84 *Egypt. J. Vet. Sci.* **Vol. 55,** No. 4, pp. 965-977 (2024)

# Egyptian Journal of Veterinary Sciences

https://ejvs.journals.ekb.eg/

## A Comparative Study of Molar, Mascufy, and Pekiny Duck Breeds: Evaluating Growth, Carcass Quality, Blood Parameters

**Ahmed Mosaad Abdelsalam[1], Gomaa Said Ramadan[1], Esteftah Mohamed El-Komy[1], Ahmed Ramzy Abdallah[2], Abdul Khaleq Abu Al-Futouh El-Ghamry[1] and Amal Ahmed Abdel-Halim[3]**

[1]*Animal Production Department, Agricultural and Biological Research Institute, National Research Centre, Dokki, Giza 12622, Egypt.*
[2]*Animal Production Department, Faculty of Agriculture, Al-Azhar University, Nasr City, Egypt.*
[3]*Animal Production Department, Faculty of Agriculture, Cairo University, 12613 Giza, Egypt.*

THE data provided encompasses a comprehensive analysis of various parameters related to the production, carcass specifications and blood of three duck breeds: Molar, Mascufy, and Pekiny. The significance of differences is indicated by P>0.05 unless specified. In terms of production indicators, Molar ducks displayed superior body weight and body weight gain at the end of the growth stage (BW10). These differences were statistically significant, signifying the breed's potential for higher weight gain. Pekiny also showed feed intake (FI) advantages but not feed conversion (FC) efficiency. Carcass specifications revealed that Mascufy had the heaviest carcasses and the highest edible weight and percentage, while Pekiny had the lightest carcasses and the lowest edible weight and percentage. These statistically significant differences and highlight the potential for Mascufy in meat production. Examining blood parameters before and after injection, most values showed no significant differences among the duck breeds (P>0.05). However, parameters related to lipid profiles, such as Cholesterol, HDL, LDL, and Triglycerides, exhibited breed-specific differences. In summary, the analysis highlights the potential for significant differences in various aspects of duck production, including body weight, carcass specifications, and blood biochemical. These differences have practical implications for breed selection and management in the poultry industry. Further research is essential to explore the underlying mechanisms and implications of these variations and to optimize production outcomes and health in duck farming.

**Keywords:** Blood parameters. Body weight, Carcass, Duck breeds, Feed intake.

### Introduction

Ducks are widely reared for their meat and eggs across the globe. Among the various duck breeds, Molar, Mascufy, and Pekiny are particularly popular due to their rapid growth, desirable carcass quality, and high adaptability to different environmental conditions. However, a comprehensive comparative analysis of these three breeds in terms of growth potential, carcass quality, blood parameters, and immunity is lacking. Understanding these aspects is crucial for breed selection, management, and improvement practices [1].

In recent years, there have been several studies focusing on individual duck breeds to assess their growth performance, carcass traits, and physiological parameters. For instance, studies conducted by Liu et al. [2] and XI et al. [3] explored the growth potential and carcass characteristics of Molar and Mascufy duck breeds, respectively. Similarly, Liu et al. [2] investigated the immune responses of Pekiny ducks under different dietary conditions [3].

However, a direct comparison between these three duck breeds is limited, and there is a need for a comprehensive analysis that evaluates their growth

*Corresponding author: Gomaa S. Ramadan, E-mail: gomaasaid87@gmail.com . Tel.:002 01009313648
(Received 26/11/2023, accepted 26/12/2023)
DOI: 10.21608/EJVS.2023.251298.1684

potential, carcass traits, blood parameters, and immune functions simultaneously. Such a study would provide valuable insights into the unique characteristics and performance of each breed, enabling farmers and researchers to make informed decisions regarding breed selection, nutrition, and management practices [4]. The outcomes of this research will contribute to a better understanding of the overall performance and physiological characteristics of these three duck breeds [5].

This study's findings will be instrumental in advancing breeding programs, improving flock management practices, and formulating specialized diets for each breed to maximize their growth potential and enhance the overall quality and immune status. Ultimately, this research would benefit both the duck industry and consumers by providing scientific evidence for selecting the most suitable duck breed based on specific production and market requirements. [6]. Ducks are globally recognized for their economic and ecological significance. Among the various duck breeds, Molar, Mascufy, and Pekiny are highly sought after for their distinct characteristics and suitability for different purposes. Conducting a comparative analysis of these breeds is crucial in understanding their growth patterns, carcass quality, blood parameters, and immunity. This study aims to provide valuable insights into the performance and potential of these duck breeds, which can aid farmers, scientists, and other stakeholders in making informed decisions about breed selection and management practices. By examining various factors, such as growth rates, meat quality, physiological parameters, and immune responses, this research seeks to unravel the unique attributes and potential benefits associated with each duck breed, ultimately contributing to the improvement of duck farming practices and the overall poultry industry [7,8,9].

Examining the growth patterns of these duck breeds will provide insight into their developmental stages, including weight gain and body size. It is essential to investigate carcass quality, as it directly impacts the meat characteristics, such as tenderness, juiciness, and flavor. Analyzing the blood parameters will provide valuable information on the physiological state of the ducks and diagnose any underlying health conditions. Lastly, studying the immune responses will shed light on the ducks' resistance to various diseases and their overall health status [10].

By conducting a comparative analysis of these three duck breeds, this study aims to highlight their unique attributes and identify any disparities in terms of growth, carcass quality, blood parameters, and immunity. Insights gained from this analysis can facilitate informed decision-making for farmers and breeders, assisting them in selecting the most suitable breed for specific purposes and optimizing their production systems [11].

In conclusion, this research aims to provide a comprehensive comparative analysis of the Molar, Mascufy, and Pekiny duck breeds, focusing on growth patterns, carcass quality, blood parameters, and immunity. This study holds practical implications for farmers, breeders, and researchers alike, aiding in the selection of the most suitable duck breed for specific purposes and promoting advancements in the field of poultry science [12]. This study focuses on three popular duck breeds, namely Molar, Mascufy, and Pekiny, and aims to assess and compare various aspects related to their growth, carcass quality, and blood parameters.

## Material and Methods

### Study Design:

This comparative study aimed to evaluate the growth performance, carcass quality, blood parameters, and immune response of three duck breeds: Molar, Mascufy, and Pekiny. The study was conducted at the Duck Research Farm, Poultry Experiment Station, Department of Animal Production, National Research Centre.

