



Egg quality and carcass characteristics of *Nag Hans* – A local duck in Bastar region of Chhattisgarh

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Received: 25 September 2024; Accepted: 9 December 2024

ABSTRACT

The present study was carried out to study egg quality and carcass characteristics of *Nag Hans*, a local duck of Bastar region in Chhattisgarh. About 300 eggs were examined to study the internal and external egg quality and 20 birds (10 male and 10 female) were slaughtered to study carcass characteristics. All the statistical analyses were done using R statistical software 2020. The different egg quality traits egg weight (g), shell weight (g), albumen weight (g), yolk weight (g), shell thickness (mm), specific gravity, albumen index, Haugh unit and yolk index recorded were 57.45±0.54, 6.57±0.09, 23.21±0.15, 24.70±0.31, 0.36±0.03, 1.15±0.09, 22.69±10.35, 89.52±1.14 and 40.04±0.39 respectively. The different carcass characters such as age at slaughter (yr), slaughter weight (kg), dressing (%) and meat bone ratio recorded were 1.7±0.12, 2.09±0.18, 73.36±2.71 and 3.81±0.33 respectively for male ducks and 1.34±0.18, 1.25±0.08, 69.21±0.87 and 1.16 for female ducks respectively.

Keywords: Bastar, Carcass, Chhattisgarh, Duck, Egg

There are 33.51 million ducks as per 20th livestock census against 23.53 million in the 19th livestock census that shows a change of 42.36% in population which means that there is an increase in demand of duck and duck farming (Patil *et al.* 2021). Indigenous ducks of our country constitute more than 90% of the total duck population. The Muscovy duck is also known as *Nag Hans* in Bastar district of Chhattisgarh. There is a great demand for *Nag Hans* among the tribals of Chhattisgarh state and thus, duck farming can be exploited as a subsidiary income and food source. Duck egg and meat is of increasing importance in human nutrition worldwide due to its high nutritive value. Compared to broiler meat, duck egg and meat contains higher percentages of protein and fiber, lower percentages of fat (Starcevic *et al.* 2021). It has been globally recognized that conservation and improvement of native animal genetic resources are essential for sustainable development in agriculture and animal husbandry (Rege and Gibson 2003, Cilek 2015, Ovaska *et al.* 2021, Ghildiyal *et al.* 2023). Hence this study was aimed to study the egg quality and carcass characteristics of *Nag Hans* duck.

MATERIALS & METHODS

The Chhattisgarh state is broadly divided into 3 agro-climatic zones, comprising Northern hills, Chhattisgarh plains, and Bastar plateau. The present study was carried

out for characterization of *Nag Hans* a local duck of Bastar plateau region in Chhattisgarh. Bastar, a district of Chhattisgarh, is also known as *Dakshin Kaushal*. Bastar is well known for its tribal population, which comprises of around 63% of the total population. Bastar has a tropical wet and dry climate. Bastar lies in the southern most part of Chhattisgarh, India. It extends between 81 27'03 N to 82 7'58 N latitudes and 18 40'25 E to 19 38'45 E longitudes (Pradhan *et al.* 2022)

Data: The study was done in the different blocks of Bastar district like Bastar, Darbha, Bastanar, Tookapal and Jagdalpur. About 300 eggs (45-50 weeks) were examined to study the internal and external egg quality and 20 birds (10 males and 10 females) of average age 1-1.5 years were slaughtered to study carcass characteristics. Individual birds were weighed using digital spring weight balance to determine their body weight. The study of internal and external quality of eggs and carcass characteristics were conducted in the laboratory of Veterinary Polytechnic College, Jagdalpur under Dau Shri Vashudev Chandrakar Kamdhenu Vishwavidyalaya, Durg. All measurements of egg quality were made within 48 hours following egg collection from farmer's door (Padhi *et al.* 2021).

Statistical Analysis: The summary statistics (Mean, standard deviation, standard error and coefficient of variation) of all the parameters was estimated using *basic statistical package* R statistical software (R 3.6.3 version) R environment (2020). To compare the difference between traits of male and female -Independent Sample T-test was conducted using *test function* R statistical software (R 3.6.3

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version) R environment (2020).

RESULTS AND DISCUSSION

Rearing of Nag-Hans duck: The tribal peoples generally provide ducks with leftover food like rice husk locally called as *Konda*. The ducks spend most of its day time scavenging in the ponds. During scavenging in the ponds, they feed on snails, crab, algae, plankton, fishlings etc available in the water. The Nag-Hans ducks are provided with temporary housing made of low cost locally available materials such as bamboos, tree branches, mud, palm fronds, dry grasses and leaves for night shelter.

