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Growth performance and carcass yield of progenies and upgraded non-descript Ifugao native chicken

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Abstract The results showed that upgrades of Paraoakan(T4), Zampen (T5), Jolo/Basilan (T2) and Darag (T3) consistently gained significantly heavier body weight, higher gain in weight, growth faster, better feed consumption and efficiency compared to progenies of non-descript Ifugao native chickens(T1). Percentage cut-up parts of male upgrades of Paraoakan (T4) were significantly different from the control treatment (T1) and from the upgrades of Darag (T3) for the neck, back and drumstick percentage while the female progenies of upgraded non-descript Ifugao native chicken thigh and back cut-up percentages were significantly different among treatment means while the wings cut-up percentage was significantly different among the treatments. Based on the findings, among all the treatment groups, progenies and upgrades of Paraoakan (T4) had the best performance on growth and carcass yield. Hence, it is recommended to genetically improve the non-descript Ifugao native chicken.

Keywords: Carcass, Philippine heritage breeds, Non- descript, Progenies, Upgrades

Introduction

Philippine native chicken has lower productivity than exotic breeds. The yield output to produce these animals is affected by high early chick attrition, poor growth and hatchability rate, all of which respond to improved nutritional, management, financial and general technical inputs (Cocjin *et al*., 2012). Likewise, native chickens in the tropics are characterized with very low growth and egg production under smallholder farmers' management conditions (Dessie *et al*., 2011).

Increased productivity of native chickens using exotic breeds are untenable option which happened from time after time constraint facing of non - supportive local poultry raisers because of production cost and changing climatic conditions. Animal production depend on the existing production systems and size of community distinguished into rural, semi- commercial, and commercial production based on population, production objectives and level of specialization

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and/or technology use (FAO, 2008) as cited by Dana *et al*. (2010). Under this set up, it is noticeably below average in size, of undeveloped local native chickens sustained in natural management practices with or with no habitat and with scarce feed sources and even with no disease prevention and control management. Notwithstanding such significance contribution, local breeds are alarmed with different disturbing elements in rearing practices and un-selective genetic improvement.

Government agencies carryout to continue work in progress with the stakeholders of the country's poultry sector to improve its global effectiveness and competitive edge. In spite of this attempt, poultry meat supply decline by 11.1 percent and 1.4 percent, respectively, however, local breed and exotic flock supply improved by 3.6 percent (PSA, 2020). With respect to improvement of livestock production particularly on poultry is of significance to attain food security. Likewise, continuous local chicken productivity would be highly valuable in the enhancement of the socio-economic and nutritional status of farmers (Al-Marzooqi *et al*., 2018). In spite of being inferior in terms of productivity compared with commercial chicken breeds, majority of small hold farmers opt to raise native chicken as source of food and additional income as it does not require special care and management. In addition, native chicken meat that has always been preferred by consumers over those of commercial broilers due to its unique taste, distinct flavor and texture, presence of nutraceutical compounds (functional food), and lower fat content (PCARRD, 2016).

At present, unstoppable increasing needs for poultry products from extensive systems and an opportunity arises to increase the importance of raising native chicken, which are particularly suitable for free range and organic farming because of their good adaptation to local conditions.

Hence, this study demonstrated the possibilities of crossing non-descript Ifugao native chicken with Philippine heritage breeds of native chickens like Zampen, Paroakan, Darag and Joloano/Basilan to evaluate their progenies and upgrades on growth and carcass yield.

