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Evaluation and Demonstration of Dual-purpose "Koekoek Potchefstroom" Chickens in Pastoral areas of Hammer woreda, South Omo Zone, SNNPR, Ethiopia

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A B S T R A C T

The objective of this study was to evaluate and demonstrate the production performance of "Koekoek Potchefstroom" chickens in pastoral areas of Hammer woreda. Twenty women pastorals from rural areas were purposely selected based on their interest to construct chicken shelters or who had house access, interest to rear exotic chickens, well-managing ability and up-come all related challenges, enough time for chickens, cover the required inputs costs and ability to recording production data. Training on poultry housing construction, poultry health, feeds and feeding, watering and important data recording system were given. Quantitative data like body weight, egg weight and first egg laying date were taken. Data were analyzed using SPSS software (v-21). Results revealed that the mortality of chicks from 45 to 60 days was 5%. The overall mortality from 60 days to 90 days was 8.75%. About 83.5% of the chicken survived until the laying age. The overall mean body weights were 0.96, 1.91, 2.14 and 2.12 kg at 3, 5, 7 and 9th month's age, respectively. Body weight at different ages was significantly different between the sexes. The average weight of eggs at 24, 28, 34 and 38 weeks of age were 47.3±0.9, 47.3±1.1, and 48.2±0.9 and 46.9±1.3 g, respectively. Age at first egg laying was recorded as 167.4 days. The major causes of death were diseases (Coccidiosis) and poor management practices like lack of follow-up, letting them go out of their home and allowing them to scavenge and poor nutrition. In a conclusion, this breed has been familiarized with scavenging and partial-scavenging production areas of the existing pastoral system with appropriate housing, feeding and good health service provision. Verification in large-scale pastoral areas with different breeds should also be seen to look at its full potential as compared to agrarian areas.

Keywords: Pastorals, Keokoek, Body weight, Egg weight, Hammer woreda

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Introduction

Poultry are among the most common livestock species in Ethiopia with an estimated of 57 million, of which total poultry regarding to breeds, 78.85%, 12.02% and 9.11% were indigenous, hybrid and exotic, respectively (CSA, 2021). It is also expected that this number will increase because it tends to follow the rapid population growth and urbanization human, shortage of cultivating and grazing land, unemployed and high and unbalanced protein demand. Poultry is relatively become with the most preferred animal (Belay *et al*., 2018). The Ethiopian poultry sector could be characterized into three major production systems (Alemu and Tadelle, 1997), traditional or backyard village poultry production system, small-scale modern poultry production system and large-scale commercial poultry production system. Recently a fourth sector emerge, that keeping a dual purpose exotic chickens breeds at the government poultry breeding and rearing centers (Solomon, 2008). The former production system encompasses the indigenous and characterized by small flock size, poor or low input and output, periodic devastation of flock by diseases. Small-scale modern poultry production system is recently emerging system particularly in urban and peri-urban areas. Those small numbers of broilers or egg type of exotic breeds of chicken (50-1000) are produced along commercial lines

using relatively modern management methods. In and near Addis Ababa there are more than twenty private large-scale commercial poultry farms among these the majority are located in Debre Ziet. The top three raised largest commercial poultry farms with modern production and processing facilities are ELFORA, Alema and Genesis farms. Breeding and rearing centers openly import fertile eggs and day old chicks of dual propose (egg and meat) chickens as a parent stock, and they distributing fertile eggs, baby chicks, pullets and cockerels for NGOs, MoARD and privates (Alemu and Tadelle, 1997; Solomon, 2008).