### Experimental Animals:

A total of 450-day-old ducklings, with equal numbers from each breed, were selected for this study. The ducklings were obtained from reputable hatcheries. All ducks were housed in separate pens with similar floor areas (5 ducks/ $m^2$) and similar dimensions and bedding material. Ducks were provided ad libitum access to clean water and a standardized diet throughout the study period (Table 1). Environmental conditions including temperature, relative humidity, and lighting were maintained within the recommended ranges for duck rearing.

**Studied traits**

The growth performance of the ducklings was monitored throughout the study. Individual body weights and average daily weight gain were recorded weekly. Feed intake was also measured to calculate feed conversion ratios. The ducks were weighed weekly to monitor growth performance. Feed intake was measured daily, and the feed conversion ratio (FCR) was calculated. Sample collection was carried out at specific time intervals following ethical guidelines**.**

**Carcass Quality**

At the end of the study, 30 ducks from each breed, representing the mean body weight of the respective breed, were selected for carcass evaluation. The ducks were slaughtered under humane conditions and carcass quality parameters such as dressing percentage, breast yield, thigh yield, and abdominal fat content were measured.

**Sheep Red Blood Cells (SRBCs) suspension**

The SRBCs suspension was formulated by combining 100 ml of blood extracted from the jugular vein of three indigenous sheep using a heparinized syringe. Subsequently, the blood was placed into clean, dried centrifuge tubes. An equivalent amount of phosphate buffer saline (PBS) was introduced, and the suspension underwent centrifugation at 3000 RPM for 10 minutes. The resulting supernatant was decanted, and approximately 20-30 volumes of PBS were added to the packed cells. After gently resuspending the cells, they were subjected to another round of centrifugation, and the supernatant was once again decanted. To create a 10% SRBCs suspension for immunization, 10 ml of the packed cells were combined with 90 ml of PBS, while a 2% SRBCs suspension for titration was prepared by mixing 2 ml of packed cells with 98 ml of PBS. At 35 days of age, 90 birds were selected randomly (30 birds from each replicate of each breed and administered a 0.5 ml intra-muscular injection of the 10% SRBCs suspension. Approximately 2 ml of blood samples were then collected from the wing vein of each bird at 42 days of age using non-heparinized tubes, allowing the blood to clot. Following this, the samples were centrifuged at 3000 RPM for 10 minutes, and the resulting serum was separated. The serum samples were subsequently stored at -20°C until they were ready for testing.

**Blood Parameters**

Blood samples were collected from 30 randomly selected ducks (30 from each breed) at the 8$^{th}$, and 10$^{th}$ week of age. The samples were analysed for haematological parameters, including biochemical parameters such as glucose, total protein, albumin, and globulin levels were measured.

**Statistical analysis**

All data collected were subjected to statistical analysis using appropriate statistical software (SAS Software, 2008) [13]. The obtained results were analysed using analysis of variance (ANOVA), and means were compared using Duncan's [14] multiple range test. The significance level was set at $p < 0.05$.

The following model was used:

$Yij = \mu + Li + eij$

Where:

Yij: The j$^{th}$ observation within the i$^{th}$ strains

$\mu$: The overall mean.

$L_i$: The effect of the i$^{th}$ strains

$E_{ij}$: Random error**.**

**Results and Discussion**

Duck farming is an important agricultural practice due to the demand for duck meat worldwide. There are various duck breeds available, each with its own unique characteristics and qualities. In this comparative analysis, we will evaluate three popular duck breeds: Molar, Mascufy, and Pekiny. We will assess their growth rates, carcass quality, blood parameters, and immunity levels. The data showed significant different in body weight. In table 2. the results showed that: At BW1, Pekiny is highest weight. At BW4, Molar is highest weight. At BW7, Molar is highest weight. Molar is highest weight The BW4, 7 and 10, A values for body weight which agree with (Omar et al.[15]; Nasr et al. [4] who stated that Mulard was 4,021 g at the 10$^{th}$ w of age. But this study disagrees with Hassan et al. [7] and Galal et al. [16] who mentioned that the Muscovy showed the highest BW. However, fyan et al. [17] reported that the Pekin breed is better than Muscovy and Deshi white ducks.

The data presented in Table 2 indicates significant differences in body weight gain (BWG) among various duck breeds during different time intervals. Specifically, during the periods of BWG1-4, BWG4-7, BWG7-10, BWG1-7, and BWG1-10, distinct trends in body weight gain were observed. Notably, Pekiny exhibited the highest body weight gain during the BWG1-4 period, while Mascufy showed the highest body weight gain during BWG4-7 and BWG7-10 periods. Additionally, Molar dated the highest body weight gain during the BWG1-7 and BWG1-10 periods. These findings underscore the importance of growth rates in assessing the commercial viability of duck breeds. Molar ducks are recognized for their exceptional growth performance, achieving market weight at a faster pace compared to other breeds. Similarly, Mascufy ducks display an impressive growth rate, making them well-suited for meat production. Although Pekiny ducks may have a slightly slower growth rate, they are valued for their superior meat quality. In contradiction with results obtained by Chartrin et al. [18] reported that the strain was a significant effect in body weight. In line with Adeola [19] and Pingel [20], other researchers also stated that genetic factors and nutrient content of the feed influenced the performance and carcass quality of Pekin duck [21,22].

Farmers can leverage this information to make informed decisions based on their specific production requirements. Selecting the appropriate duck breed aligns with optimizing growth rates and, consequently, enhancing commercial success in the duck farming industry [8]. This discussion emphasizes the practical implications of the observed body weight gain differences in the context of duck breeding and meat production.

The data presented in Table 2 indicates significant variations in Feed Intake (FI) and Feed Conversion (FC) among different duck breeds during distinct time intervals.

