0.293 | *   |
| 3rd Wk     |         | 11.34a±0.285 | 11.98a±0.977 | 11.26a±1.124 | N.S |
| 4th Wk     |         | 11.16a±0.260 | 11.39a±0.202 | 9.58b±1.103 | *   |
| Overall period |     | 10.86a±0.244 | 10.98a±0.385 | 9.60b±0.310 | *   |

| Lines | Periods | W       | B       | Y       | L.S.* |
|-------|---------|---------|---------|---------|------|
| 1st Wk |         | 9.84a±0.418 | 9.18b±0.421 | 9.01b±0.231 | *   |
| 2nd Wk |         | 10.65a±0.395 | 10.04c±0.465 | 10.30b±0.095 | *   |
| 3rd Wk |         | 12.68a±0.878 | 10.20b±0.431 | 11.71ab±1.076 | *   |
| 4th Wk |         | 11.90a±0.165 | 10.91a±0.298 | 9.320b±1.014 | *   |
| Overall Period |     | 11.27a±0.350 | 10.08b±0.406 | 10.08b±0.217 | *   |

| Periods | Interaction (T*L) | T₀ | T₁ | T₂ | L.S.* |
|---------|------------------|----|----|----|------|
| Overall period |                 | W | B  | Y  | L.S.* |
|               | T₀               | 11.29b±0.073 | 12.33 a±0.607 | 10.21c±0.021 | *   |
|               | T₁               | 11.40ab±0.024 | 10.21c±0.105 | 8.640d±0.024 | *   |
|               | T₂               | 9.89c±0.0304 | 10.41bc±0.206 | 9.963c±0.667 | N.S |

, b, c means in rows bearing different superscripts differ significantly at P≤0.05.
** a, b, c means in column bearing different superscripts differ significantly at P≤0.05.

high or low due to several other stress related problems such as dehydration or anemia’s. Which can result from conditions such as starvation, parasite infections, or hemolytic diseases (Minias, 2015). The results in Table (13) showed that T² recorded the highest levels compared to other groups with significant differences due to the diet that contain 3% CSP since hematocrit level influenced by nutrient and environment. The hematological constituents demonstrate a physiological response of birds to internal and external environments such as type of diet and behavioral dieting patterns (Challenge et al., 2001; Emenalom et al. 2004).
Table (10): Effect of adding canola seed powder on egg mass (g/hen/day) in different lines of local quails (Mean + SE).

| Treatments | Periods | T<sup>0</sup>=Control | T<sup>1</sup>=+1% CSP | T<sup>2</sup>=+3% CSP | L.S.* |
|------------|---------|------------------------|----------------------|----------------------|-------|
| 1st Wk     |         | 2.82c±0.61             | 3.76b±1.089          | 4.72a±0.324          | *     |
| 2nd Wk     |         | 7.82b±0.912            | 7.86a±2.12           | 5.19c±0.631          | *     |
| 3rd Wk     |         | 8.25b±1.23             | 11.31a±1.308         | 7.99c±1.40           | *     |
| 4th Wk     |         | 10.08a±1.05            | 11.04a±1.20          | 6.65b±1.23           | *     |
| Overall period |     | 7.24b±0.56             | 8.49a±1.41           | 6.14c ±0.89          | *     |

| Lines | Periods | W | B | Y | L.S.* |
|-------|---------|---|---|---|-------|
| 1st Wk |         | 5.03a±1.04 | 3.45b±0.543 | 2.83c±0.419 | *     |
| 2nd Wk |         | 10.98a±1.57 | 4.44c±0.736 | 5.46b±0.536 | *     |
| 3rd Wk |         | 12.14a±1.102 | 4.81c±1.033 | 10.60b±0.732 | *     |
| 4th Wk |         | 11.70a±1.283 | 6.75c ±1.195 | 9.22b±1.246 | *     |
| Overall Period | | 9.962a±1.070 | 4.86c ±0.513 | 7.027b±0.453 | *     |

Interaction (T*L) | T<sup>0</sup> | T<sup>1</sup> | T<sup>2</sup> | L.S.* |
|------------------|---------------|---------------|---------------|-------|
| Overall period   | W             | 9.71b±0.041   | 14.45a±0.0273 | 7.08d±0.018 | *     |
|                  | B             | 5.79e±0.076   | 6.01.e±0.0110 | 2.80f±0.036 | *     |
|                  | Y             | 7.66d±0.034   | 5.89e±0.125   | 8.54c±0.37 | *     |

L.S** | * | * | * |

, b, c means in rows bearing different superscripts differ significantly at P≤0.05.
** a, b, c means in column bearing different superscripts differ significantly at P≤0.05.

