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Reproductive performance of the Philippine's Caraga black native chicken

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Abstract

The Philippines' native chickens' role in the country's economy was recognized as early as 1998. However, no studies have been conducted about the Philippines' Caraga black native chicken. This study evaluated the reproductive performance of the Caraga's black native chicken. A total of 40 heads of native chickens (eight roosters and 32 hens) aged 30 weeks old were utilized as test animals. These test animals are the product of the breeding and purification project of the Caraga black native chicken. The findings revealed that the Caraga black native chickens have an average egg production of 110 eggs per year, an average egg weight of 45.5 grams, an 85% fertility rate, an 84% hatchability rate, and a livability rate of 81%. In addition, the hen's age was observed to affect egg production, present fertility and hatchability.

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Introduction

Hatchability and the survival rate of chicks are the significant factors determining the poultry's productivity (Habte *et al.*, 2013). Fertility, hatchability, egg production, and growth are economically essential traits in local poultry production systems (RSh., 2014; Foleng *et al.*, 2014). The poultry industry regards growth and reproduction as the two most economically valued characteristics (Li *et al.*, 2013).

Breeders usually aim at conserving and increasing the productive efficiency of native chickens genetically for economic traits (R. Sh., 2014; Foleng *et al.*, 2014). High fertility and hatchability of eggs of breeder stock and survivability of the chicks are necessary to produce large numbers of birds (Nse Abasi *et al.*, 2014; Foleng *et al.*, 2014). The supply of day-old chicks is crucial for the success of the poultry production chain (King'ori, 2011), and fertility and hatchability are two significant parameters that highly influence the demand for day-old chicks. Fertility is defined as the percentage of incubated eggs that become fertile, while hatchability refers percentage of fertile eggs that hatch (Wondmeneh *et al.*, 2006; King'ori, 2011; Foleng *et al.*, 2014). Fertility and hatchability are the significant constraints that affect the profitability of the hatchery industry and are influenced by genetics, physiology, and extrinsic factors (Ahmad, 2019). Furthermore, egg handling, collection management, and storage conditions are the primary concerns affecting egg hatchability (Alsobayel *et al.*, 2013; Abudabos *et al.*, 2017).

The Philippines have more than 6 million raisers of native chicken, and the majority of the raisers are farmers in rural areas. The Philippine native chickens have been the primary source of meat and eggs for Filipino farmers (Dusaran & Cabarles, 2005; Dusaran & Pabulayan, 2015). The country's native chickens were recognized as a significant contributor to the continuous supply of eggs and meat, providing extra income for many farmers (Dusaran & Pabulayan, 2015). However, the Philippines' native chicken breeds usually have lower productivity than commercial breeds. The production of these animals is constrained by several factors, such as high early chick attrition, low hatchability, and poor growth rate, all of which respond to improved nutritional, management, financial and general technical inputs (Cocjin *et al.*, 2003).

In the Caraga region, there is an endemic chicken known as Patani. This native chicken possessed distinct morphological traits among the identified Philippine native chickens because of its black plumage, skin, and shank. Further, it has a unique taste, less body fat, and can quickly adapt to the changing environmental conditions of the Caraga Region (Austral *et al.*, 2022). However, no available study has been conducted concerning its reproductive performance. This study deals with the reproductive performance of the Caraga black native chicken, such as egg production, egg quality, percent fertility, percent hatchability, and percent livability.

Materials and methods

Locale of the Study

The study was conducted in the Organic Native Chicken Project area, Caraga State University-Main Campus, breeding facility with a total of eight (8) cages measuring 245cm × 120cm × 350cm and one (1) room for incubation area and one (1) room for hatching area. Each coop has three nests positioned at the same level or height. The grower cage measured 400cm x 400cm, and the brooder boxes were 127cm x 82cm x 52cm with 50 watts of incandescent bulbs. Flooring filled with rice hulls.

Test Animals

A total of 40 heads (8 roosters, 32 hens) of native chicken from the F2 generation of the breeding and purification project of the Caraga black native chicken aged 30 - 39 weeks were subjected to the study of the reproductive performance of the Caraga black native chicken. The breeding flock allowed free access to range area. Commercial feeds and supplemental feeds like *Trichantera gigantea*, *Arachis pintoi*, *Leucaena leucocephala* and *Gliricidia sepium* are equivalent to 50% of the birds' daily requirements that were provided twice a day.