Regarding Feed Intake (FI), duing FI 1-4, Pekiny exhibited the highest feed intake, followed by Mascufy. In the subsequent intervals (FI 4-7, FI 7-10, FI 1-7, and FI 1-10), Pekiny consistently showed the highest body weight gain, with Mascufy following closely in each instance. In terms of Feed Conversion (FC), during FC 4-7, Mascufy demonstrated the highest Feed Conversion, with Molar and Mascufy following suit. For FC 1-4, Pekiny exhibited the highest Feed Conversion, with Mascufy following in second place. In FC 7-10, Molar recorded the highest Feed Conversion, followed by Pekiny. Pekiny also showed the highest Feed Conversion for both FC 1-7 and FC 1-10, with Mascufy as the second-highest in each case. In contradiction with results were obtained by El-Sayed and Mahrous [23] who reported that feed conversion (feed /weight) for Mulard was (8.59) better than Muscovy (10.09) ducks. Hassan et al. [7] reported that offer a comprehensive assessment of the growth performance of Muscovy, Pekin, and Mulard ducks, focusing on key parameters such as Initial Body Weight (BW), Final BW, Body Weight Gain (BWG), Average Feed Intake (AFI), and Feed Conversion Ratio (FCR). The comparable initial weights suggest that, at the experiment's onset, the breeds were fairly matched in size. However, as the study progressed, significant variations emerged, particularly in final BW and BWG, where Muscovy ducks outperformed Pekin and Mulard ducks, underscoring the substantial genetic influence on growth trajectories. The lower AFI in Muscovy ducks implies more efficient feed utilization, pointing towards superior feed conversion efficiency. The observed differences carry practical implications for poultry farming and breeding programs, with Muscovy ducks standing out for their superior growth and feed efficiency. Pekin ducks present a balanced profile suitable for commercial meat production, while Mulard ducks offer a compromise between growth potential and feed efficiency. Overall, these findings emphasize the crucial role of genetic factors and thoughtful breed selection in optimizing duck production systems, providing valuable insights for farmers and breeders aiming to enhance growth performance and feed efficiency in their flocks.

Moving to Table 3, significant differences in carcass traits were observed. At BW10, Mascufy recorded the highest body weight, followed by Pekiny. In terms of Carcass weight, Mascufy led, followed by Pekiny and Molar. For Liver weight, Molar had the highest, followed by Mascufy and Pekiny. The highest Gizzard weight was recorded by Molar, followed by Mascufy. Molar also led in Heart weight, with Mascufy and Pekiny following. Regarding Giblet weight, Molar was highest, followed by Mascufy and Pekiny. Giblet percentage was highest for Molar, followed by Mascufy and Pekiny. In Edible weight, Mascufy led, followed by Pekiny, and in Edible percentage, Molar was highest, followed by Mascufy and Pekiny. For Non-Edible weight, Mascufy led, followed by Pekiny, while in non-Edible percentage, Pekiny was highest, followed by Mascufy and Molar. Similar trend was obtained by El-Sayed and Mahrous [23] who found that the strain was significant effect in carcass parts.

It is important to note that the three breeds under investigation (Muscovy, Pekin, and Mulard) differ considerably in terms of growth rate and the characteristics of valuable body parts, but all can grow continuously until the 12$^{th}$ week of life [24] Carcass quality is a critical factor in the duck meat industry, influencing yield and meat quality for further processing. Molar ducks, with their high meat-to-bone ratio, offer a substantial proportion of edible meat. Mascufy ducks also provide a favourable meat yield, making them economically advantageous. Despite slower growth, Pekiny ducks often possess well-developed muscle mass and tender meat texture, enhancing overall carcass quality. Farmers and meat processors can use this information to select the most suitable breed for their production goals [25].

Hassan et al. [7] reported that provide a detailed exploration of carcass traits and meat composition in Muscovy, Pekin, and Mulard ducks. Notable distinctions emerged in various parameters, underscoring the impact of breed on carcass characteristics and meat quality. Muscovy ducks exhibited a significantly higher dressing percentage (75.20%), surpassing Pekin (72.41%) and Mulard (73.73%) ducks, emphasizing their superior overall carcass yield. Similarly, Muscovy ducks showed higher breast percentage (51.04%) compared to Pekin and Mulard, reinforcing their prominence in breast meat production. The liver composition in Pekin ducks stood out with significantly lower fat content (2.26%), contrasting with the higher fat content in Muscovy (2.36%) and Mulard (3.34%) ducks. In terms of meat composition**,** Muscovy ducks demonstrated superior breast meat quality with higher protein content (19.21%) and lower fat content (4.26%) compared to Pekin and Mulard ducks. These findings highlight the distinct carcass and meat composition attributes associated with each breed, providing valuable insights for poultry producers and informing strategic decisions in duck farming practices.

The average carcass weight of Pekin ducks in this study resembles the results of Omojola [26] Carcass weight is very important role as one of the main products in poultry. Carcass weight tended to increase in line with the increasing of the age. Carcass weight could also be influenced by the type, size and genetic factors [26,27] Environmental factors, feed and stress conditions before slaughtering could also affect the quality of poultry carcasses [28].

The data presented in Table 4 highlights the variations in blood parameters before injection among the Molar, Mascufy, and Pekiny duck strains, revealing significant strain-related effects. Before injection, the Total Protein (Tp1) exhibited the highest values in the following order: Molar, Mascufy, and Pekiny. Similarly, for Albumin (Al1), Molar had the highest value, followed by Mascufy and Pekiny. The Globulin (Gl1) levels were highest in Pekiny, Molar and Mascufy, respectively. The Albumin-to-Globulin Ratio (Agratio1) showed the highest values in Molar, Mascufy and Pekiny, with Molar leading. The Cholesterol (Chol.1) levels were highest in Molar, Mascufy and Pekiny. The HDL Cholesterol (HDL1) values were highest in Molar, Mascufy and Pekiny. For LDL Cholesterol (LDL1), the highest values were recorded in Molar, Mascufy and Pekiny. The Creatinine (Creatinin.1) levels exhibited the highest values in Mascufy, Molar and Pekiny . In terms of Triglycerides (Triglycr.1), Molar and Mascufy had the highest values. The Alkaline Phosphatase (Alkalin.1) values were highest in Mascufy, Molar and Pekiny, respectively. Additionally, the Total Lipids (T.Lipids1) showed the highest values in Mascufy, Pekiny, and Molar. Aspartate Aminotransferase (AST1) had the highest values in Molar, Mascufy and Pekiny. Similarly, for Alanine Aminotransferase (ALT1), the highest values were recorded in, Pekiny, Mascufy. and Molar. Also, these results are consistent with Chartin *et al.*[18] who found that the strain affected chemical analysis. These findings underscore the significant impact of duck strain on various blood parameters before injection. The order of values among the strains provides insights into the physiological differences that may exist between Molar, Mascufy, and Pekiny ducks in relation to these blood parameters.

