Crowing characteristics of native singing chicken breeds in Indonesia

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Abstract. Singing chicken is germplasm, genetic resources, indigenous chicken in Indonesia and be known of their unique, exclusive, superiority of singing style with long-melodious rhythm, and different crowing style-tone-tempo comparing with other singing chickens breeds in the world. Some crowing character information was needed to optimize conservation and utilization strategies. The aim of the study was to compare crowing duration and number crowing syllables four singing chicken breeds in Indonesia (Bekisar, Kokok Balenggek, Pelung and Gaga’). This research used 532 birds Gaga’ chicken from Sidrap, Barru and Maros Districts, South-Sulawesi province, Indonesia. They were separated based on crowing speed into Slow-group (234 birds) and Dangdut-group (298 birds). Then, Dangdut-group has separated again, based on total number crowing syllables, into Long-Dangdut-type (51 birds) and Short-Dangdut-type (247 birds). All crowing sounds were recorded and computerizing digitalized using Cool Edit Pro. Software to visualized bioacoustic character as a wave form then data interpreting for analyzing mean and standard deviation. Average crowing durations of Pelung, Kokok Balenggek, Bekisar and Gaga’ chicken (Short-Dangdut-type and Slow-group) were 2.0 to 10.0 sec. Dangdut-Long-type was the longest crowing duration (30.5 sec) and the highest number syllables (140.92). Average number syllables of Pelung (3 sec), Kokok Balenggek (3 to 12 sec) and Bekisar (2 sec) chicken were less than Gaga’ chicken (Dangdut-Long-type: 140.9 sec, Dangdut-Short-type: 20.9 sec and Slow group: 8.2 sec). Each singing chicken breed in Indonesia have uniqueness and differences crowing character. A crowing character such as crowing duration and number of syllable could be identified as one of basic selection to promote and to maintain conservation of singing chicken as germplasm of Indonesia.

1. Introduction

Many developing countries have many local and indigenous chicken breeds with diverse uses and benefits. Unfortunately that many those breeds which were known as a genetic resource are becoming seriously endangered. FAO states that in general, animal genetic resources in developing countries are being eroded through the rapid transformation like an intensification of the agricultural system or uncontrol mating system and now we have faced the loss of indigenous Animal Genetic Resources (AnGRs) problem. This is due to the uncontrolled introduction of the exotic genetic resource before proper characterization, utilization, and conservation of indigenous genetic resources [1]. Local and indigenous chickens, in particular, also play important socio-economic roles in developing countries [2].
There were 31 breeds of indigenous and native chicken in Indonesia which were recognized based on their voice as singing chicken, base on their power as fighting cocks or based on their meat as broilers [3]. Singing chicken breed in Indonesia could be characterized on their long and melodious crowing voice [4]. Chickens with exceptionally long crow are often favored all over the world and connoisseur breeders have bred certain types of chicken exclusively for this trait. Unfortunately, the research publications and scientific information related to the phenotypic description, morphological traits, reproduction traits, production traits, and the blood scheme related with an examination of biochemical polymorphisms of singing chicken breeds in Indonesia were very limited whereas that information were needed. That information will be useful to maximize the conservation and developing strategies for preserving the indigenous chicken as genetic resources in Indonesia before those chicken extinct. Therefore this study is aimed to compare and analyze some crowing characteristics of Gaga’, Kokok Balengek, Pelung and Bekisar chicken breeds to provide more valuable information that can be used in conservation, breeding and developing native singing chicken as ornamental chicken in Indonesia.

2. Methods
A total of 532 birds of Gaga’ chicken was taken purposively between January to March 2015 based on some criteria such as 1 to 2 years of age, healthy and can crow. Those Gaga’ chicken was reared under a traditional system in small-holder farms of Gaga’ chicken at Sidenreng Rappang district, Barru district and Maros District, South Sulawesi Province Indonesia. The chicks were fed as traditionally ways (rice brand and corn), which was provided ad libitum and the birds had free access to water.

Gaga’ chicken was grouped based on the speed of crowing rhythm to slow-groups (234 birds) and dangdut-group (298 birds). Slow-group has slower crowing rhythm, short crowing duration, and have less number of crowing syllables (4 to 6 crowing beat). Dangdut-group has faster crowing rhythm, longer crowing duration and have more than 8 beats of crowing syllables. Based on a total number of crowing syllables, dangdut-group was separated again into Long-Dangdut-type (51 birds) and Short-Dangdut-type (247 birds). Long-dangdut-type have more than 10 crowing syllables; Short-Dangdut-type has less than 10 crowing syllables.

