Potential study and utilization of red fruit peels (*Pandanus conoideus* Lam) as feed additive for native chicken production

D T R Saragih¹, J A Syamsu², S Purwanti² and W Pakiding²

¹Animal Science Postgraduate Program, Faculty of Animal Science, Universitas Hasanuddin, Makassar
²Faculty of Animal Science, Universitas Hasanuddin, Makassar

E-mail: desruli76.saragih@gmail.com

Abstract. Application of the use of red fruit (*Pandanus conoideus* Lam) as a feed additive needs to be developed because it has antioxidant properties and as a preventive disease drug. The purpose of this review is to examine the use of red fruit peels as feed additives for native chickens. A literature study conducted by reviewing several journals with the results of the study showed that the use of red fruit peels in poultry is still limited to broilers. Red fruit has known properties as a cancer-preventing drug, hypertension, diabetes, and even HIV. Red fruit contains beta-carotene, tocopherol, oleic acid, and linoleic acid. It also contains unsaturated fatty acids, namely oleic acid, linoleic acid, linolenic acid, decanoic, omega 3, and omega 9. Parts used only in fruit juice, oil, and red fruit pulp, while the skin has not been utilized. Thus, the use of red fruit peels in free-range chickens as feed additives will provide new treasures in science and prospects for local, regional, national, and even international sluggish poultry fields.

1. Introduction

Poultry production trends in Indonesia in BPS Indonesia still show unsatisfactory figures. Indonesian BPS data shows that the population of native chickens in Indonesia from 2016 to 2017 were 294,161,691,299,701,400 and 310,595,951, respectively. While in Papua and West Papua the growth rate of growth was not too significant, namely 1,841,816 (the proportion of the national population 0.63%), 1,309,112 (0.44%) and 1,347,392 (0.43%) [1]. The population growth of free-range chicken in Indonesia every year is only 5.58%. While in Papua it still looks positive at 14.16%. But in West Papua the value is negative -26.84%. Whereas in Indonesia, several types of local chickens can be great community farms and have been kept for generations.

In Indonesia there are 32 types of local chickens (ecotype), including pelung, sentul, merawang, gaok, and Nusa Penida [2]. Chicken breeding programs are currently carried out to form local chicken strains that are resistant to diseases, such as AI and tetelo (newcastle disease). For this reason, the management of native chicken in the aspect of feed, which has properties as an additive for disease prevention, needs to be developed. One of them is the use of red fruit as feed additives in the ration.

The use of red fruit-(*Pandanus conoideus* Lam) as feed additives because it has efficacy as an antioxidant needs to be developed to the broadest extent. It is essential to get chickens with genes that have the body's resistance to the above diseases. Red fruit is a kind of traditional fruit from Papua.
This plant height can reach 16 meters. Red fruit has a fruit length reaching 55 cm, a diameter of 10-15 cm with a weight of 2-3 kg/fruit, the medicinal properties, and increased stamina.

Papua people who consume this fruit are usually more muscular and high stamina and rarely affected by degenerative diseases such as hypertension, diabetes, and cancer. This fruit contains high antioxidants in the form of carotene, beta carotene, and tocopherol. The current use of red fruit is oil extraction, which will give a byproduct in the form of a paste. The resulting paste is usually used as animal feed even though this red fruit paste still has a high nutritional value.

Indonesia itself has not been able to meet the demand for quantity and quality of animal food continuously. Imports of livestock products still occur every year. The volume of imports of Indonesian chickens is 76.7 thousand kg, where free-range chickens (Gallus domesticus) live under 185 g are valued at 76.5 thousand kg.

One strategic aspect that can be a determining factor is animal feed. Animal feed, especially in poultry, has been produced by several large and commercial feed mills in Indonesia, but to date, it is felt that the price of this chicken feed factory is still too high and tends to cost production; thus strategic efforts are needed to provide alternative feed sources for native chicken farming. The quality and quantity of animal feed are still not able to meet the needs of animal feed consumption, even though the availability of alternative feed sources is abundant throughout the year. The purpose of this study is to determine the possible use of local red fruit feed ingredients (Pandanus conoideus Lam) as a source of feed additives in native chickens.