Despite their low egg production and poor growth rates, indigenous poultry breeds are commonly performed better in resistance to diseases and advanced level of performance under poor nutrition and environmental extremes compared to commercial strains under village systems (Horst, 1989). In many parts of Africa, studies on biodiversity of indigenous chickens revealed the presence of high genetic variability within ecotype populations (Muchadeyi *et al.*, 2007; Mwacharo *et al.*, 2007; Mogesse, 2007) showing that the potential for genetic improvement of these chickens through selection. Poultry productions has a great role for poverty reduction in rural poorest society, but in rural areas of Ethiopia, particularly in smallholder farmers they consider poultry production as a side line activity beside to their main agricultural farming such as cropping and livestock production (Belay *et al.*, 2018). The empowerment of farmers through introduction of poultry technology may contribute significantly to reducing poverty, enhancing food security, and promoting gender equality (Reta, 2009). Thus, interventions, which are targeting farmers and pastorals, are crucial towards reaching those development goals and increasing poultry production.

Koekoek chicken breed is suited for the scavenging particularly in semi-scavenging production practices, they can adapt in tropical agro-ecology due to farmers preferred this breed. Koekoek chicken breed is a best scavenger and with an egg production potential of 180-240 eggs per year which is depending on the management practice. According to Aman *et al.* (2016), "Potchefstroom Koekoek" chicken performed better under farmer's management condition, this indicating their productivity could be increased through improved husbandry practices such as feeding, housing and health intervention. Research result by Nigussie *et al.* (2010), observed that the strengths of institutional linkage should be need to transform the traditional piece meal approach of poultry technology into promotion via careful selection and packaged technologies.

Hence, to improve the poultry production sector, technologies with their packages should be disseminated to the marginal pastoral and agro-pastoral rural areas. Therefore, this study was conducted to evaluate and demonstrate productive performance of Potchefstroom Koekoek chickens in pastoral areas of Hammer woreda in South Omo zone.

Materials and Methods

Description of the study area

This study was conducted in pastoral areas of the Hammer woreda of South Omo Zone. The woreda is located at 36° 12.45″ and 37° 30.25″ E. The weather condition is hot to warm semi-arid. An average temperature is 37°C and altitude varies from 450 meter to 1765 meter above sea level with an average annual rainfall 400 mm (Hidosa *et al.*, 2020).

Selection of pastorals

Twenty women pastorals from rural area of Hammer woreda were purposely selected based on their willingness to construct poultry shelter or those who had house access, interest to rear the exotic chickens, ability to manage well the breeds and up-come all related challenges, enough time for chickens, covering the required inputs costs and ability to recording production data. Training on poultry housing construction, poultry health, feeds and feeding, watering and important data recording system were given.

Accordingly, model pastorals

- Pastorals were given 20 chicken seed source (A total of four hundred 45 day old koekoek for 20 female pastorals).

Distribution, management and diet of birds

Day old dual-purpose chickens, which were obtained from Debrezeit Agricultural Research Center, were managed by cooperatives that grow chicken up to 45 day old and then after 45 day the chicken were given to selected women pastorals. Chickens were vaccinated for NCD, Gumboro and Mareks. Introduced chickens were vaccinated against common diseases in the area such as salmonella and coccidiosis diseases.

Data collection technique and analysis

Data was collected on live body weight and weight gain monthly up to 9 months of age with sensitive balance, mortality, disease, predator, age at first egg laying and egg weight at different age. Monitoring and evaluation were undertaken on monthly base afterwards. Egg production data was collected through the help of developmental agent's with the collaboration and participation of beneficiary pastorals using data collection checklists. Quantitative data measurements (live weight, egg weights and egg production) were analyzed using descriptive statistics of SPSS version 21 software.

Results and Discussion

Adaptability of Koekoek chicken breed

It has been observed that the Potchefstroom Koekoek chicken were well adapted in the studied areas. The chickens are ideal breed for a free scavenging environment particularly for the rural residence because they are highly scavengers without confining them to a house. It was observed that it might cause of death due to suffocation and cannibalism because of mineral deficiency; alongside this, they compete with human food. As observed that Koekoek chicken has a broody behavior, which has comparable characteristics with the Ethiopian indigenous chicken breeds (Belay *et al.*, 2018). Comparatively Koekoek chicken breeds has low broody behavior than the indigenous one as most hens do not show any sign of broody behavior or not easily observed by the producers (Belay *et al.*, 2018). Though broadness behavior is preferred by the rural pastorals, it has negative impact on egg production and this is the main reason for the low egg productivity of the indigenous chicken ecotypes of Ethiopia (Belay *et al.*, 2018).