The crowing sound from 532 birds of Gaga’ chicken was observed and recorded using voice recorder. Each record was digitized using Cool Edit Pro. software to get the bioacoustic graphic and the quantitative data. The length of total crowing duration, first and second part crowing duration and crowing syllables number were measured. Total crowing duration means the total time required when chicken crow. First part of crowing duration means the total time required when the crowing sound of rooster has sounded and it has high tone; Second part of crowing duration means the total time required when crowing like human laughing has sounded. The crowing syllables number were also counted from each part of crowing duration.

Descriptive statistics such as mean and standard deviation were used to analyze each crowing character data using SPSS ver. 16. The experimental unit was a chicken.

3. Results and discussion

3.1. Crowing duration
Long Dangdut type of Gaga’ chicken has the longest total crowing duration (30.52 sec) and compare with Pelung chicken (3 to 10.6 sec) and other singing chicken breeds and types (table 1). Bekisar chicken has shorter crowing duration (2 sec) among all singing chicken breeds. Crowing duration of Kokok Balengek chicken (2 to 4.9 sec) were nearly similar with those of Bekisar (2 sec), Short Dangdut type (4.11 sec), and Slow group (3.65 sec).

At first part of crowing duration, all group or type of Gaga’ chicken has a nearly similar result. Different duration was found at the second part that Long Dangdut type has the longest crowing duration (29.56 sec) compare with Short Dangdut type (3.13 sec) and Slow group (2.61 sec). There is no comparison of first and second parts with other breeds of singing chicken because this unique crowing
character only is discovered at Gaga’ chicken beside that there was limited information on crowing duration at each part from other singing chicken breeds.

3.2. Number of syllables
Long Dangdut type showed the highest total and at the second part of number syllables (140.92 and 140.41) compare with other group or types of Gaga chicken or another chicken breed (table 2). Gaga’ chicken has long crowing duration, many crowing syllable and uniqueness crowing characteristic at the second part of the crowing voice.

3.3. Singing chicken breeds
There are several singing chicken breeds with good, melodious, greater or lesser extent display long crowing behaviour and ability, such as from Japan (Tohtenko/Japanese Red Crower, Tohmaru/Japanese Black Crower, Minahiki, Kurokashiwa, and Koeyoshi/Japanese Good Crower), from South America (Brazilian Musician Fowl), from Eastern Europe (Jurlower and Kosovo), from Turkey (Denizli chicken), and from Germany (Bergische Kräher/German Long Crower) [5,6]. Indonesia has four singing chicken breeds as long crower type well known as Pelung chicken from West Java, Bekisar chicken from East Java, Kokok Balenggek chicken from West Sumatra [4] and Gaga’ chicken from South Sulawesi [7]. Those four singing chicken breeds were known as local and indigenous chicken breeds in Indonesia and they have been decided by Indonesian Ministry of Agriculture as Indonesian poultry genetic resources. Those singing chicken breeds have exceptionally unique, long crow, fast or slow rhythm, melodious crow with different style-tone-tempo of crowing sound compare with other singing chicken breed from other countries [7,8] and frequently send to the chicken singing contest by fanciers. Singing competition is indirect plays a role in preserving of singing chicken breeds. Unfortunately that there are very limited information and experiments related with crowing characters of singing chicken. Some efforts are needed to study the characterization and analysis of crowing characters of singing chicken.

| Chicken Breed | Crowing group | Crowing type | Crowing duration (sec) | References |
|---------------|---------------|--------------|------------------------|-------------|
| Pelung        | -             | -            | 3.0-8.9                | [9]         |
| Kokok Balenggek Bekisar | -             | -            | 2.09-4.43              | [12]        |
| Dangdut group | Long Type     | 30.52±18.91  | 0.98±0.33              | Present study |
| Gana’         | Short Type    | 4.11±1.76    | 0.97±0.47              | Present study |
| Slow group    | 3.65±1.06     | 1.09±0.48    | 2.61±1.03              | Present study |

3.4. Indonesia singing chicken
Bekisar chicken as local chicken from Madura island, East Java province, Indonesia and be known as the first generation hybrid offspring of the Green Jungle Fowl (Gallus varius) and domesticated Red Jungle Fowl from Java (Gallus gallus bankiva). The roosters are highly prized for their loud clear calls. Bekisar chicken was traditionally used by the original inhabitants of the Sunda Islands as symbolic or spiritual mascots on outrigger canoes and consequently spread over a wide area. Bekisar was a
combination of female local chicken and male Jungle Fowl. Bekisar chicken has a distinctive crowing voice and can be distinguished by two part sound such as front-sound (low tune, big-thick-long-clean sound) and back-sound (high tune, big-thick-long-straight-clean sound) and only have two syllables [13].