Egg Collection, Incubation, and Hatching

The eggs were collected, stored for seven days, and transferred in the incubator for 18 days. On the 18th day, the eggs were candled to determine their fertile eggs. The fertile eggs were then transferred to the hatcher for three days to hatch while the infertile eggs were pulled out. After hatching, the chicks stayed for one day in the hatcher to avoid mortality. Overall, the egg collection, incubation and hatching take 21 days.

Reproductive Performance

The reproductive performance of the Caraga black native chickens' breeder is evaluated based on the hen-housed egg production (% HHD), percent fertility, percent hatchability (Ayeni *et al.*, 2022), and percent livability. The hen-housed egg production is calculated by dividing the total number of eggs over the number of hen days and multiplying by 100. Percent fertility is the total number of fertile eggs divided by the number of eggs per set and multiplied by 100. In contrast, percent hatchability is the number of chicks hatched divided by the number of fertile eggs multiplied by 100. Percent livability is the total number of alive chicks over the number of chicks multiplied by 100(Ayeni *et al.*, 2022; Dzungwe *et al.*, 2018).

Egg Quality

The assessment of the egg quality includes shell, albumen, and yolk divided into external and internal qualities. The external quality is egg weight, length (mm), width (mm), shell weight (gm), and shell thickness (mm): top (mm), middle (mm), and bottom (mm) and measured by the use of a digital calliper. Moreover, internal quality is yolk weight (gm), yolk color, and albumen weight (gm). The eggs subjected to the analysis were stored in the laboratory and held at room temperature for 24 hours.

Data Analysis

The data on egg production, percent fertility, percent hatchability, percent livability, and egg quality were calculated using Microsoft Excel 2013.

Results and discussions

Total Egg Production

The average annual total egg production of Caraga black native chicken recorded 121 eggs/hen from the initial 40 breeder hens ages 30 to 38 weeks old. It was observed that the increase and decrease in egg production are associated with the native chicken's hen age, nutrition, climatic factors, and environmental condition, as shown in Fig. 1.

Hens aged 30 weeks to 38 weeks were recorded and showed an increasing pattern of egg production from week 34 to 37 and a decline in the 38 weeks (Fig. 1). This result is similar to the findings of the study of Joyner *et al.* (1986), wherein it was observed that the rate of egg production was reduced with increasing age, and the incidence of thin-shelled and cracked eggs was markedly increased. Moreover, older hens that remained in lay produced fewer but larger eggs than the younger birds.

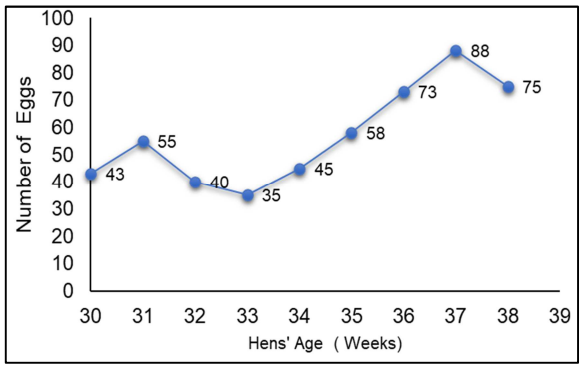

Fig. 1. Average monthly egg production of Caraga black native chicken from 30-39 weeks.

Egg Quality

Results on egg quality characteristics of Caraga black native chicken show that native chicken egg has an average of 44g, which falls under the egg category of pewee, length of 50.95mm and width of 39.33mm. Moreover, egg yolk weight averaged 15.17g, and yolk color ranges between 5-7 based on the La Roche scale. The albumen, on the other hand, weight an average of 23.7g, a shell weight of 5.08g, and a shell thickness of 0.40mm for the top shell, 0.36mm for the middle shell and 0.39mm for the bottom shell (Table 1).

The percentage distribution of the color revealed that light brown eggs obtained the highest percentage at 58%, followed by dark brown and off-white at 17%, and the least are dirty white at eight percent (8%) (Fig. 2).