Table 5 presents data detailing the distinctions in blood parameters after injection across the Molar, Mascufy, and Pekiny duck strains, highlighting significant strain-related effects. Following injection, Total Protein (tp2) exhibited the highest values in the order of Mascufy, Molar and Pekiny, Similarly, for Albumin (al2), the highest values were recorded by Molar Mascufy, and Pekiny, Globulin (gl2) levels peaked in Pekiny, followed by Mascufy and Molar. The Albumin-to-Globulin Ratio (agratio2) displayed the highest values in Molar Mascufy, and Pekiny. For Cholesterol (Chol_2), the highest values were recorded by Mascufy, Pekiny, with Molar at 89.38% of the value achieved by Mascufy. The HDL Cholesterol (HDL2) values were highest in Molar Mascufy and Pekiny. For LDL Cholesterol (LDL2), the highest values were noted by Mascufy, Pekiny, and Molar. Creatinine (Creatinin_2) levels exhibited the highest values in Mascufy and Molar followed by Pekiny. In terms of Triglycerides (Triglycr_2), Pekiny recorded the highest values, followed by Molar and Mascufy.

The highest values for Alkaline Phosphatase (Alkalin_2) were recorded by Mascufy, Molar and Pekiny. Total Lipids (T#_Lipids_2) exhibited the highest values in Mascufy, followed by Pekiny and Molar. Aspartate Aminotransferase (AST_2) recorded the highest values in Molar Mascufy, and Pekiny. For Alanine Aminotransferase (ALT2), was no significant differences in Mascufy, Pekiny and Molar. The study underscores the intricate interplay between genetics and environmental factors in shaping the productive and physiological characteristics of duck breeds. Molar stands out as a promising breed for meat production, showcasing superior growth, carcass traits, and immune response. Mascufy also demonstrates favorable traits, while Pekiny, though competitive in some aspects, lags behind in crucial parameters. These findings offer valuable insights for selecting breeds tailored to specific production goals, aiding the optimization of duck farming practices.

Table 6 presents the pre- and post-injection blood parameter data for three duck strains: Molar3, Mascufy1, and Pekiny2. Statistically significant increases in total protein levels are observed post-injection across all strains. Albumin levels also show significant increases after injection. A marked decrease in the A/G ratio is noted in Mascufy1. Cholesterol levels decrease significantly in Molar3 and Pekiny2. HDL levels significantly drop in Molar3 and Mascufy1. LDL levels decrease significantly post-injection. Triglycerides show significant decreases in all strains. Alkaline phosphatase levels notably decrease in Mascufy1. Total lipid levels significantly change in Mascufy1. AST levels decrease significantly in Molar3 and Mascufy1. ALT levels increase significantly in Molar3 and Mascufy1 post-injection. Overall, the injection induces significant shifts in blood parameters, indicating varied physiological responses among the duck strains.

Biochemical parameters serve as crucial indicators for predicting metabolic disorders [28], with alterations observed in response to stress-induced thermoregulatory mechanisms in birds [29]. Notably, the ALT and triglyceride values in Pekin ducks differed from those reported by Arak et al. [30], revealing a potential divergence in metabolic profiles. The elevated total cholesterol in Pekin ducks, compared to other breeds, suggests increased hepatic cholesterol production and reduced tissue mobilization [31]. Conversely, the lower concentrations of total proteins in Star 53 may stem from heightened protein and amino acid requirements for somatic development, aligning with findings in chickens and guinea fowl [32,33]. The biochemical parameter values for Muscovy and Mulard are consistent with the study by Nasr et al. [4], while Mulard's total proteins, albumin, and globulin values align with those reported by Omar et al. [15]. However, Muscovy's values correspond to earlier research [29]. Interestingly, El-Fiky et al. [34] found higher HDL values in Muscovy compared to Mulard, emphasizing the breed-specific nuances in lipid metabolism. The interplay between free radicals, reactive oxygen species, and antioxidant capacity underscores the complex dynamics influencing oxidative stress [35]. Also Abdel-Hamid, et al. [9] reported that the impact of different duck breeds reared under uniform environmental conditions on their biochemical parameters at the 12$^{th}$ week of age was assessed. Statistically significant variations were observed in glucose, uric acid, total cholesterol, HDL, LDL, triglyceride, total protein, albumin, globulin, A/G ratio, ALT and AST levels among the Pekin, Star 53, Muscovy, and Mulard ducks ($p < 0.001$). Pekin ducks exhibited the highest values in several parameters, while Star 53 ducks generally displayed lower values. The ALP values did not differ significantly among the breeds ($p > 0.05$). These findings underscore the biochemical diversity associated with different duck breeds, emphasizing the importance of breed selection in influencing physiological profiles.

## Conclusions

The comprehensive analysis of three duck breeds - Molar, Mascufy, and Pekiny - revealed important insights into production, carcass specifications, and blood measurements. The study highlighted that Mascufy exhibited an advantage in terms of carcass weight and edible percentage.

***Acknowledgment***

We would like to express our sincere gratitude and appreciation to are also due to the National Research Centre for Providing financial support.

***Ethical Considerations***

This study was conducted in accordance with ethical guidelines for animal experimentation, and all procedures were approved by The Institutional Animal Care and Use Committee (ARC-IACUC) Agricultural Research Centre Approval Number ARC ABRI 86 23.

***Conflicts of interest***

There are no conflicts to declare.

***Funding statement***

There is no funding statement to declare.

***Author`s contributions***

The authors contribute equally in this work.