Materials and methods

The study was laid out to Completely Randomized Design (CRD) using one nondescript Ifugao native chicken and four Philippine heritage breeds as treatments and replicated three times. Five (5) genetic group progenies were produced repeatedly out of the crossing of non- descript Ifugao native chickens with one of its kind or same breed assigned as T1 (control). The other four genetic groups assigned as treatments where Philippine heritage native chicken breeds cockerels were source out from associated native chicken farm breeders from other regions and these were Jolo/Basilan (T2)**,** Darag as T3**,** Paraoakan (T4)**,** and Zampen (T5) respectively. Fifteen experimental units were constructed as rearing pen with a galvalume roofing and each units have a measurement of 2mx5m with a siding of slice-bamboo with a height of 2.5 meters. Plastic tube feeding through, water drinkers and perching stick were provided for standing, climbing, playing, rubbing and cleaning beaks, chewing and entertainment to prevent chickens from pecking. The perimeter of the experimental area was enclosed with # 14 interlining fence to avoid outside intervention throughout the duration of the trial. In addition, potable source of water was available during the study. Moreover, disinfection of rearing units prior to random assignment of native chicks was undertaken. Ten (10) desirable day-old chicks were selected and randomly distributed to fifteen experimental units provided with elevated portable brooding cage measuring four feet squared (4ft) provided with feeding throughs, water drinkers and installed with one (1) unit brooder lamp to provide heat and facilitate feeding at night for 28 days inside the brooding units. Fifteen (15) layers of used old newspapers were used as beddings and served as receptacle feeder to minimize feed refuse. Leftovers and chicken litters were also disposed properly. Old sacks were sewed to cover all side walls of brooding cage in order to protect the birds from adverse climatic condition. After brooding, cleaning of chicken dung in the different experimental units through sweeping was done regularly by the researcher. Initial body weight of the native chicks was measured to start the trial, The chicks were removed from brooding cage and ten (10) experimental birds in each unit was reared for the whole duration of the study. Experimental birds were fed with commercial ration during the trial period of 14 weeks. Crumble - micro pellet type rations were given such as chick booster at 0-28 days, starter (29-56 days, and finisher, at 57-108 days. Plastic tube feeders and drinkers were cleaned daily prior to provision of ration to the birds.

Two sample birds in each rearing units with opposite sex were selected with body weight near to the average body weight of each experimental units at the end of the trial. Sample birds were slit to their jugular vein to remove the blood and dip into hot water for scalding. The sample birds were eviscerated using a sharpened knife to extricate the giblets and other internal organs. The dress weight of birds with and without giblets were measured using a digital weighing scale and cut by parts will be split up to evaluate carcass cut up parts percentage.

Initial and weekly body weight, gain in weight, percentage rate of growth, cumulative feed consumption, FCR and FCE at growing stage (1^{st}- 8^{th} week) and maturity stage (9^{th}-14^{th} week), carcass cut up parts percentage and abdominal weight. Analysis of Variance in CRD using STAR software were used in the analysis of data. Least Significance Difference (LSD) was used to compare treatment means with significant result.

Results

Initial, growing, maturity stage and final body weights (g)

The initial, body weight at growing, maturity stage and final body weight of progenies and upgraded non-descript Ifugao native chicken and the control is presented in Table 1. Results were highly significant (P>0.01) on the initial body weight of the different progenies and upgraded non-descript Ifugao native chicken. Upgrades of Paraoakan (T4) and Zampen (T5) were significantly heavier than upgraded non-descript Ifugao native chicken from Jolo/Basilan (T2) and Darag (T3). However, T2 was heavier than the control (T1) and (T3).

The upgrades of non-descript Ifugao native chicken was highly significant differences (P<0.01) in the different Philippine heritage breeds body weight at growing stage. The body weight of upgrades of Paraoakan (T4) was significantly heavier (664.47 g) than the progenies of non-descript Ifugao native chicken (Control) and upgrades of Darag (T3) but not with the upgrades of Zampen (T5) and Jolo/Basilan (T2). The body weight of upgrades of Darag (T3) and control (T1) progenies were not significantly differed.