Egg quality traits: The different egg quality characters of *Nag Hans* ducks is presented in Table 1.

Table 1. Evaluation of different egg quality traits of *Nag Hans* ducks

Attribute	Mean±S.E
Egg weight (g)	57.45±0.54
Shell weight (g)	6.57±0.09
Albumin weight (g)	23.21±0.15
Yolk weight (g)	24.70±0.31
Shell thickness (mm)	0.36±0.03
Specific gravity	1.15±0.09
Albumin index	22.69±10.35
Haugh unit	89.52±1.14
Yolk index	40.04±0.39

Very scanty information is obtained in relation to egg production traits of indigenous breeds of ducks. The average age at first egg reported in Nag Hans ducks aligns with the findings of Giri *et al.* (2014) for indigenous ducks of Odisha, Padhi (2014) for Moti ducks of Odisha, and Morduzamman *et al.* (2015) for Nageswari ducks. Similar trends were observed by Kamal *et al.* (2020) in Maithili ducks of the middle Gangetic plain of Bihar, as well as in indigenous ducks of Jharkhand, Odisha, and Chhattisgarh. Additionally, Naik *et al.* (2022) reported comparable results for Pati ducks of Assam, Maithili ducks of Bihar, Nageswari ducks of Assam, Kuttanad ducks of Kerala, and local ducks of Andaman. *Nag Hans* ducks has a very low egg production (30-38 eggs annually). The annual egg production of *Nag Hans* ducks is very close to the egg production of Pati ducks, Cinahanh ducks, Maithili ducks and Rajhanh ducks as reported by Kamal *et al.* (2020). Higher annual egg production is reported in other indigenous ducks of India by many workers viz. Khatun *et al.* (2020) in Rupali and Nageswari duck, Naik *et al.* (2022) in Pati ducks of Assam, in Nageswari ducks of Assam, Kuttanad ducks of Kerala, Keeri ducks of Tamil Nadu and in local ducks of Andaman.

The most predominant egg shell colour of *Nag Hans* ducks reported in the present study was light brown contributing 57% of total egg shell color followed by white (40%) and brown (3%) respectively. Phookan *et al.* (2018) studied the egg quality characteristics in Nageswari ducks of North Eastern region of India and reported the shell

color as greenish blue. Momu and Hossain (2022) studied the egg quality characteristics in Deshi black and Deshi white ducks of Bangladesh and reported the greenish white egg shell color in Deshi black ducks and white color in Deshi white ducks of Bangladesh.

The average egg weight recorded in this study (55 g) is consistent with the findings of several researchers, including Veeramani *et al.* (2014) in indigenous ducks of Tamil Nadu, Phookan *et al.* (2018) in Pati ducks, and Wijedasa *et al.* (2020) in indigenous ducks of Sri Lanka. However, higher egg weights have been reported in various duck breeds by Sarma *et al.* (2013) in two indigenous ducks of Assam (Chara-Chemballi and Pati), Giri *et al.* (2014) in indigenous ducks of Odisha, and Morduzamman *et al.* (2015) in Nageswari ducks of Bangladesh. Similar trends of higher egg weights were also observed by Popoola *et al.* (2015), Amao and Olugbemiga (2016), and Nuhu *et al.* (2018) in indigenous ducks of Nigeria, as well as by Phookan *et al.* (2018) in Nageswari, Tripura local, and Manipur local ducks. Additionally, Khatun *et al.* (2020) reported higher egg weights in Rupali and Nageswari ducks of Bangladesh, Kholy *et al.* (2021) in Domyati indigenous ducks of Egypt, Widianingrum *et al.* (2020) in Muscovy ducks of Indonesia, and Momu and Hossain (2022) in Deshi black and Deshi white ducks of Bangladesh.

The average egg shell weight recorded in this study is in agreement with many workers viz. Giri *et al.* (2014) in indigenous ducks of Odisha, Amao and Olugbemiga (2016) in indigenous ducks of Nigeria. Higher egg shell weight as compared to present study was reported by Nuhu *et al.* (2018) in indigenous ducks of Nigeria, Savanna, Kholy *et al.* (2021) in Domyati indigenous ducks of Egypt.

The average albumen weight recorded in this study is in agreement with Amao and Olugbemiga (2016) in indigenous ducks of Nigeria. Higher albumen weight as compared to present study was reported by Giri *et al.* (2014) in indigenous ducks of Odisha, Nuhu *et al.* (2018) in indigenous ducks of Nigeria, Kholy *et al.* (2021) in Domyati indigenous ducks of Egypt.