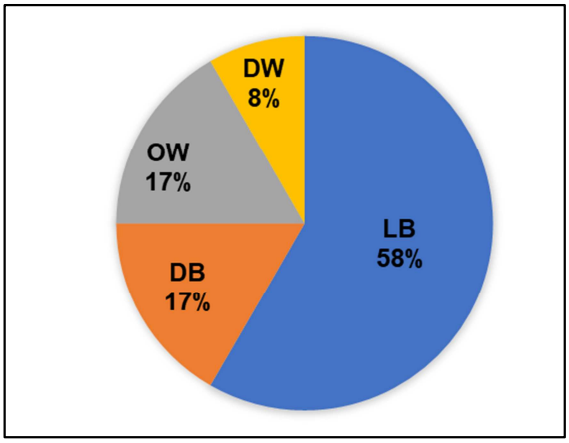

Fig. 2. The percent distribution of the egg color of the Caraga black native chicken.

Percent Egg Fertility, Percent Hatchability, and Percent Livability

The Caraga black native chicken has an average fertility of 85% and a percent hatchability of 84%. Fig. 3 shows the percent fertility and hatchability of hens aged 30 to 38 weeks. The findings revealed that hens aged between 35 and 36 weeks obtained the highest percent fertility with 95%, while hens aged 38 weeks obtained the highest percent hatchability with 93%. On the other hand, hen aged 32 weeks is the lowest on the percent fertility and hatchability, with 63% and 72%, respectively. The result implies a possibility that fertility is associated with age, considering the maturity and readiness of the reproductive ova of the chicken. Moreover, fig. 4 conspicuously observed that as the hen's age increases, the number of fertile eggs decreases. Furthermore, fig. 4 also shows that the number of loaded eggs was directly proportional to the number of fertile eggs.

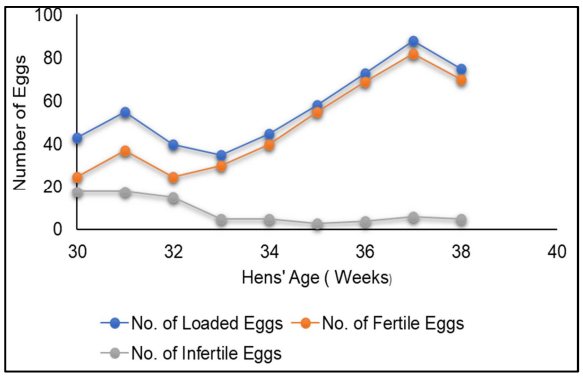

Fig. 3. The average number of fertile and infertile eggs of the Caraga black native chicken aged 30 - 38 weeks.

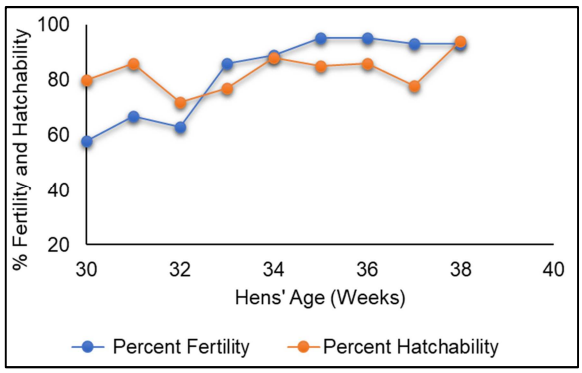

Fig. 4. The percent hatchability of the Caraga black native chicken hens aged 30-38 weeks.

Molapo and Kompi (2015) identified that the age of the hen and rooster is one of the factors that affect the hatchability along with the health and nutrition, egg size, quality and weight, egg storage, and the position of the egg's storage. Moreover, findings on the study on the reproduction efficiency of broiler breeders show that the reproductive efficiency of broiler breeders decreases with age because age negatively affects the quality of hatching eggs. Internal egg composition or ratio changes, higher egg weight, poorer eggshell quality, and increased early and late embryo mortality have been reported in older breeders (Elibol & Brake, 2003; Joseph & Moran, 2005). Moreover, similar findings were observed in the study of Brotherstone *et al.* (2000); age has been shown to affect the fertility of broiler breeders, and this effect is more pronounced in females than in male breeders.