Table 1. Average initial, weight at growing and maturity stage and final body weight (g) of progenies and upgrades of non- descript Ifugao native chicken

Treatment	Initial Weight(g)	Growing stage(g) 1st – 8th weeks	Maturity Stage(g) 9th –13th weeks	Final weight(g) 14th week
T1 – Control (Non-descript Ifugao native chicken)	28.05^{c}	543.57^{c}	1107.00^{c}	1191.67^{d}
T2 – Upgrades of (non-descript NC x Jolo/Basilan	28.82^{b}	620.60^{ab}	1235.67^{ab}	1339.67^{b}
T3 – Upgrades of non-descript NC x Darag	28.14^{c}	577.80^{bc}	1178.00^{b}	1273.33^{c}
T4 – Upgrades of non-descript NC x Paraoakan	29.76^{a}	664.47^{a}	1292.00^{a}	1403.00^{a}
T5 – Upgrades of non-descript NC x Zampen	29.40^{a}	632.40^{a}	1253.67^{a}	1361.67^{ab}

Means in the same row with different superscripts are significantly different by LSD.

On body weight at maturity stage, the upgraded non-descript Ifugao native chicken and its progenies showed substantial significant (P<0.01) differences among the different treatments. Consistently, progenies sired by the different larger genetic breeds (T2, T3, T4 and T5) were significantly better than those sired by non-descript Ifugao native chicken. Paraoakan (T4), Zampen (T5) and Jolo/Basilan (T2) progenies were statistically differed from control (T1) and Darag (T3) progenies. Moreover, there was no variation between tested upgrades of Darag (T3) native chicken and upgrades of Jolo/Basilan (T2) in body weight on maturity stage. Final body weights of progenies and upgraded non-descript Ifugao native chicken revealed highly significant difference. Thus, consistently upgrades of T4, T5, T2 and T3 were significantly heavier (P<0.01) than the control (T1). Upgrades of Paraoakan recorded cross breeding the highest average body weight of 1,403.00 grams that was significantly (P<0.01) heavier than those sired by the non-descript Ifugao native chicken (control). It was followed by upgrades of T5 with a mean body weight of 1361.67 grams and upgrades of T2 and T3 produced a mean weight of 1339.67 and 1273.33 grams, respectively.

Gain in weight (g)

The gain in weight during the growing and maturity stage of progenies and upgraded non-descript Ifugao native chicken is revealed in Table 2. The gain in body weight of different treatment groups differed significantly (P<0.01) during growing stage. Upgrades of Paraoakan gained significantly heavier weights (675.63 g) than the control and upgrades of Jolo/Basilan (591.79 g) and Darag (535.48 g) but not significant with the upgrades of Zampen (622.68 g). Likewise, in the maturity stage upgraded Paraoakan exhibited highly significant (P<0.01) gains out of the other progenies and upgraded non - descript ifugao native chicken means with gained weight of 804.01 grams.

Table 2. Gain in weight (g) at growing and maturity stage of progenies and upgrades of non-descript Ifugao native chicken

Treatment	Growing Stage, (g)	Maturity Stage, (g)
	1^{st} – 8^{th} weeks	9^{th} – 14^{th} weeks
T1-Control	485.36^{c}	600.77^{d}
T2	591.79^{b}	707.67^{b}
T3	535.48^{c}	653.33^{c}
T4	675.63^{a}	804.01^{a}
T5	622.68^{ab}	746.29^{b}

Means in the same column with different superscripts are significantly different by LSD.

Percentage rate of growth (%)

The growth rate percentage of progenies and upgraded non-descript Ifugao native chicken is shown in Tables 3. Statistically, the present study revealed significant ($P<0.01$) differences on growth rates obtained during growing stage. Upgrades of nondescript native chicken with Paraoakan (T4) had a growth rate of 42.62% which was significantly faster than the control and upgrades of Zampen, Jolo/Basilan and Darag which had growth rates of 32.54, 39.53, 37.43 and 35.53 percent, respectively. Likewise, results showed significant differences ($P<0.05$) among the treatments observed during the maturity stage and similarly, upgrades of Paraoakan(T4) were significantly faster in growth rates as compared to the control and different upgrades.