2. Methods

2.1. Materials feed

This preliminary study was conducted to see the extent of the use of red fruit, especially the peels in native chicken feed additives. The survey was conducted on existing literature sources on publication media in Indonesia through Google Scholar in 2019 and Elsevier in 2019. By using the keywords and the use of red fruit peel as native chicken feed, the results of a survey of scientific publications information on the use of red fruit in Elsevier 2019 found no application of the use of red fruit in livestock. But on Google Scholar, found several studies that have used red fruit products in chicken feed, especially broilers.

2.2. Data collection

In this preliminary study, the data used were obtained from the Indonesian Central Statistics Agency and the Central Statistics Agency for West Papua and Manokwari. The information obtained is the growth trend of native chickens, broiler chickens, and laying hens in the last three years, namely 2015, 2016 and 2017 [3–8]. In addition, we also compile the utilization of plant parts from red fruit. It is important to know the extent of the application of the use of red fruit in livestock and try to synthesize the advantages and disadvantages. Thus, it is expected to know what aspects are not yet known to be used as stepping points of this study.

2.3. Data analyses

Data were analyzed using descriptive statistics. Presentation of data done through tabulation (tabulation) and by using graphs.

3. Results and discussions

The population of domestic poultry in Manokwari with the largest population is in the district of West Manokwari. Followed by the southern Manokwari, East Manokwari and Prafi districts. While the lowest population is in the Warmare district. The largest laying hen population is in the West Manokwari district, followed by Prafi, southern Manokwari and Masni. For broilers, the largest population is still in West Manokwari. While ducks, the largest population is in Prafi, Masni, Sidey and Warmare.
3.1. The utilization of red fruit (Pandanus conoideus Lam.)
Utilization of red fruit in the world has not been well exposed. The results of the library search by using Elsevier search found no scientific articles about the use of red fruit as animal feed (additive feed). While searching libraries using Google Scholar found more studies of red fruit in animal experiments. Meanwhile, in poultry, so far only in broilers [9].

3.2. Chemical composition
Component of red fruit consists of 51-61% of pellets, 39-49% of grain, 27-36% of seeds and 10-17% of fruit flesh [13]. The results of the study of several experts found the composition of red fruit is a protein with a content of 3.32%, 4.56% fiber.

Red fruit contains nutrients that are beneficial to the body, including beta-carotene, tocopherol, oleic acid, and linoleic acid [10]. In summary, red fruit contains antioxidants (carotenoids, tocopherol), saturated and unsaturated fatty acids, fiber, and calcium. Red fruit contains many antioxidants with an average content that is, carotene (12,000ppm), beta-carotene (700ppm), and tocopherol (11,000ppm). Red fruit also contains types of unsaturated fatty acids that have a healthy effect, namely oleic acid, linoleic acid, linolenic acid, decanoic, omega 3 and omega 9 which are all active compounds to counteract the formation of free radicals in the body. It also contains high levels of vitamin E and carotene. The chemical compounds contained in red fruit juice are still not uniform, especially tocopherol and its beta-carotene.

Potential of red fruit (skin, red fruit juice, red fruit flesh, red fruit seeds, red fruit leaves, red fruit roots and red fruit stems. Some of the red fruit juice samples studied showed different levels of tocopherol and beta-carotene content. These two compounds are influenced by the location of the plant
and its manufacturing process. Tocopherol and high beta-carotene are obtained from fruits that come from upland plants and through the right cooking process.

Table 1. Composition of nutrient.

| Compound     | Proportion (%) |
|--------------|----------------|
| Moisturizer  | 68             |
| Ash          | 1.99           |
| Fat          | 3.41           |
| Protein      | 3.32           |
| Fibre        | 4.56           |
| Vitamin A    | 3.12           |
| Vitamin B    | 0.74           |
| Vitamin C    | 1.07           |
| Vitamin E    | 9.68           |
| Ca           | 3              |
| P            | 0.69           |
| Fe           | 0.42           |

Table 2. Composition of antioxidant.