The study of Kirk *et al.* (1980) observed that the fertility of the post-peak broiler breeders (60 weeks) declined by 11%, and hatchability declined by 9% in eggs weighing more than 70g. This effect was partly explained by a relationship between breeder age and egg weight, as younger breeders produced eggs with superior hatchability at an average weight of 60g. In addition, Abudabos (2010) reported that a hen's age affected hatchability, and there was a reduced hatchability with advanced age. Furthermore, the literature showed that the hatchability reduction of eggs from older broiler breeders is a result of many contributing factors, including larger egg size (Leeson & Summers, 2000), increased early.

Late embryo mortality (Elibol & Bracket, 2003), poorer shell quality due to more extensive surface area (Bennett, 1992), albumen quality deterioration (Tona *et al*., 2004) and increased yolk cholesterol content (Dikmen & Sahan, 2007).

The results on the percent livability revealed that the Caraga black native chicken has an average percent livability of 81%, calculated from the day-old chick up to 3 months old (fig. 5). Reproductive diseases and illnesses affect the livability performance of the birds. Since Caraga is a type III climate condition (wet & very wet), 79% livability is still better compared to other chicken breeds. These Caraga black native chickens are known as adopters of climate change conditions. They can quickly adapt despite the changing environment in the locality.

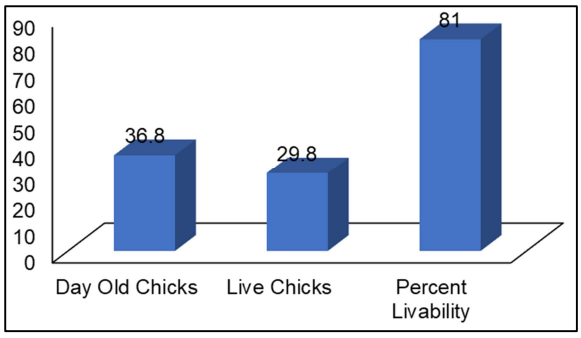

Fig. 5. The percent livability of the Caraga black native chicken.

Conclusion

In conclusion, the reproductive performance, particularly the egg production, percent fertility, and percent hatchability, were affected by the Caraga black native chicken hens' age. However, in general, the Caraga black native chicken manifests an average annual production of 121 eggs, percent fertility of 85%, percent hatchability of 84%, and percent livability of 81%.

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References

Abudabos A, Aljumaah R. 2010. Evaluation of digestible lysine needs for male broiler. International Journal of Poultry Science **9(12),** 1146-1151.

Abudabo AM, Aljumaah RS, Algawaan AS, Al-Sornokh H, Al-Atiyat RM. 2017. Effects of hen age and egg weight class on the hatchability of free-range indigenous chicken eggs. Brazilian Journal of Poultry Science **19(1),** 33-39.

Ahmad S, Mahmud A, Hussain J, Javed K. 2019. Productive performance, egg characteristics, and hatching traits of three chicken genotypes under free-range, semi-intensive, and intensive housing systems. Brazilian Journal of Poultry Science **21(2),** 1-9.

Alsobayel AA, Almarshade MA, Albadry MA. 2013. Effect of breed, age and storage period on egg weight, egg weight loss and chick weight of commercial broiler breeders raised in Saudi Arabia. Journal of the Saudi Society of Agricultural Sciences **12(1),** 53-57.

Austral TM, Olaybar BB, Palma SS, Cagatin ES, Gallardo LC. 2022. Morphological characteristics of the Philippines' CARAGA Black Native Chicken.

Ayeni AO, Agbede JO, Igbasan FA, Onibi GE, Adegbenro M. 2020. Effects of storage periods and positioning during storage on hatchability and weight of the hatched chicks from different egg sizes. Bulletin of the National Research Centre **44(1),** 1-6.

Cocjin BB, Roxas GFA, Casiple CG, Arenga RL. 2003. Conservation, improvement, and utilization of the Darag Philippine native chicken. 1 st International Farmer-to-farmer Forum. Leyte Livestock Improvement Project, Leyte State University, Visca, Baybay, Leyte, October 21- 23, 2003.