Table 3. Growth rate percentage (%) at growing and maturity stage of progenies and upgrades of non-descript Ifugao native chicken

Treatment	**Growing Stage, (g)** 1st – 8th weeks	**Maturity Stage, (g)** 9th – 14th weeks
T1-Control	32.54^{d}	11.04^{d}
T2	37.43^{bc}	12.84^{bc}
T3	35.53^{c}	11.76^{cd}
T4	42.64^{a}	14.96^{a}
T5	39.53^{b}	13.67^{b}

Means in the same column with different superscripts are significantly different by LSD.

Cummulative feed consumption (g)

The feed consumption at growing and maturity stage of progenies and upgrades of non-descript Ifugao native chicken is shown in Table 4. Throughout the feeding trial, there were highly significant ($P<0.01$) differences between the treatment groups for both growing and maturity stages. It was found out that upgrades of Paraoakan (T4) had the highest feed consumption of 1735.44g and 3306.16g as compared to control with 1477.89g and 2971.89g and so with the other upgraded non-descript Ifugao native chicken.

Table 4. Cumulative feed consumption (g) at growing and maturity stage of progenies and upgrades of non-descript Ifugao native chicken

Treatment	Growing Stage, (g) 1st – 8th weeks	Maturity Stage, (g) 9th – 14th weeks
T1-Control	1477.89^{d}	2971.89^{d}
T2	1600.95^{bc}	3160.91^{bc}
T3	1542.08^{cd}	3075.42^{c}
T4	1735.44^{a}	3306.16^{a}
T5	1658.91^{ab}	3232.80^{ab}

Means in the same column with different superscripts are significantly different by LSD.

Feed conversion ratio (g)

The feed conversion ratio at growing and maturity stage of progenies and upgraded non-descript Ifugao native chicken is presented in Table 5. Results showed highly significant differences (P<0.01) among the treatments of progenies and upgraded non-descript Ifugao native chicken both for growing and maturity stages. During the growing and maturity stage, upgrades of Paraoakan (T4) recorded the highest conversion ratio of 3.65g at growth stage and 6.82g at maturity stage to convert a kilogram of weight while the control treatment had the least of 2.10g and 3.84g respectively.

Table 5. Feed conversion ratio (g) at growing and maturity stage of progenies and upgrades of non-descript Ifugao native chicken

Treatment	Growing Stage, (g)	Maturity Stage, (g)
	1^{st} – 8^{th} weeks	9^{th} – 14^{th} weeks
T1-Control	2.10^{d}	3.84^{d}
T2	2.66^{bc}	4.79^{bc}
T3	2.37^{cd}	4.41^{cd}
T4	3.65^{a}	6.82^{a}
T5	2.96^{b}	5.37^{b}

Means in the same column with different superscripts are significantly different by LSD.

Feed conversion efficiency (%)

The feed conversion efficiency recorded at growing and maturity stages of progenies and upgraded non-descript Ifugao native chicken is shown in Table 6. There were highly significant (P<0.01) differences among the treatment groups from growing to maturity stage. On growing stage, all of the progenies/ upgrades of Paraoakan, Zampen, Jolo/Basilan and Darag as well as the control were significantly different to each other. Moreover, progenies of Paraoakan recorded the highest feed conversion efficiency with 52.45g at growth stage and 30.51g and the control treatment had the least with 34.40% at growth and 16.19% at maturity stage, respectively.

Table 6. Feed conversion efficiency (%) at growing and maturity stage of progenies and upgrades of non-descript Ifugao native chicken

Treatment	Growing Stage, (g)	Maturity Stage, (g)
	1^{st} – 8^{th} weeks	9^{th} – 14^{th} weeks
T1-Control	34.40^{e}	16.19^{d}
T2	44.04^{c}	22.56^{bc}
T3	39.54^{d}	20.35^{cd}
T4	52.45^{a}	30.51^{a}
T5	48.05^{b}	25.64^{b}

Means in the same column with different superscripts are significantly different by LSD.