Plate 1. Chicken rearing practices under pastoral management condition.

Survival rate of chicken

The result showed mortality of chicks from 45 day to 60 days was 5.00%. The overall mortality from 60 days to 90 days was 8.75%. On average about 83.50% of the chicken survived to the laying age. The survival and mortality rate varied between pastorals and this could be due to the difference in management practices. The survival rate of the chicks was comparable with works of Yirgu *et al.* (2019) at Sidama zone who reported 88.30% survival rate at 8 weeks of age.

The major reason for mortality was predator followed by disease. The mortality reasons are accompanied by inappropriate housing, watering and feeding condition at the pastorals.

Table 1. Morality of chicken in different stages.

Kebeles	No. of Chicken given	Mortality up to 60 days N (%)	Mortality from 60 to 90 days N (%)	Total mortality up to six months N (%)
Eriya Embule	200	9 (4.50)	19 (9.50)	35 (17.50)
Dimeka zuriya	200	11 (5.50)	16 (8.00)	31 (15.50)
Overall	400	20 (5.00)	35 (8.75)	66 (16.50)

N= sampled HH; % = percent (Source: Survey result)

Weight at different age and sex

Koekoek chicken breed performances under the pastoral management are presented in Table 2. The average body weight of the male was 1.00, 2.06, 2.22 and 2.16 kg at 3, 5, 7 and 9th months, respectively. Similarly, the average weight of the female chickens was 0.91, 1.75, 2.05 and 2.08 kg with the similar ages and condition. The overall average body weight was 0.96, 1.91, 2.14 and 2.12 kg at similar age. Body weight at different age was significantly differing between sexes. Chickens age at first egg laying was at six months age under pastorals management practice. The average body weight and age at first laying attained in this finding was better than the result reported by Aman *et al.* (2016) with 1.5 kg for male and 1.1 kg for female at the age of 5 months and 1.3 for male and 1.2 for female at the age of 5 months (Belay *et al.*, 2018). This difference might be due to the feeding and management practices of the pastorals and agro-ecological effect. Similarly, according to Yirgu *et al.* (2019), the average body weight of the chicken at twenty weeks of age was 1.49 and 1.23 kg for males and females, respectively in Shebedino woreda of Sidama region, which is lower that the result attained in this study.

Table 2. Weight (kg) of Koekoek chicken at different age and sex at the district.

Parameters	3rd month wt		5th month wt		7 month wt		9 month wt	
Sex	N	Mean±SE	N	Mean±SE	N	Mean±SE	N	Mean±SE
Female	48	0.91±26.8^{b}	37	1.75±48.4^{b}	37	2.05±71.9^{b}	35	2.08+83.8^{b}
Male	54	1.00±20.7^{a}	38	2.06±61.7^{a}	38	2.22±59.9^{a}	36	2.16+72.2^{a}
Overall	102	0.96±17.2	75	1.91+43.0	75	2.14±47.4	71	2.12±55.0

^{ab}Means in the same column for each parameter with different superscripts are significantly different (P<0.05); SE = Standard Error.N = number of sampled chickens