| Compound         | Proportion (%)                   |
|------------------|----------------------------------|
| Free fatty acids | 21.96±2.74                      |
| Acids number     | 42.22±7.45                      |
| Lod number       | 44.46±4.2                       |
| Peroxide number  | 3.17±1.88 (Meg/1000g)           |
| Saponification numbers | 3.33±(KOH/g)               |
| Brightness of oil type | 5.79±0.01 m           |
| Carotene total   | 12,333.34                       |
| β-carotene       | 500-800 (ppm)                   |
| Tocopherol total | 10,319.10 (ppm)                 |
| α-Tocopherol     | 500 ppm                         |
| Oleat-acid       | 56.21                           |
| Palmitate acid   | 33.48                           |
| Lioleate acid    | 5.26                            |
| Linoleate acid   | 3.25                            |
| Stearate acid    | 1.8                             |

The potency of red fruit is the skin, red fruit juice, red fruit flesh, red fruit seeds, red fruit leaves, red fruit roots, and red fruit stems. Some of the red fruit juice samples studied showed different levels of tocopherol and beta-carotene content. These two compounds are influenced by the location of the plant and its manufacturing process. Tocopherol and high beta-carotene are obtained from fruits that come from upland plants and through the right cooking process.

3.3. Recent findings of red fruit
From the results of the study, the use of red fruit is still limited to experimental animals such as mice. The utilization of red fruit that has been used in livestock is broiler chickens, for example sampled by [9] and [11]. While the utilization of the dominant red fruit plant parts is in the form of red fruit oil.

The utilization of red fruit in West Papua, especially in Manokwari is still limited to humans by using red fruit oil. The utilization of red fruit meat is still limited by boiling it for direct consumption. While red skin is generally not used. The red rind has been a waste (crop wastes). Thus, it is hoped
that the skin of red fruit can be an additional feed ingredient for livestock, particularly native chicken. Extensive use of red fruit, such as the skin, is still limited and very rare. In pig and cow breeders, red fruit rind is given to these animals in raw and boiled. The boiling process is done to avoid the sap and provide a soft effect for livestock to consume.

The cooking process with high heating and long-time will reduce these two ingredients. The content of these chemical compounds is also influenced by the type of red fruit. According to [22] stated that of the 85 red fruit cultivars found, red fruit cultivars containing tocopherol and high carotene content were MMS-Md cultivar red fruits originating from Masni District, Manokwari Regency. The cultivars contained total tocopherol and total carotene of 2,294.28 ppm and 1,264.28 ppm, respectively.

4. Conclusion
The literature study suggested that the application of red fruit, especially the skin, has not been widely used as an alternative feed on native chicken. Red fruit turned out to have the potential to be used as feed additives because it has efficacy as a drug (herbal) for the prevention of dangerous diseases such as cancer. It also has properties for endurance, immunity.

Table 3. Utilization of red fruit in animal-related studies.

| Parts    | Yield (results)                                                                 | Resources |
|----------|--------------------------------------------------------------------------------|-----------|
| Fruit    | The usage of red fruit as pig feed                                             | [12]      |
| RFO (Oil)| For improving cholesterol, LDL and HDL on broiler, it is suggested to apply red fruit extract up to 3% | [13]      |
|          | Incapable of reducing oxidative stress on rat                                  |           |
|          | Incapable of reducing blood glucose and capable of reducing malonaldehyde (MDA)| [14]      |
|          | Incapable of increasing Feed Conversion Ratio, however increasing feed consumption and average daily gain (ADG)| [9]       |
|          | Capable of antioxidant and pro-vitamin A to inhibit many diseases              | [15]      |
|          | The RFO has effect of hypoglycemic                                             | [16]      |
|          | The RFO has effect on prevention of cancers, the one is lung cancer             | [17]      |
|          | The RFO has effect on improved lung carcinogenesis inhibition                   | [18]      |
|          | Quality of microemulsion of the RFO achieved at 40% tween-20                   | [19]      |
|          | The RFO determined positive effect on meat pH, water holding capacity, moisture content and cooking loss of the broilers | [11]      |
|          | The RFO has vital role in decreasing SGOT and SPGT so that it has capacity in prevention of cell deterioration | [20]      |
| Seed     | Extract ethanol of the Red fruit seed play a prominent role as medicine due to tannin and glycoside (for both phenolic and anthraquinone) is an antioxidant compound | [21]      |
| Leaves   | None                                                                            | -         |
| Trunk    | None                                                                            | -         |
| Root     | None                                                                            | -         |
| Left offer | Increasing digestion organ                                                     | [17]      |