Percentage carcass cut-up parts (%)

Six parameters recorded on carcass yield cut-up percentage of male and female progenies of upgraded non-descript Ifugao native chicken are shown in Table 7 and 8. These parts were drumstick, thigh, breast, wings, back and neck. For the male progenies and upgraded non-descript Ifugao native chicken, the neck and back percentage cut-up parts were highly significant ($P<0.01$), while the drumstick percentages were significantly ($P<0.05$) different among the treatment groups and the rest were not significant. In drumstick cut-up percentage, the male upgrades of Paraoakan (T4) were significantly ($P<0.05$) different from the male upgrades of Darag and control treatments but not significantly different from the male upgrades of Zampen and Jolo/Basilan.

Table 7. Percentage (%) cut-up parts of male progenies and upgrades of non-descript Ifugao native chicken

Treatment	Drumstick %	Thigh %	Breast %	Wings %	Neck %	Back %
T1 Control	15.25^{bc}	15.19	24.16	13.91	6.58^{c}	24.91^{c}
T2	15.2^{abc}	15.2	24.08	13.92	6.60^{ab}	25.0^{bc}
T3	15.25^{bc}	15.25	24	13.98	6.60^{bc}	24.92^{c}
T4	15.40^{a}	14.0	24.20	14.0	6.84^{a}	25.56^{a}
T5	15.30^{ab}	14.15	24.31	14.1	6.74^{a}	25.40^{ab}

Means in the same column with different superscripts are significantly different by LSD.

On the other hand, the neck cut-up percentage of male upgrades of Paraoakan(T4) were highly significant ($P<0.01$) different from the male upgrades of Darag and control treatments but not significantly different from the male upgrades of Zampen and Jolo/Basilan. Meanwhile, for back cut-up percentage both male upgrades of T4 and T5 had statistically highly significant ($P<0.01$) difference from the male upgrades of T2 and T3 as well as from the male control treatment but not significantly different from each other.

In terms of the female progenies and upgraded non-descript Ifugao native chicken, thigh and back cut-up percentages werw highly significant ($P<0.01$) differed among treatment means (Table 8). Meanwhile, the wings percentage was significantly different ($P<0.05$) among the treatments. On the other hand, the drumstick, breast and neck cut-up percentages were not significantly different among the treatments. In thigh cut-up percentage, the female upgrades of T4 and T5 were highly significant ($P<0.01$) different from the female control treatment T1 and from the female upgrades of T2 and T3 but not significantly different from each other. For wings cut-up percentage, the female upgrades of T4, T5 and T2 were significantly different from the female upgrades of Darag and female control treatment T1. Moreover, for back cut-up percentage, the female upgrades of T4, T5 and T2 were significant ($P<0.01$) highly differed from the female control treatmentT1 and female upgrades of T3.

Table 8. Percentage (%) cut-up parts of female progenies and upgrades of non-descript Ifugao native chicken

Treatment	Drumstick %	Thigh %	Breast %	Wings %	Neck %	Back %
T1- control	13.99	14.52^{b}	25.92	13.80^{c}	6.38	25.39^{b}
T2	14	14.53^{b}	25.93	13.81^{abc}	6.32	25.41^{ab}
T3	13.99	14.52^{b}	25.93	13.78^{bc}	6.39	25.39^{b}
T4	13.85	14.62^{a}	25.66	13.88^{a}	6.40	25.59^{a}
T5	13.90	14.60^{a}	25.70	13.82^{ab}	6.42	25.56^{a}

Means in the same column with different superscripts are significantly different by LSD.

Discussion

The difference in growth performance and carcass yield of native chickens was caused by their genetic potential whether it is a larger genetic breeds or smaller genetic breeds. This experiment demonstrated that native chickens with high genetic potential had heavier body weight, gained weight, fast growth rate more feed consumption and improved at growing stage and consistently continued up to maturity stage.