**TABLE 1. Starter, grower, and finisher diet formulation and nutrient composition for growing ducks.**

| Ingredients % | Starter (1-28 days) | Grower (29-49 days) | Finisher (50-end days) |
|---|---|---|---|
| **Yellow maize (7.5%)** | 58.14 | 64.93 | 74.06 |
| **Soybean meal (46%)** | 32.09 | 24.57 | 17.93 |
| **Corn gluten meal (60%)** | 0.00 | 1.85 | 3.43 |
| **Wheat Bran (15%)** | 5.00 | 4.08 | 0.00 |
| **Soybean oil** | 0.50 | 0.50 | 0.50 |
| **Dicalcium phosphate** | 1.86 | 1.76 | 1.64 |
| **Limestone** | 1.38 | 1.31 | 1.41 |
| **Vitamin & Mineral mix*** | 0.30 | 0.30 | 0.30 |
| **NaCl (Salt)** | 0.31 | 0.31 | 0.30 |
| **DL-methionine** | 0.22 | 0.19 | 0.17 |
| **L-Lysine HCl** | 0.00 | 0.00 | 0.04 |
| **$NaHCO_3$** | 0.05 | 0.05 | 0.07 |
| **Choline chloride** | 0.05 | 0.05 | 0.05 |
| **AntiToxins** | 0.10 | 0.10 | 0.10 |
| **Total** | **100** | **100** | **100** |
| **Calculated composition** | | | |
| **Crude protein %** | 20.0 | 18.0 | 16.0 |
| **ME (Kcal/Kg)** | 2850 | 2950 | 3100 |
| **Ether extract%** | 3.18 | 3.38 | 3.58 |
| **Crude fiber%** | 3.08 | 2.86 | 2.37 |
| **Lysine %** | 1.13 | 0.94 | 0.79 |
| **Methionine %** | 0.55 | 0.50 | 0.47 |
| **Methionine + Cystine %** | 0.90 | 0.83 | 0.77 |
| **Threonine %** | 0.79 | 0.70 | 0.62 |
| **Calcium %** | 1.04 | 0.97 | 0.96 |
| **Nonphytate P %** | 0.50 | 0.47 | 0.43 |
| **Sodium%** | 0.16 | 0.16 | 0.16 |
| **Chlorine%** | 0.23 | 0.23 | 0.23 |
| **Potassium%** | 0.89 | 0.75 | 0.60 |
| **Linoleic Acid%** | 1.75 | 1.85 | 1.96 |

* Vitamin and mineral mix supplied/ Kg of diet: Vit $D_3$, 2200 IU; Vit A, 12000 IU; Vit $K_3$, 2 mg; Vit E, 10 mg; Vit $B_1$, 1mg; Niacin, 20 mg; Vit $B_2$, 4mg; Vit $B_{12}$, 10μg; Vit $B_6$, 1.5mg; Folic acid, 1 mg; Pantothenic acid, 10 mg; Choline chloride, 500 mg; I, 1mg; Biotin, 50 μg; Fe, 30 mg; Cu, 10 mg; Mn, 55 mg; Se, 0.1 mg and Zn, 50 mg.

**TABLE 2. The difference between Molar, Mascufy and Pekiny in performance rate**

| Strain<br>Item | Molar | Mascufy | Pekiny |
|---|---|---|---|
| | **BW(g)** | | |
| **BW1** | 42.40±0.32 b | 41.00±0.42 c | 46.20±0.31 a |
| **BW4** | 1601.00±18.32 a | 1295.00±24.42 c | 1553.70±37.70 b |
| **BW7** | 2832.00±19.17 a | 2678.00±44.46 b | 2368.00±24.82 b |
| **BW10** | 4021.00±20.49 a | 3740.00±47.37 b | 2846.00±30.06 c |
| | BWG (g) | | |
| **BWG1-4** | 1558.60±18.62 a | 1254.00±23.56 c | 1507.50±13.46 b |
| **BWG 4-7** | 1231.00±13.30 b | 1383.00±24.51 a | 1114.30±19.28 c |
| **BWG7-10** | 1189.00±15.14 a | 1062.00±18.34 b | 478.00±8.22 c |
| **BWG1-7** | 2789.60±13.06 a | 2637.00±44.57 b | 2321.80±24.97 c |
| **BWG1-10** | 3978.60±20.68 a | 3699.00±47.91 b | 2799.80±30.14 c |
| | FI (g) | | |
| **FI 1-4** | 3686.00±24.19 b | 2540.40±35.07 c | 4040.00±33.46 a |
| **FI 4-7** | 4534.00±28.51 a | 4565.00±35.39 a | 4510.00±49.37 a |
| **FI 7-10** | 5208.00±15.43 a | 5122.00±82.60 a | 5117.00±19.14 a |
| **FI 1-7** | 8220.00±39.03 b | 7105.40±66.19 c | 8550.00.±60.59 a |
| **FI 1-10** | 13428.00±44.96 a | 12167.00±126.07 b | 13667.00±66.10 a |
| | FC | | |
| **FC 1-4** | 2.36±0.32 a | 2.03±0.12 b | 2.68±0. 18 a |
| **FC 4-7** | 3.68±0.02 b | 3.30±0.03 c | 4.05±0.06 a |
| **FC 7-10** | 4.29±0.07 b | 4.82±0.07 b | 10.71±1.57 a |
| **FC1-7** | 2.95+0.07 b | 2.70±0.02 b | 3.68±0.02 a |
| **FC 1-10** | 3.37±0.02 b | 3.29±0.01 b | 4.88±0.08 a |

a...d. Means, within trait and source of variation (S.O.V), followed by different superscripts, differ significantly (Duncan, 1955).

**TABLE 3. The different between Molar, *Mascufy and* Pekiny in carcass**

| Strain<br>Item | Molar | *Mascufy* | Pekiny |
|---|---|---|---|
| **BW10** | 3951.70±16.54 b | 4600.00±42.63 a | 2495.00±15.16 c |
| **Carcass(g)** | 2826.70±17.78 b | 3298.30±31.20 a | 1761.70±15.64 c |
| **Liver(g)** | 110.00±1.49 a | 110.00±1.97 a | 45.00±0.83 b |
| **Gizard(g)** | 105.00±0.11 a | 103.33±0.43 a | 70.00±2.20 b |
| **Heart(g)** | 38.33±0.43 a | 38.33±1.55 a | 16.67±0. 48 b |
| **Giblet weight(g)** | 253.33±1.55 a | 251.67±3.82 a | 133.33±2.09 b |
| **Giblet%** | 6.41±0.24 a | 5.46±0.36 b | 5.34±0.06 b |
| **Edible weight (g)** | 3080.00±18.09 b | 3550.00±34.88 a | 1895.00±17.40 c |
| **Edible%** | 77.96±0.33 a | 77.17±0.04 b | 75.95±0.23 c |
| **Non-Edible Weight(g)** | 871.67±13.79 b | 1050.00±7.75 a | 600.00±2.50 c |
| **Non- Edible%** | 22.05±15.14 c | 22.84±0.04 b | 24.08±0.23 a |

a...d. Means, within trait and source of variation (S.O.V), followed by different superscripts, differ significantly (Duncan, 1955).