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References
[1] BPS Indonesia 2019 Populasi Ayam Buras Menurut Provinsi, 2009-2018 (Jakarta: Badan Pusat Statistik)
[2] Nataamijaya A G 2017 Pengembangan potensi ayam lokal untuk menunjang peningkatan kesejahteraan petani Jurnal Penelitian dan Pengembangan Pertanian 29 131-138
[3] BPS-Manokwari 2015 Manokwari dalam angka (Manokwari: Badan Pusat Statistik)
[4] BPS-Manokwari 2016 Manokwari dalam angka (Manokwari: Badan Pusat Statistik)
[5] BPS-Manokwari 2017 Manokwari dalam angka (Manokwari: Badan Pusat Statistik)
[6] BPS-Papua Barat 2015 Papua Barat dalam angka (Papua Barat: Badan Pusat Statistik)
[7] BPS-Papua Barat 2016 Papua Barat dalam angka (Papua Barat: Badan Pusat Statistik)
[8] BPS-Papua Barat 2017 Papua Barat dalam angka (Papua Barat: Badan Pusat Statistik)
[9] Astuti Y and Dewi L L R 2007 Pengaruh ekstrak buah merah (Pandanus conoideus L.) terhadap kadar glukosa darah Mutiara Med. 7 1–6
[10] Budi I M 2002 Kajian kandungan zat gizi dan sifat fisiko kimia berbagai jenis minyak buah merah (Pandanus conoideus Lam) hasil ekstraksi secara tradisional di Kabupaten Jayawijaya Propinsi Irian Jaya Thesis (Bogor: Institut Pertanian Bogor)
[11] Ollong A R, Arizona R and Badaruddin R 2019 Kualitas fisik daging ayam broiler yang diberi minyak buah merah dalam pakan komersial J. Ilmu dan Teknol. Peternak. Trop. 6 20–6
[12] Sawen D, Rahayu B W I and Sumpe I Pemanfaatan limbah pengolahan buah merah pada sistem pemeliharaan babi secara pastura Pastura 4 34-37
[13] Handayani M, Soekarno P and Wanandi S 2013 Red fruit oil supplementation fails to prevent oxidative stress in rats Universa Med. 32 86–91
[14] Kadri H, Jarit E J and Rustam E 2015 Pengaruh pemberian minyak buah merah (Pandanus conoideus Lam) terhadap kadar glukosa darah dan malondialdehid serum mencit yang diinduksi aloksan Maj. Kedokt. Andalas 34 79–87
[15] Nishigaki T, Kunitaka H, Surono I S and Shigematsu H 2011 Antitumor effects of pandanus conoideus in in vitro and in vivo studies J. Agro-Based Ind. 28 1–7
[16] Ollong A R, Arizona R and Badaruddin R 2019 Kualitas fisik daging ayam broiler yang diberi minyak buah merah dalam pakan komersial J. Ilmu Ternak dan Teknol. Peternak. Trop. 6 20–6
[17] Ollong A R, Tethool A N and Arizona R 2017 Pengaruh berbagai taraf ampas buah merah (Pandanus conoideus Lam.) dalam ransum komersial terhadap persentase panjang dan bobot organ pencernaan itik lokal jantan Seminar Nasional Peternakan 3 pp 173–80
[18] Ollong A R, Wihandoyo and Erwanto Y 2012 Penampilan produksi ayam broiler yang diberikan pakan mengandung minyak buah merah (Pandanus conoideus Lam) pada alas yang berbeda Bul. Peternak. 36 14–8
[19] Palupi I A and Martosupomo M 2009 Buah Merah: potensi dan manfaatnya sebagai antioksidan J. Tumbuh. Obat Indones. 2 42–8
[20] Sarungallo Z, Murtiningrum A H A, Toha and Junaidi M 2006 Eksplorasi Jenis Buah Merah (Pandanus conoideus lamk) asal Papua (Manokwari: Laporan Penelitian Universitas Papua)
[21] Sundari I 2010 Identifikasi Senyawa dalam Ekstrak Etanol Biji Buah Merah (Pandanus conoideus Lamk.) (Surakarta: Universitas Sebelas Maret)
[22] Sarungallo Z L 2014 Karakterisasi Sifat Fisik Buah Merah (Pandanus conoideus), Metode Ekstraksi, dan Sifat Kimia Minyak yang dihasilkannya (Bogor: Institut Pertanian Bogor)