This result of the study was in conformity by a report of Hunduma *et al*. (2010) that one of the low productivities of local chicken is mainly attributed to genetic potential. Upgrades of Paraoakan (T4) had remarkably the highest in body weight in the present study which could be associated with the report of Kgwatalala and Segokgo (2013) regarding several studies that elicited significant findings in crossbreeding larger genetic breeds like Paraoakan and Jolo/Basilan with smaller genetic breeds and commercial free-range breeds which found out that the offspring (F1) or progenies showed better performance. The result of the study in body weight gained could be due to the genetic make-up of the birds. Growth rate result of the present study consistently reaffirms and follows the standard growth rate patterns/curves in chickens with high growth rate on the first two weeks which then gradually decreases towards marketable period. However, it was reported further by Lupi *et al*. (2016) that growth can be fixed in some coordinates of weight and time employing a series of points, obtaining growth curves and can be summarized into several biologically interpretable parameters and provide estimates of growth rate and weight at maturity. Another statement that correlates with growth rate and growth curve was also reported by Morbos *et al*. (2016) that due to the influence of genotype and body size, nutrients required would make birds eat more to satisfy their needs (Adeyemi *et al.,* 2012).This result implied that the larger the body size of the chicken, it tends to have higher feed intake that may convert to more meat of the birds.Furthermore, a similar findings of Magala *et al.* (2012) in which he concluded that the higher intake levels of birds could be attributed to their large body size and large-sized birds tend to require more dietary nutrients than their small-sized counterparts. Likewise, based on the research of Morbos *et al*. (2016), that voluntary feed intake was influenced by genotype and body size and elaborated by Hunduma *et al.* (2010) that low productivity of local chickens is mainly attributed to low genetic potential. With the above findings a comparison between the progenies of small and upgrades of larger native chicken lines showed that larger genetic breeds in terms of gain caused a major increasing in weight and also increased feed consumption, whereas in terms of feed conversion ratio standards supposed to increase weight with essentially no change in feed consumption. Another contradictory to this result stated that selection to decrease FCR increases BW and WG and decreases FI as a correlated response (Varkoohi *et al*., 2010).

Findings in feed conversion efficiency was associated with findings of Tallentire (2016) revealed that both energy intake per day and the metabolic heat production rate have increased in the recent decades whilst the efficiency of utilizing energy for growth has also increased; this is due to an increased growth rate so that chickens reach slaughter weight more quickly. Thus, elaborated that the larger body composition of the larger genetic breeds upgrades and considering their genetic potential that are more efficient in feed conversion, they are thus faster and quick to reach marketable weight as compared to the smaller and slow growing non-descript Ifugao native chicken offspring.

In the present study, females set forth a higher breast percentage than males, however, males showed better yields in thigh compared to females. Apparently, this result implied that carcass traits of males with heavier body weight, and breast weight were lower compared to females. In contrast, the females showed heavier abdominal fat than males, that could be supported with the reason that females are evolutionarily hard-wired to prepare and maintain egg production.

Findings of the current study with improvement of the non-descript Ifugao native chicken by Philippine heritage breeds with higher potentials produces better performance and carcass percentage cut up parts. Moreover, this study showed that distinction in growth performance and carcass yield are credited to the variation on traits potential of these chickens. Among progenies of Philippine heritage breeds with larger composition immanently considered, T4 gave the best response followed by T5, T2and T3, respectively. Since the results are very remarkable, it is likewise recommended to look at the possibility of crossing further these breeds to explore the potentials of heterosis/hybrid vigor.

Furthermore, it is suggested that a further study be done to evaluate other parameters like sensory evaluation and meat analysis that will help establish more sensible claims on the acceptability of the progenies of Philippine heritage chicken particularly on economic analysis of growing native chicken in confinement and semi-confinement or if it is possible on free-range.

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