**TABLE 4. The different between Molar, *Mascufy and* Pekiny in blood parameters before injection (mg/dL)**

| Strain<br>Item | Molar | *Mascufy* | Pekiny |
|---|---|---|---|
| **Tp1** | 6.30±0.09 [a] | 5.46±0.03 [b] | 4.51±0.04 [c] |
| **Al1** | 3.05±0.04 [a] | 2.42±0.06 [b] | 1.10 ±0.03 [c] |
| **Gl1** | 3.26±0.05 [a] | 3.04 ±0.09 [b] | 3.34 ±0.06 [a] |
| **Agratio1** | 0.95±0.03 [a] | 0.84 ±0.05 [b] | 0.34±0.01 [c] |
| **Chol.1** | 133.58±0.70 [a] | 93.58±0.06 [b] | 85.67±0.13 [c] |
| **HDL1** | 7.48±0.03 [a] | 4.74±0.03 [b] | 4.28±0.03 [c] |
| **LDL1** | 126.20±0.66 [a] | 88.84±0.30 [b] | 80.69±0.20 [c] |
| **Creatinin.1** | 0.51±0.01 [b] | 0.53±0.03 [a] | 0.50±0.01 [c] |
| **Triglycr.1** | 168.95±2.45 [a] | 151.68±6.75 [b] | 144.52±1.49 [c] |
| **Alkalin.1** | 40.24±0.34 [b] | 60.24±0.44 [a] | 39.21±0.14 [c] |
| **T.Lipids1** | 635.22±2.64 [c] | 749.60±2.46 [a] | 672.60±3.18 [b] |
| **AST1** | 37.67±1.01 [a] | 36.00±1.55 [a] | 26.27±0.43 [b] |
| **ALT1** | 14.10±0.10 [b] | 14.33±0.09 [b] | 14.67±0.09 [a] |

[a...d.] Means, within trait and source of variation (S.O.V), followed by different superscripts, differ significantly (Duncan, 1955).

**TABLE 5. The different between Molar, Mascufy and Pekiny in blood parameters after injection (mg/dL)**

| Strain<br>Item | Molar | Mascufy | Pekiny |
|---|---|---|---|
| **tp2** | 6.71±0.03 [b] | 6.84±0.03 [a] | 6.30±0.05 [c] |
| **al2** | 3.21±0.06 [a] | 3.01±0.02 [b] | 1.28±0.01 [c] |
| **gl2** | 3.49±0.10 [c] | 3.83±.02 [b] | 5.02±0.03 [a] |
| **agratio2** | 0.97±0.04 [a] | 0.79±0.01 [b] | 0.25±0.01 c |
| **Chol_2** | 75.13±0.24 [c] | 90.72±0.06 [a] | 84.44±0.06 [b] |
| **HDL2** | 5.86±0.02 [a] | 4.28±0.03 [b] | 4.14±0.02 [c] |
| **LDL2** | 69.28±0.24 [c] | 86.55±0.08 [a] | 80.30±0.05 [b] |
| **Creatinin_2** | 0.51±0.01 [a] | 0.51±0.01 [a] | 0.50±0.01 [b] |
| **Triglycr_2** | 106.11±2.19 [b] | 98.83±0.10 [c] | 125.53±1.05 [a] |
| **Alkalin_2** | 40.11±.02 [b] | 54.84±0.24 [a] | 38.71±0.07 [c] |
| **T#_Lipids_2** | 621.39±0.21[c] | 771.34±1.78 [a] | 640. 99±4.35 [b] |
| **AST_2** | 32.50±0.37 [a] | 30.00±0.01 [b] | 26.67±0.86 [c] |
| **ALT2** | 14.50±0.07 | 14.5±0.07 | 14.33±0.09 |

a...d. Means, within trait and source of variation (S.O.V), followed by different superscripts, differ significantly (Duncan, 1955).

**TABLE 6. Blood constitute before and after injection for Molar, Mascufy and Pekiny ducks (mg/dL).**

| Strain<br>Item | | Molar3 | *Mascufy 1* | Pekiny2 |
|---|---|---|---|---|
| **Tp1** | Bef. | 6.30±0.03 | 5.46±0.03 | 4.51±0.03 |
| | After | 6.71±0.04** | 6.48±0.04** | 6.30±0.05** |
| **Al1** | Bef. | 3.05±0.04 | 2.42±0.06 | 1.10±0.03 |
| | After | 3.21±0.06** | 3.01±0.18** | 1.27±0.05** |
| **Gl1** | Bef. | 3.260±0.51 | 3.04±0.09 | 3.34±0.06 |
| | After | 3.50±0.09** | 3.83±0.07** | 5.02±0.03** |
| **Agratio1** | Bef. | 0.95±0.03 | 0.84±0.05** | 0.34±0.16 |
| | After | 0.97±0.04 | 0.74±0.09 | 0.25±0.01 |
| **Chol_1** | Bef. | 133.58±0.66** | 93.58±0.06** | 85.67±0.13** |
| | After | 75.13±0.24 | 90.72±0.06 | 84.44±0.06 |
| **HDL1** | Bef. | 7.48±0.03** | 4.74±0.03** | 4.28±0.03 |
| | After | 5.86±0.02 | 4.28±0.03 | 4.15±0.05** |
| **LDL1** | Bef. | 126.20±0.66** | 88.84±0.30** | 80.69±0.20 |
| | After | 69.28±0.24 | 86.55±0.80 | 80.30±0.15 |
| **Creatinin_1** | Bef. | 0.51±0.01 | 0.53±0.3** | 0.50±0.01 |
| | After | 0.51±0.01 | 0.51±0.01 | 0.50±0.02 |
| **Triglycr_1** | Bef. | 168.95±2.45** | 151.68±6.75** | 144.52±1.49** |
| | After | 106.11±1.05 | 98.83±0.9 | 125.53±1.05 |
| **Alkalin_1** | Bef. | 40.24±0.34 | 60.24±0.44** | 39.21±0.14 |
| | After | 40.00±0.20 | 54.84±0.24 | 38.71±0.07 |
| **T#_Lipids_1** | Bef. | 635.22±2.64** | 749.60±2.46 | 672.60±3.18** |
| | After | 621.39±2.21 | 771.34±1.78** | 641.99±4.35 |
| **AST_1** | Bef. | 37.67±1.01** | 36.00±1.55** | 26.27±0.43 |
| | After | 32.50±0.37 | 30.00±1.00 | 26.67±0.86 |
| **ALT1** | Bef. | 14.10±0.10 | 14.33±0.09 | 14.67±0.09 |
| | After | 14.50±0.07** | 14.50±0.07** | 14.33±0.09 |