Most of the researchers have recorded lower or higher yolk weight as compared to present study. Lower yolk weight as compared to present study was recorded by Popoola *et al.* (2015) in ducks of Nigeria and Kholy *et al.* (2021) in Domyati indigenous ducks of Egypt. Higher yolk weight as compared to present study was reported by Giri *et al.* (2014) in indigenous ducks of Odisha, Amao and Olugbemiga (2016) in indigenous ducks of Nigeria and Nuhu *et al.* (2018) in indigenous ducks of Nigeria, Savanna.

The average eggshell thickness recorded in this study aligns with the findings of several researchers, including Sarma *et al.* (2013) in Chara-Chemballi and Pati ducks, Nuhu *et al.* (2018) in indigenous ducks of Nigeria and Savanna, and Phookan *et al.* (2018) in Nageswari ducks. However, lower eggshell thickness compared to the present study has been reported by Phookan *et al.* (2018) in Pati and Tripura local ducks, Kholy *et al.* (2020) in Domyati ducks, and Wijedasa *et al.* (2020) in indigenous ducks

of Sri Lanka. Conversely, higher eggshell thickness was observed by Phookan *et al.* (2018) in Manipur local ducks, Giri *et al.* (2014) in indigenous ducks of Odisha, Amao and Olugbemiga (2016) in indigenous ducks of Nigeria, and Khatun *et al.* (2020) in Rupali and Nageswari ducks of Bangladesh.

Most of the researchers have recorded lower albumen as compared to present study. Sarma *et al.* (2013) in Chara-Chemballi and Pati ducks, Amao and Olugbemiga (2016) in indigenous ducks of Nigeria, Nuhu *et al.* (2018) in indigenous ducks of Nigeria, Savanna, Phookan 2018 *et al.* (2018) in Pati, Nageswari, Tripura local and Manipur local ducks of North Eastern region of India, Khatun *et al.* (2020) in Rupali and Nageswari duck of Bangladesh.

A lower albumen index compared to the present study was reported by Sarma *et al.* (2013) in Pati ducks, Amao and Olugbemiga (2016), and Nuhu *et al.* (2018) in indigenous ducks of Nigeria, as well as Khatun *et al.* (2020) in Rupali and Nageswari ducks of Bangladesh. Conversely, a higher albumen index was reported by Sarma *et al.* (2013) in Chara-Chemballi ducks, Popoola *et al.* (2015) in indigenous ducks of Nigeria, Phookan *et al.* (2018) in Pati, Nageswari, Tripura local, and Manipur local ducks of the northeastern region of India, and Wijedasa *et al.* (2020) in indigenous ducks of Sri Lanka.

Amao and Olugbemiga (2016) studied the egg quality characteristics of indigenous ducks in Nigeria, while Phookan *et al.* (2018) examined these traits in Pati and Tripura local ducks. A higher Haugh unit compared to the present study was reported by Sarma *et al.* (2013) in Chara-Chemballi and Pati ducks, Popoola *et al.* (2015) in indigenous ducks of Nigeria, and Nuhu *et al.* (2018) in indigenous ducks of Nigeria and Savanna. Additionally, Phookan *et al.* (2018) studied egg quality characteristics in Nageswari and Manipur local ducks, while Khatun *et al.* (2020) reported similar findings in Rupali and Nageswari ducks of Bangladesh.

The performance of any species is greatly contributed by both genotype and environment. Tribal peoples of Bastar region are generally poor and have less source of income for the proper management and feeding of the duck breed which is one of the limiting factors for food availability to the ducks, and that may be the prime reason for lesser egg quality parameters as compared to other recognized breeds of India as well as abroad.

In poultry, the egg quality parameters are primarily determined by the genotype of the female birds. Birds that lay larger eggs may have better genetic constitution for all the egg quality parameters like size, weight etc. As a result, their descendants would inherit a similar higher genetic endowment for these characteristics. The systematic selection for high quality genes that controls different egg quality and egg production parameters for *Nag Hans* ducks are lacking and it may also be contributing for poor egg production and egg quality parameters.