Table (11): Effect of adding canola seed powder on red blood cells account (*10<sup>6</sup>/mm³) in different lines of local quails (Mean + SE).

| Treatments (T) | T<sup>0</sup>=Control | T<sup>1</sup>=+1%CSP | T<sup>2</sup>=+ 3% CSP | L.S.* |
|----------------|------------------------|----------------------|----------------------|-------|
| W              | 3.5917a±0.06           | 3.3217a±0.62         | 3.9367a±0.16         | N.S   |
| B              | 3.3583a±0.32           | 3.5683a±0.51         | 3.9233a±0.23         | N.S   |

| Lines (L) | W | B | Y | L.S.* |
|-----------|---|---|---|-------|
| W         | 3.640a±0.03 | 2.630a±0.76 | 3.805a±0.44 | N.S   |
| B         | 3.490a±0.09 | 3.220a±1.88 | 3.995a±0.18 | N.S   |
| Y         | 3.645a±0.17 | 4.115a±0.72 | 4.010a±0.35 | N.S   |

Interaction (T*L) | T<sup>0</sup> | T<sup>1</sup> | T<sup>2</sup> | L.S.* |
|------------------|---------------|---------------|---------------|-------|
| Overall period   | W             | 3.640a±0.03   | 2.630a±0.76   | 3.805a±0.44 | N.S   |
|                  | B             | 3.490a±0.09   | 3.220a±1.88   | 3.995a±0.18 | N.S   |
|                  | Y             | 3.645a±0.17   | 4.115a±0.72   | 4.010a±0.35 | N.S   |

L.S** | N.S | N.S | N.S
Table (12): Effect of adding canola seed powder on hemoglobin (g/dl) in different lines of local quails (Mean + SE).

| Treatments (T) | T₀=Control | T₁= +1% CSP | T₂= + 3% CSP | L.S.* |
|---------------|-------------|-------------|--------------|-------|
| Lines (L)     |             |             |              |       |
| W             | 17.083a±0.31| 18.300a±1.61| 18.433a±0.83 | N.S.  |
| B             | 17.417a±0.65| 18.867a±1.29| 17.533a±1.12 | N.S.  |
| Y             |             |             |              |       |
| Interaction (T*L) |         |             |              |       |
| W             | 17.250a±0.05| 15.850±0.55  | 19.150a±0.75 | N.S.  |
| B             | 17.700a±0.60| 20.250±4.55  | 16.850a±0.75 | N.S.  |
| Y             | 16.300±0.20 | 18.800±2.80  | 17.500±2.80  | N.S.  |
| L.S**         | N.S         | N.S         | N.S          |       |

Table (13): Effect of adding canola seed powder on hematocrit (%) in different lines of local quails (Mean + SE).

| Treatments (T) | T₀=Control | T₁= +1% CSP | T₂= + 3% CSP | L.S.* |
|---------------|-------------|-------------|--------------|-------|
| Lines (L)     |             |             |              |       |
| W             | 31.917a±5.22| 37.500a±6.73| 35.367a±6.62 | N.S.  |
| B             |             |             |              |       |
| Interaction (T*L) |         |             |              |       |
| W             | 28.95b±0.05 | 27.05b±0.75 | 39.75ab±17.75| N.S.  |
| B             | 29.25b±0.15 | 27.30b±12.90| 55.95a±1.15  | *     |
| Y             | 25.70b±0.10 | 24.55b±1.75 | 55.85a±4.95  | *     |
| L.S**         | N.S         | N.S         | N.S          |       |

**CONCLUSIONS**

Using RAPD - PCR marker for a genetic relationship, noted that genetic variations refer to the good genetic resources in the local quail. On the other hand inclusion of natural ingredients in the feed of local quail such as canola seed, can improve body weight, feed conversion, Egg weight and mass. Egg production. Besides, it can improve metabolic energy in laying birds that stimulate bone marrow to produce more red blood cells to provide more oxygen due to erythrocytes number is a signal of the oxygen transfer capacity in the blood thus it can be used as an indicator of health in birds since its contribution in improving the body defense system against diseases.
الأداء الإنتاجي، وبعض الصفات الدموية والعلاقة الجينية في الخطوط المختلفة من السمان المحلي المتأثر

استخدام مستويات مختلفة من مسحوق بذور النبات (كالوانا)

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التخليصة

أجريت هذه الدراسة لムعرفة تأثير مستويات من مسحوق بذور النبات (كالوانا) في خطوط السمان المختلفة وتأثیر

التداخل مسبین الخصائص الهراثیة ومستويات مسحوق بذور النبات على الأداء الإنتاجي وبعض الصفات

dموية والعلاقة الهراثیة. تم تربية 64 طير من السمان في ثلاثة خطوط: اللون الأبيض والأسود والبني

الصغيراء. وزعت الطيور بشكل عشوائي على ثلاث مجموعات تجريبية مع ثلاث مكررات وثلاث خطوط.

T0: معاملة السيطرة (نظام غذائي قياسي)؛ ثم T1 و T2 اتباع نظام غذائي قياسي مع 1 % و 3 %

RAPD - PCR. أشارت النتائج للعلاقة الهراثیة باستخدام (CSP) على التوالي. أظهرت نتائج العلاقة الهراثیة باستخدام (CSP) أن تأثير الخصائص المختلفة على لوزن الجسم والحبوب تتجاوز النسبة في الـ 0.05 (P ≤ 0.05).

و الفقرة التالية.

الكلمات المفتاحیة: RAPD – PCR، السمان البياض، الهيماتوكريت

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