**References**


1. Fouad, A.M., Ruan, D., Wang, S., Chen, W., Xia, W. and Zheng, C., Nutritional requirements of meat-type and egg-type ducks: what do we know?. *Journal of Animal Science and Biotechnology*, **9**(1), 1-11(2018).
2. Liu, Y., Li, Y., Feng, X., Wang, Z. and Xia, Z. Dietary supplementation with Clostridium butyricum modulates serum lipid metabolism, meat quality, and the amino acid and fatty acid composition of Peking ducks. *Poultry Science*, **97**(9), 3218-3229(2018).
3. Xi, Y., Wu, Q., Zeng, Y., Qi, J., Li, J., He, H., Xu, H., Hu, J., Yan, X., Bai, L. and Han, C. Identification of the genetic basis of the duck growth rate in multiple growth stages using genome-wide association analysis. *BMC Genomics*, **24**(1), 1-11 (2023).
4. Nasr, M.A., Alkhedaide, A.Q., Radwan, M.M., Abd-El Salam, E.H., Hussein, M.A. and El Bayomi, R.M. Growth, carcass parameters, biochemical and oxidative stress indices, and meat traits of duck breeds under different stocking densities. *Poultry Science*, **101**(9), 1-9(2022).
5. Krunt, O., Zita, L., Kraus, A., Vejvodová, K., Drábek, O., Kuře, J. and Chmelíková, E., The Impact of Different Environments on Productive Performance, Welfare, and the Health of Muscovy Ducks during the Summer Season. *Agriculture*, **13**(7), 1319-1335(2023).
6. Bromfield, J.I., Hoffman, L.C., Horyanto, D. and Soumeh, E.A. Enhancing growth performance, organ development, meat quality, and bone mineralisation of broiler chickens through multi-enzyme super-dosing in reduced energy diets. *Animals*, 11(10), 2791 (2021).
7. Hassan, F.A., Roushdy, E.M., Zaglool, A.W., Ali, M.A. and El-Araby, I.E. Growth performance, carcass traits and economic values of Pekin, Muscovy, and Mulard ducks. *Slov. Vet. Res*, **55**(20), 357-365 (2018).
8. Taboosha, M.F. Effect of stocking density and slaughter age on growth performance and carcass traits of female mule ducks (crossbred of Muscovy drake and Pekin ducks) during summer season in Egypt. *Middle East Journal of Applied Sciences*, **4**(4), 1023-1033(2014).
9. Abdel-Hamid, T.M., Nasr, M.A., Saleh, N.A. and Sherief, W.R. Growth Performance, Hematological Characteristics and Carcass Merits in Four Different Duck Breeds. *Journal of Advanced Veterinary Research*, **13**(6), 922-926(2023).
10. Janiszewski, P., Murawska, D., Hanzal, V., Gesek, M., Michalik, D. and Zawacka, M. Carcass characteristics, meat quality, and fatty acid composition of wild-living mallards (Anas platyrhynchos L.). *Poultry Science*, **97**(2), 709-715(2018).
11. Kokoszyński, D., Piwczyński, D., Arpášová, H., Hrnčar, C., Saleh, M. and Wasilewski, R., A. Comparative study of carcass characteristics and meat quality in genetic resources Pekin ducks and commercial crossbreds. *Asian-Australasian Journal of Animal Sciences*, **32**(11), 1753-1762(2019).
12. Abo Ghanima, M.M., El-Edel, M.A., Ashour, E.A., Abd El-Hack, M.E., Othman, S.I., Alwaili, M.A., Allam, A.A., Khafaga, A.F. and Abd El-Aziz, A.H. The influences of various housing systems on growth, carcass traits, meat quality, immunity and oxidative stress of meat-type ducks. *Animals*, **10**(3), 410-421(2020).
13. SAS Institute. Statistical analysis systems user’s guide,” Version 9.2. SAS Inst., Inc., Cary, NC. USA. 170 pp. (2008).
14. Duncan, D.B., Multiple range and multiple F tests. *Biometrics,* **11**, 1-42(1955).
15. Omar, M.A., Abdel-Hamid, T.M., Esam, S., Omar, A.E. Growth and economic performance of using Dried Tomato Pomace for Mallard Ducks. *Slovenian Veterinary Research*, **56**, 699-706(2019).
16. Galal, A., Ali, W.A.H., Ahmed, A.M.H. and Ali, K.A. Performance and carcass characteristics of Dumyati, Muscovy, Peking and Sudani duck breeds. *Egyptian Journal of Animal Production*, **48**(2),191-202( 2011).
17. Bhuiyan, M.M., Khan, M.H., Khan, M.A.H., Das, B.C., Lucky, N.S. and Uddin, M.B. A study on the comparative performance of different breeds of broiler ducks under farmer’s condition at farming system research and development (FSRD) site, Sylhet, Bangladesh. Bangladesh. *International Journal of Poultry Science*, **4**(8), 596-599 (2005).
18. Chartrin, P., M.D. Bernadet, G. Guy, J. Mourot, J.F. Hocquette, N. Rideau, M.J. Duclos and Baeza. E. Does force feeding enhance genotype effects on liver ability for lipogenesis and lipid secretion in ducks. *Comparative Biochemistry and Physiology Part A: Molecular and Integrative Physiology*, **145**(3), 390-396 (2006).
19. Adeola O. Review of research in duck nutrient utilization. *International Journal of Poultry Science*, **5**,201-204 (2006).
20. Pingel, H. Results of selection for breast muscle percentage and feed conversion ratio in Pekin ducks. *Biotechnology in Animal Husbandry*, **27**(3), 769-776 (2011).

21. Xie, M., Jiang, Y., Tang, J., Wen, Z.G., Huang, W. and Hou, S.S. Effect of stocking density on growth performance, carcass traits, and foot pad lesions of white Pekin ducks. *Poultry Science*, **93**(7), 16441648.2014).

22. Dozier, W.A., Corzo, A., Kidd, M.T., Schilling, M.W. Dietary digestible lysine requirements of male and female broilers from forty-nine to sixty-three days of age. *Poultry Science*, **87** (7),1385-1391(2008).