Dikmen BY, Şahan Ü. 2007. Correlations between breeder age, egg cholesterol content, blood cholesterol level and hatchability of broiler breeders.

Dusaran RN, Pabulayan RAV. 2015. Production practices of the native chicken growers in Western Visayas. Retrieved from https:// pidswebs. pids. gov.ph

Dusaran R, Cabarles J. 2005. Native chicken production study in the top three native chicken producing municipalities of Iloilo. Research report submitted to the University Research Center, Central Philippine University, Iloilo City.

Dzungwe JT, Gwaza DS, Egahi JO. 2018. Egg weight, fertility, embryonic mortality, hatchability and keets survival rate after brooding of the French broiler guinea fowl raised in the humid tropics of Nigeria. Poultry. Poultry Fisheries and Wildlife Sciences **6,** 192.

Elibol O, Brake J. 2008. Effect of egg position during three and fourteen days of storage and turning frequency during subsequent incubation on hatchability of broiler hatching eggs. Poultry Science **87(6),** 1237-1241.

Elibol O, Braket J. 2003. Effect of frequency of turning from three to eleven days of incubation on hatchability of broiler hatching eggs. Poultry Science **82(3),** 357-359.

Habte M, Ameha N, Demeke S. 2013. Production performance of local and exotic breeds of chicken at rural household level in Nole Kabba Woreda, Western Wollega, Ethiopia. Academic Journal **8(11),** 1014-1021.

Joseph NS, Moran Jr ET. 2005. Effect of flock age and post-emergent holding in the hatcher on broiler live performance and further-processing yield. Journal of Applied Poultry Research **14(3),** 512-520.

King'ori AM. 2011. Review of the factors that influence egg fertility and hatchability in poultry. International Journal of Poultry Science **10(6),** 483-492. Retrieved from https://www.researchgate.net /publication/286738636_Review_of_the_factors_ that _influence_egg_fertility_and_hatc_in _poultry.

Kirk S, Emmans GC, McDonald R, Arnot D. 1980. Factors affecting the hatchability of eggs from broiler breeders. British Poultry Science **21(1),** 37-53.

Leeson S, Summers JD, Caston LJ. 2000. Response of layers to dietary flaxseed according to body weight classification at maturity. Journal of Applied Poultry Research **9(3),** 297-302.

Li DY, Zhang L, Smith DG, Xu HL, Liu YP, Zhao XL, Zhu Q. 2013. Genetic effects of melatonin receptor genes on chicken reproductive traits. Czech J. Anim. Sci **58(2),** 58-64.

Molapo SM, Kompi P. 2015. The effect of cock: hen ratio on reproduction performance of koekoek chickens in the lowlands of Lesotho. Theriogenology Insight **5(2),** 139.

NseAbasi NE, Joseph SE, Glory EE. 2014. Dietary Influences of Aspilia Africana on Litter Traits of Breeding Female Rabbits. American Journal of Experimental Agriculture **4(2),** 153-161, 2014 Sciencedomain International. www.sciencedo main.org

Oleforuh-Okoleh VU, Ndofor-Foleng HM, Olorunleke SO, Uguru JO. 2015. Evaluation of growth performance, haematological and serum biochemical response of broiler chickens to aqueous extract of ginger and garlic. Journal of Agricultural Science **7(4),** 167.

RSh Abou El-Ghar. 2014. Estimation of genetic and phenotypic parameters in 3rd generation and backcrosses of some local strains of chicken. Egypt. Poult. Sci. Vol **(34) (II),** 521-535.

Tona K, Onagbesan O, De Ketelaere B, Decuypere E, Bruggeman V. 2004. Effects of age of broiler breeders and egg storage on egg quality, hatchability, chick quality, chick weight, and chick posthatch growth to forty-two days. Journal of Applied Poultry Research **13(1),** 10-18.

Wondmeneh E, Dawud I, Adey M. 2011. Comparative evaluation of fertility and hatchability of Horror, Fayoumi, Lohmann Silver and Potchefstroom Koekoek breeds of chicken. Asian J. Poul. Sci **5,** 124-129.