Egg weight (g) at the studied Kebeles

Data on egg weight of the chicken was collected and the average weight of egg at 24, 28, 34 and 38 weeks of age were 47.3±0.9, 47.3±1.1, 48.2±0.9 and 46.9±1.3 g, respectively. The current finding is higher than egg weight stated by Lemlem and Tesfay (2010) (43.0±2.24 g) and Aman *et al.*, (2016) (40.2 g) in northern Ethiopia and Areka area, respectively. However, higher egg weight of Koekoek is reported by Belay *et al.* (2018) on Koekoek (52.5 g), Nthimo (2004) on koekoek (55.7 g) and Rhode Island Red (52.5±2.83 g) and Lemlem and Tesfay (2010) on white leg horn (52.1±3 g) chickens. Egg weight at East Shoa zone in Dugda district was obtained 44.28 g under backyard management (Geleta, 2020). According to Geleta (2020), variation in egg weight most probably caused due to different feed resource because egg weight is the function of breed and protein source feed.

Table 3. Egg weight (g) of the chicken at the two kebele.

Kebele	24 weeks	28 weeks	34 weeks	38 weeks
Eriya Embule (Mean ±SE)	48.2±1.2	48.0±1.5	48.7±1.3	48.4±2.1
Dimeka Zuriya (Mean ±SE)	46.3±1.4	46.4±1.6	47.7±1.4	45.1±1.5
Overall (Mean ±SE)	47.3±0.9	47.3±1.1	48.2±0.9	46.9±1.3

SE = Standard Error;

Age at first egg laying

Age at first egg laying was recorded as 167.2 and 167.6 days for Eriya Embule and Dimeka Zuriya pastorals, respectively with a mean of 167.4 days. This result was lower than Belay *et al.*, (2018) report in which age at first laying was 6 months in Tigray region and 187 days in Shebedino woreda of Sidama region (Yirgu *et al.*, 2019). But higher than the value reported by Geleta (2020) in East Showa zone which is 22 weeks; Aman *et al.* (2016) in the southern part of Ethiopia (142 days); Belay *et al.*, (2018) and Desalew (2012) (153 days) results of age at first egg laying of the same breed. Correspondingly, in South Africa, this chicken grasps the age of 130 days (Nthimo, 2004). Feeding, watering, housing, veterinary services and environmental conditions could be the main reasons for the lateness or earliness of egg laying. Based on the current result, sexual maturity both in male and female koekoek chickens were more than 23 weeks at Hammer pastoral area.

Table 4. Age at first egg laying days.

Kebeles	Sampled HH	Mean±SE (days)
Eriya Embule	10	167.2±1.8
Dimeka Zuriya	10	167.6±2.3
Overall	20	167.4±1.4

SE = Standard Error

Major constraints of poultry production

Major problems and mortality of chicken was encountered due to death, eaten by predators, died as soon as started laying egg (emergency) and stolen by thief. According to the respondents, the major causes of death are disease like coccidiosis (Symptoms of disease diarrhea, loss of appetite, wrinkling) and accidental. Poor management like lack of follow up by owners, letting them to go out from their home and allowing them to scavenge and poor nutrition are the major ones.

Conclusions and Recommendations

This result revealed that Koekoek chicken is suited breed for the semi-scavenging production system of tropical environment and preferred breed in the studied areas. The breed is a good scavenger. The overall average body weight was 0.96, 1.91, 2.14 and 2.12 kg at similar age. Body weight at different age was significantly differing between sexes. Due to broody behavior of Koekoek chicken is preferred by the rural pastorals, as they have no artificial incubator. This behavior may be important for sustainability of the breed under traditional production system. Age at first egg laying was 167.4 days. Data on egg weight of the chicken was collected and the average weight of egg at 24, 28, 34 and 38 weeks of age was 47.3±0.9, 47.3±1.1, 48.2±0.9 and 46.9±1.3 g, respectively.

Based on the attained result, the breed is recommended to be introduced into scavenging and semi-scavenging chicken production system of the existing pastoral area. Good housing, feeding, enough veterinary service provision and capacity building to all stakeholders is a critical issue beside of introducing and maximizing their production. Verification in large scale at pastoral area with the breed should be seen to look its full potential as compared to agrarian areas.

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