Pelung chicken is a poultry breed from Cianjur, West Java Province, Indonesia. The roosters are considered to be singing chicken because with contests being frequent in the Pelung area for the longest and melodious crowing. Pelung Chicken have good, rhythmic, and harmonious sound and the crowing sound can be distinguished by three part sounds such as the beginning-middle-end sound and have a long voice at the syllables[11]. All group sounds consist of many syllables.

Kokok Balenggek chicken is a local singing fowl from Solok regency, West Sumatera province, Indonesia and adopted as a symbol of Solok Gaga chicken. Minang people used to call Kokok Balenggek chicken as Kukuak Balenggek, means multilevel rhythm. The crowing character of rooster Kokok Balenggek was melodious voice, multiple steps of crowing sound and range from 3 to 12 syllables with the highest reach 24 syllables [8]. A chicken who have more syllables will be more expensive than others.

Gaga’ chicken was natively raised and breed in the central habitat of Gaga’ chicken at Baranti, Panca Rijang, Benteng, Simpo Arasi’e, Rappang, Benteng, Paseno and Tonronge villages, Sidenreng Rappang district, South Sulawesi province, Indonesia as an in-situ breeding place. Originally Gaga’ chicken only maintained and proliferated in the dynasty of the Bugis lord as a social status symbol but lately, Gaga’ chicken has spread to many places in Indonesia [7]. The external performances of Gaga’ chicken were almost similar as other domestic or local chicken. Gaga’ chicken has nice, attractive color feather, and good body performance. The unique differences of crowing character were stuttering voice and it sounded like a voice of human laughing [7]. Therefore crowing characters of Gaga’ chicken were very different compare with other singing chicken breeds in the world. Gaga’ chicken were separated based on crowing speed, dynamic crowing sound, and crowing interval. Since 2011, Gaga’ chicken has been established as one of the local groups of Indonesian chicken which was based on the decree of the Ministry of Agriculture No. 2920/Kpts/OT.140/6/2011. Therefore its genetic resources need to be protected and preserved.

Farmer and fanciers interest to keep those singing chicken breeds for singing contest because the winner of singing chicken contest will have high potential economic value for the farmer. That condition make singing chicken breeds became very popular and make it easy to spread to outside the central habitat but it lead many uncontrolled mating and reducing the blood purity of those chicken.

| Chicken Breed | Crowing group | Crowing type | Number Total | Crowing 1st part Syllables 2nd part | References |
|---------------|---------------|--------------|---------------|------------------------------------|------------|
| Pelung        | -             | -            | 3             | -                                  | - [9]      |
| Kokok Balenggek | -             | -            | 3 – 12        | -                                  | - [8]      |
| Bekisar       | -             | -            | 2             | -                                  | - [14]     |
| Gaga’ Dangdut | Long Type     | 140.92±90.92 | 2.49±0.81     | 140.41±90.72                      | Present study |
|              | Short Type    | 20.94±9.52   | 2.69±0.74     | 18.13±9.46                        | Present study |
| Slow group    | 8.27±2.58     | 2.50±0.68    | 5.79±2.41     | Present study                      |            |

3.5. Crowing sound as economic value and individual marker function
The 2nd International Conference of Animal Science and Technology

The advance of crowing sound research at livestock is not developed yet. In the future, it will show significant improvement relating to the voice function in life. Crowing sound of chicken could be as one of the valuable commodity economy because the winner of chickens singing contest, who can produce long and melodious crowing sound, usually have higher sale price or higher commercial value than other. Beside that crowing sound can be used as an individual marker because each individual has a specific voice characteristics. There is no human nor animals have similar sound exactly because of differences in the sound spectrum, frequency, and amplitude, both between individuals or between species. Therefore crowing sound of chicken could be used as fingerprints voice (voice printing), which is equal to the accuracy of fingerprint of human and DNA analysis.