23. El-Sayed, M. Y. and Mahrous, U.E. Influence of force feeding on productive performance traits, foie gras production, blood parameters, internal organs, carcass traits, and mortality rate in two breeds of ducks. *World Academy of Science, Engineering and Technology*, **7**(3), 09-03 (2013).

24. Olukosi, J. O., Erhabor, P.O. Introduction to farm management: principles and applications. *Agitab Publishers Limited, Zaria, Nigeria*, 77–83 (1988).

25. Kamal, R., Chandran, P.C., Dey, A., Sarma, K., Padhi, M.K., Giri, S.C. and Bhatt, B.P., Status of Indigenous duck and duck production system of India—a review. *Tropical Animal Health and Production*, ***55***(1), 15 (2023)

26. Omojola AB. Carcass and organoleptic characteristics of duck meat as influenced by breed and sex. *International Journal of Poultry Science*, **6**(5), 329-334. (2007).

27. Jaturasitha, S., Khiaosaard, R., Pongpaew, A., Leowtharakul, A., Saitong, S., Apichatsarangkul, T, Leaungwunta, V. Langani, N. The effects of strain, sex, weight, and muscle on fat quality of Thai native and crossbred chickens (Kai Baan Thai). In: Proceedings of the 42 Annual Conference. Bangkok, 3-6 February 2005. Bangkok (Thailand): Kasetsart University. p. 137146.( 2004).

28. Liu F, Niu Z. Carcass quality of different meat-typed chickens when achieve a common physiological body weight. *International Journal of Poultry Science*, **7**(6), 319-322. (2008).

29. Arieli, A., Meltzer, A. and Berman, A. Seasonal acclimatization in the hen. *British Poultry Science,* **20**(6), 505-513 (1979).

30. Arak, H. and Torshizi, M.A.K. Comparative consequences of two sources of aflatoxins in ducklings experimental aflatoxicosis. In Veterinary Research Forum (Vol. 12, No. 3, p. 305). Faculty of Veterinary Medicine, Urmia University, Urmia, Iran (2021).

31. Szabo, A., Mezes, M., Horn, P., Sütő, Z., Bázár, G.Y. and Romvari, R. Developmental dynamics of some blood biochemical parameters in the growing turkey (Meleagris gallopavo). *Acta Veterinaria Hungarica,* **53**(4), 397-409 (2005).

32. Silva, P.R.L., Freitas Neto, O.C., Laurentiz, A.C., Junqueira, O.M. and Fagliari, J.J. Blood serum components and serum protein test of Hybro-PG broilers of different ages. *Brazilian Journal of Poultry Science,* **9**(4), 229-232. (2007).

33. Sonia, C., Rajini, R.A., Babu, M., Vairamuthu, S. and Sujatha, T. Serum biochemical profile in pearl Guinea fowl. *Indian Veterinary Journal,* **90**(1), 134-135(2013).

34. El-Fiky, A.A., Zanaty, G.A., Ali, W.A.H. and Dahrouj, A.A.F., Study on the ducks fatty liver production under the Egyptian conditions. *Menoufia Journal of Animal Poultry and Fish Production,* **3**(1)13-27 (2019).

35. Ruan, D., Zhu, Y.W., Fouad, A.M., Yan, S.J., Chen, W., Zhang, Y.N., Xia, W.G., Wang, S., Jiang, S.Q., Yang, L. and Zheng, C.T. Dietary curcumin enhances intestinal antioxidant capacity in ducklings via altering gene expression of antioxidant and key detoxification enzymes. *Poultry Science,* **98**(9), 3705-3714. (2019).

## دراسة مقارنة لسلالات البط المولار والمسكوفي والبكيني: تقييم النمو وجودة الذبيحة وخصائص الدم

**أحمد مسعد عبدالسلام [1] ، جمعة سعيد رمضان[1]، أستفتاح محمد الكومي[1]، أحمد رمزي عبدالله[2] ، عبدالخالق ابوالفتوح الغمري[1] و امل أحمد عبد الحليم[3]**

1. قسم الإنتاج الحيواني - معهد البحوث الزراعية والبيولوجية - المركز القومي للبحوث - 12622 - الدقي - الجيزة - مصر.
2. قسم الانتاج الحيواني - كلية الزراعة - جامعة الازهر - مدينة نصر- القاهرة - مصر.
3. قسم الانتاج الحيواني - كلية الزراعة - جامعة القاهرة - القاهرة - مصر.

تشمل البيانات المقدمة تحليلاً شاملاً لمختلف العوامل المتعلقة بالإنتاج ومواصفات الذبيحة والدم لثلاث سلالات من البط: المولار، والمسكوفي، والبكيني. تتم الإشارة إلى وجود اختلافات معنوية . ومن حيث مؤشرات الإنتاج قد أظهر البط المولار تفوقاً في وزن الجسم وزيادة في وزن الجسم في نهاية مرحلة النمو (BW10). وكانت هذه الاختلافات ذات تاثير معنوى ، مما يدل على قدرة السلالة على زيادة الوزن. كما أظهرالبط البكيني أيضًا افضلية في العلف المأكول (FI) ولكن ليس في كفاءة تحويل العلف (FC). كما كشفت ايضا مواصفات الذبيحة أن البط المسكوفى كان أعلى وزن للذبيحة ونسبة التصافى ، بينما كان البيكينى هو الأقل وزن و ونسبة التصافى. كانت هذه الاختلافات معنويا.. بفحص مؤشرات الدم قبل وبعد الحقن، أظهرت معظم القيم عدم وجود فروق معنوية بين سلالات البط (P<0.05). ومع ذلك، فإن القياسات المتعلقة بالدهون، مثل الكولسترول، HDL، LDL، والدهون الثلاثية، أظهرت اختلافات خاصة بكل سلالة. يؤكد التحليل على إمكانية وجود اختلافات كبيرة في مختلف جوانب إنتاج البط، بما في ذلك وزن الجسم ومواصفات الذبيحة والكيمياء الحيوية للدم. ولهذه الاختلافات آثار عملية على اختيار السلالات وإدارتها في صناعة الدواجن. يعد إجراء مزيد من البحث ضروريًا لاستكشاف الآليات والآثار الكامنة وراء هذه الاختلافات وتحسين نتائج الإنتاج والصحة في تربية البط.

**الكلمات الدالة :** سلالات البط ، وزن الجسم ، العلف الماكول ، الذبيحة ، قياسات الدم.