Carcass characters: The different carcass characters of *Nag Hans* ducks is presented in Table 2 for male and

Table 2. Evaluation of Different Carcass Characters of *Nag Hans* ducks

Carcass Characters	Mean±S.E (Male)	Mean±S.E (Female)	P-Value
Average Slaughter Age (years)	1.7±0.12	1.34±0.18	0.007**
Slaughter Weight (Kg)	2.09±0.18	1.25±0.08	0.0016**
Defeatherd Weight (Kg)	1.95±0.15	1.21±0.08	0.001**
Head (g)	94.79±7.89	67.17±7.86	0.019**
Feet(g)	55.75±6.04	33.10±3.93	0.006**
Heart(g)	21.31±3.27	12.31±0.68	0.027*
Liver(g)	37.06±2.40	32.15±3.70	0.14 ^{NS}
Gizzard(g)	61.73±7.89	46.85±0.88	0.001**
Dressing Percentage (%)	73.36±2.71	69.21±0.87	0.002**
Meat to Bone Ratio	3.81±0.33	3.39±0.12	0.148**

*= Significant at P<0.05, **= Significant at P<0.01, NS= Non-Significant

female *Nag Hans* ducks.

In this study, a significant difference is obtained in the carcass characters of adult male and female *Nag Hans* ducks (Table 2). Male *Nag Hans* ducks had more slaughter weight, defeatherd weight, head weight, feet weight, heart weight, gizzard weight, dressing percentage and meat to bone ratio as compared to female *Nag Hans* ducks. Liver weight showed no significant difference in male and female *Nag Hans* ducks. Very few literature was found with respect to carcass characters in ducks.

A shorter age at slaughter compared to *Nag Hans* ducks was reported by Kuzniacka and Adamski (2019) in Pekin duck breeds F11, A55, and AF51 of Poland, Cyriac *et al.* (2020) in Kuttanad ducks of Kerala, Bugiwati *et al.* (2021) in Pekin and local ducks of Indonesia, and Debnath *et al.* (2023) in local ducks of Tripura.

A lower average live weight at slaughter was reported by Cyriac *et al.* in Kuttanad ducks of Kerala, Ahmad *et al.* (2021) in local Nageswari ducks of Bangladesh, Bugiwati *et al.* (2021) in Pekin and local ducks of Indonesia, Nimmi *et al.* (2022) in Kuttanad ducks of Kerala, and Padhi *et al.* (2022) in Kuzi ducks of Odisha. In contrast, a higher average live weight at slaughter was reported by Galal *et al.* (2011) in Muscovy, Pekin, and Sudani ducks, Steczny *et al.* (2017) in Pekin ducks of Egypt, Hassan *et al.* (2018) in Pekin, Muscovy, and Mallard ducks, Kuzniacka and Adamski (2019) in three strains of Pekin ducks (F11, A55, and AF51) of Poland, Ewuola *et al.* (2020) in local ducks of Nigeria, and Linh *et al.* (2022) in Muscovy ducks of Vietnam.

As reported in many animal species (Cilek 2009; Cilek and Gotoh 2014), it can be said that males have a higher body weight than females. Most of the workers have reported a shorter age at slaughter and higher slaughter weight as compared to *Nag Hans* ducks. Sexual maturity and body growth are greatly influenced by the environment, quality and quantity of feed, management and genetic potential of the birds resulting in high age at slaughter and lower slaughter weight as in *Nag Hans* ducks.

The lower dressing percentage was reported by Cyriac *et al.* (2020) in Kuttanad ducks of Kerala, Ahmad *et al.* (2021) in local Nageswari ducks of Bangladesh, Bugiwati *et al.* (2021) in Pekin ducks and local ducks of Indonesia, Nimmi *et al.* (2022) in Kuttanad ducks of Kerala and Debnath *et al.* (2023) in local ducks of Tripura; whereas higher dressing percentage as compared to present study was reported by Hassan *et al.* (2018) in Pekin, Muscovy and Mallard ducks. The geographical area, management system and method of slaughter can greatly affect dressing percentage in ducks.

Lower meat bone ratio as compared to present study was reported by Padhi *et al.* (2022) in Kuzi ducks of Odisha and Debnath *et al.* (2023) in local ducks of Tripura. Higher meat bone ratio as compared to present study was reported by Bugiwati *et al.* (2021) in Pekin ducks and local ducks of Indonesia.



Fig. 1. Male Nag Hans Duck.

From the above study, it may be concluded that the *Nag Hans* ducks of Chhattisgarh have good egg and carcass performance and systematic breeding plan for the selection of good performance birds is needed. However, this study could be useful to provide some baseline information on production performance, egg quality traits and carcass characteristics of indigenous duck of Chhattisgarh for future improvement and research programs in local duck of Chhattisgarh

ACKNOWLEDGEMENT

The authors express their sincere gratitude to the Dean, College of Veterinary Science and Animal Husbandry, Anjora, Durg, and Incharge, Veterinary Polytechnic, Jagdalpur, Durg for providing the funds and research facilities for the successful completion of this study.

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