3.6. Crowing character analysis
Crowing character of each singing chicken breed could be distinguished from their ability at crowing part. The part number of crowing sound of Gaga’ chicken were different with their uniqueness and distinction crowing style of each breed. Bekisar chicken have two parts of crowing style with short voice at 1st part and long-straight crowing voice at second part. The crowing sound of Kokok Balenggek chicken could be divided into three parts namely initial-middle-last voice. Initial voice of Kokok Balenggek chicken consist of first syllable; middle voice consist of second and third syllables; last voice consist of long crowing voice as fourth to last syllables. The crowing sound at last part is known as “lenggek voice” or crowing wave voice as melodious and uniqueness crowing character [16]. The crowing sound of Pelung chicken could be divided into three parts namely lift-middle-end voice. Lift voice of Pelung chicken consist of first, second, third syllables with clean slow rift beat voice; middle voice consists of only one syllable with very long, straight, and big voice as uniqueness crowing character; end voice is time to breathe release, tone down and ending voice is by big-clean voice. There is no stuttering voice at the crowing sound of Pelung chicken. The crowing sound of Gaga’ chicken could be divided into two parts which 1st part consists of 2 to 3 syllables, slow, and rift beat; second part consists of many syllables with diverse of crowing characters, such as long duration, smooth, slow-rift beat or fast-closely beat. This second part was uniqueness crowing character and be known as “Gaga’ voice because the voice sounded like people laughing and stuttering voice.

All roosters can crow when reached their mature age. Development of the song system is highly sensitive to steroid hormones [15]. Male bird sings more often when testosterone levels are high in adulthood, but the adult female does not sing even if treated with testosterone [17]. The testosterone hormone influence the development of the song circuit and for crystallization of learned song [18].

Crowing is induced under the control of a circadian system which will lead to a varied behavior of crowing sound and also by external stimuli [19]. A rooster crows for several reasons, such as to make their presence felt, to warning signal advertising territorial claims from other roosters which more aggressively, when they hear another rooster crow, when they find something to eat and call out to the rest of the flock, if they detect the presence of predators like cats, be used to attract hen to mate with them, challenges or threatens intruding males, as as well as to stimulate females reproductive behaviour and physiology [20–22] and they will crow if there is light suddenly flashed on them in the dark. Thus it can be assumed that the crowing behavior of rooster is its way of communicating with others and as a signal status.

Singing chicken breed has special distinction of characters like unique-great-long-melodious of crowing sound and many numbers of syllables compare with the local chicken breed. There were differences of crowing ability and crowing characteristic among breeds of singing chicken. Crowing ability was better when the chicken has longer crowing duration. Long crowing chicken type is characterized by the unusually long-drawn-out crow of the cocks, which may in some cases last for up to 60 sec [23].

Crowing duration of Long Dangdut type was nearly similar result of previous studies [24] but it was longer than that reported in the literature [10–12]. This results showed that crowing duration of Pelung and Kokok Balenggek chickens were a nearly similar range with the Short Dangdut type or Slow group of Gaga’ chicken. Average crowing duration of all singing chicken breeds and types were longer than average crowing duration of common breeds of chicken in Indonesia (2.8 sec) such as Bangkok chicken,
Birma chicken, Hutang chicken, Kampong chicken, Serama chicken, and Kate chicken [25] and Kampong chicken breed of 2.28 sec [26]. The champion at National Contest of Pelung Chicken at Bogor Indonesia during 1989-1994 have a range of crowing duration between 8.0 to 9.3 sec [9]. In Japan, some chicken varieties such as Toutenko, Toumaru, Koeyoshi [27], and Naganakidori [5] have been specifically bred to develop an exceptionally long crow of over 15 sec. Crow averages of Kosovo long crower chicken from Balkan countries and Denizli long crower chicken from Turkey were 20 to 40 sec and 20 to 25 sec, respectively. Beside that Tomaru as a singing chicken breed originating in Japan can be sustained for up to 25 sec.

Long Dangdut type showed higher number syllables than other group or types of Gaga chicken or than that reported in the literature [8,9,13,14]. A total number of syllables for all groups of Gaga’ chicken was lower than that reported in the literature [24].

4. Conclusion

In the current study, each singing chicken breed in Indonesia showed uniqueness and differences crowing character. A crowing character such as crowing duration and number of syllable could be identified as one basic selection to promote and to maintain preservation of singing chicken as germ plasm of Indonesia.

Acknowledgements

Technical assistances and helpful assistance in experiments and recording data from Mr. Fachri Ashari are gratefully acknowledged.

References

[1] Haoua M T, Keambou C T, Poutougnigni M Y and Manjeli Y 2015 Characterisation of indigenous chicken production systems in the Sudano-sahelian zone of Cameroon. Livest. Res. Rural Dev. 27 Article-30
[2] Kondombo S R 2005 Improvement of village chicken production in a mixed (chicken-ram) farming system in Burkina Faso (Wageningen Institute of Animal Sciences (Vol. PhD, p. 208.).)
[3] Nataamijaya A G 2000 The native chicken of Indonesia Bul. Plasma Nutfah 6 1–6
[4] Rusfidra and Arlina F 2014 A review of “Long crower chickens” as poultry genetic resources in indonesi Int. J. Poult. Sci. 13 665–9
[5] Komiyama T, Ikeo K and Gojobori T 2004 The evolutionary origin of long-crowing chicken: its evolutionary relationship with fighting cocks disclosed by the mtDNA sequence analysis Gene 333 91–9
[6] Lukanov H 2013 Balkan chicken breeds and breed groups (Part I and II) Avic. Eur. 8 1–16
[7] Bugiwati S R A and Ashari F 2013 Crowing sound analysis of Gaga’chicken: local chicken from South Sulawesi Indonesia. Int. J. Plant, Anim. Environ. Sci. 3 163–8
[8] Rusfidra 2007 Pemanfaatan waveform suara kokok sebagai marker suatu bangsa pada “ayam penyanyi” di Indonesia. Prosiding Seminar Nasional Sains dan Teknologi untuk Kejayaan Bangsa (Bandar Lampung: Lembaga Penelitian Universitas Lampung)
[9] Jatmiko 2001 Studi fenotipe ayam Pelung untuk seleksi tipe ayam penyanyi
[10] Jarmani S N and Nataamijaya A G 1995 Karakteristik suara ayam pelung Prosiding Seminar Nasional Peternakan dan Veteriner. (Puslitbang Peternakan. Badan Litbang Pertanian)
[11] Iskandar S and Susanti T 2007 Karakter dan manfaat ayam Pelung di Indonesia Wartazoa 17 128–36
[12] Rusfidra 2004 Karakterisasi sifat-sifat fenotipik sebagai strategi awal konservasi ayam kokok balenggek di Sumatera Barat (Sekolah Pascasarjana Institut Pertanian Bogor)
[13] Tarigan N and Hermanto S 1992 Bekisar: pemeliharaan dan pengembangbiakan secara modern (Kanisius)
[14] Rusfidra 2009 Analisis Suara Kokok pada Ayam Kokok Balenggek; Ayam lokal Berkokok Merdu dari Sumatera Barat Simposium dan Kongres Peripi ke-VI (PERIPI Bogor Indonesia)
[15] Wade J and Arnold A P 2004 Sexual differentiation of the zebra finch song system Ann. N. Y. Acad. Sci. 1016 540–59
[16] Rusfidra 2009 Comparison of Characteristics of Phenotype Traits and Song Traits of Kokok Balenggek, Pelung, and Bekisar chicken Proceeding International Seminar of Biotechnology (Livestock of Services of West Sumatera Province, Bukittinggi, Indonesia)
[17] Arnold A P 1974 Behavioral Effects of Androgen in Zebra Finches (Poephila guttata) and a Search for Its Site of Action (Doctoral dissertation, Rockefeller University)
[18] Arnold A P 1997 Sexual differentiation of the zebra finch song system: positive evidence, negative evidence, null hypotheses, and a paradigm shift J. Neurobiol. 33 572–84
[19] Shimmura T and Yoshimura T 2013 Circadian clock determines the timing of rooster crowing Curr. Biol. 23 R231–3
[20] Brenowitz E A, Margoliash D and Nordeen K W 1997 An introduction to birdsong and the avian song system J. Neurobiol. 33 495–500
[21] Tadano R, Kinoshita K, Mizutani M, Atsumi Y, Fujiwara A, Saitou T, Namikawa T and Tsudzuki M 2010 Molecular characterization reveals genetic uniformity in experimental chicken resources Exp. Anim. 59 511–4
[22] Wood-Gush D G M 1971 The Behaviour of the domestic fowl (London, Nimrod Press)
[23] Damerow G 2010 Guide to Raising Chickens (Storey Publishing)
[24] Junaedi 2012 Kajian bioakustik tipe suara ayam Gaga’ (Undergraduate Thesis Fakultas Peternakan Universitas Hasanuddin Makassar)
[25] Ginting A V 2015 Identifikasi dan Karakterisasi Pola Kokok Pada Ayam Pelihara Berdasarkan Pendekatan Bioakustik J. Peternak. Integr. 3 142–55
[26] Nurningsih 2010 Karakteristik bioakustik suara ayam buras jantan pada umur yang berbeda (Undergraduate Thesis, Fakultas Peternakan Universitas Hasanuddin)
[27] Chang H and Huang Y 2003 The Relationship between Indigenous Animals and Humans in AP-EC Region Chinese Taipei 186