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Quality of Duck Eggs Maintained Using a Different Maintenance System in the Malang Raya Area

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***Abstract*—** *This study aims to examine the effect of nomadic intensive, semi-intensive and extensive maintenance systems on the physical quality of duck eggs. Ducks used 36 - 50 weeks old were fed with a composition of rations from smallholder farmers. The research design used was non-experimental research using survey methods. Surveys were conducted on 5 farmers from Greater Malang. Sampling in this study was conducted using a purposive sampling method. Samples from selected summits were divided into 3 maintenance systems, namely intensive, semi-intensive maintenance systems and extensive. Measurements of egg physical quality include egg weight, eggshell weight, and thickness of the g. The data obtained were then compared to an average using the ANNOVA test . The results showed that the ducks were reared using the system maintenance intensive to produce eggs with a better physical quality than the ducks are reared using intensive maintenance system. This can be seen from the egg yolk color score and the yolk index. Egg weight, eggshell weight, eggshell thickness, egg white index and Haugh unit provide the same quality between intensive, semi-intensive and extensive maintenance systems.*

***Keywords*—** *Egg physical quality, Ducks, Maintenance system, Intensive, Semi intensive, Extensive.*

I. INTRODUCTION

Ducks is one of the local poultry commodities that has the potential to be cultivated as egg producers to meet the needs of animal protein. There are many types of local ducks in Indonesia. Local ducks are cultivated in Malang Raya. Ducks can be used as an egg and meat producer. The environmental conditions of each region differ, resulting in differences in the availability of natural resources. Breeders in Malang Raya have potential as duck farms because the availability of feed around the area of breeding is very abundant. Rice bran comes from rice mills around the farm, fresh fish comes from fish auction near the farms and Aking rice comes from collectors and restaurants around the farm.

Maintenance systems in duck farming are generally classified into three, namely intensive, semi-intensive and extensive nomadic. The three maintenance systems have advantages and disadvantages of each. The difference in the maintenance system lies in the housing and fulfillment of duck nutrient requirements. Duck rearing system is one of the factors that cause differences in feed intake to nutrient requirements, activities and duck health on the physical quality of eggs. Different duck rearing systems will certainly produce eggs with different physical qualities. Proper duck maintenance system will result in optimal egg production and improve the physical quality of the egg.

Breeders in Malang Raya in general keeping ducks using pemelih system araan intensive, semi-intensive and extensive nomadic.

The nomadic extensive maintenance system was initially used by farmers because of the availability of sufficiently large paddy fields. The decreasing number of paddy fields causes farmers to start using semi-intensive, intensive maintenance systems. Semi-intensive system maintenance is done by way of herding ducks in paddy fields at harvest time and then returned to the cage when the rice planting season . Natural food ingredients such as scattered rice grains, forages, water algae, rice snails and insects are widely available around grazing areas. Farmers do not only rely on food available in the fields, but also provide other feed both before and after pasture. Extensive maintenance system is done by way of keeping ducks in a cage and feed needs are provided by the breeder.

The purpose of this study was to examine the effect of semi-intensive and intensive maintenance systems on the physical quality of eggs such as egg weight, monkey weight, eggshell thickness. The results are expected to provide information on how the influence of nomadic intensive, semi-intensive and extensive maintenance systems on the physical quality of duck eggs. The hypothesis to be tested is that there are differences in the physical quality of duck eggs between intensive, semi-intensive and extensive nomadic maintenance systems .

II. MATERIAL AND METHODS

Time and Location

This study had been conducted in Jun 2019 – August 2019. The research took place in Malang Raya area duck livestock, Laboratory of Molecular Biology Laboratory of Mathematics and Natural Sciences Faculty in Brawijaya University Malang - Indonesia.

Research Material

The material used in this study is laying ducks in Malang Raya. Laying ducks used 35 - 50 weeks old are fed with the composition of feed from smallholder farmers. The equipment used in this study were egg tray, digital scales, sliding glass, yolk color fan, tripold micrometer.

Method

The research design used was non-experimental research using the survey method. Surveys were carried out on all farmers from 5 farmers. Sampling in the study was conducted

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using a sampling method. Egg samples from selected breeders are divided into 3 maintenance systems, namely intensive, semi-intensive and extensive nomadic maintenance systems. The number of laying duck farmers who elected consisting of two farmers who use intensive maintenance system and two breeders who use semi-intensive maintenance system, and 1 extensive nomadic breeders.

Research Parameters

The variable of this study were Egg weight, Index of egg, Egg weight Shell, Shell thickness, Egg yolk, Haugh unit

Analysis of Data

The data obtained were then compared on average using ANNOVA statistical tests using the Randomized Group Design method. Data testing is performed using the ms.excel application. Hypothesis formulation:
H0: There is no difference in the physical quality of duck eggs between intensive and intensive nomadic semi-intensive maintenance systems.
H1: There is a difference in the physical quality of duck eggs between intensive and semi-intensive maintenance systems
Test Criteria:
Accept H0 if Fcount <F table 0.5α
Accept H1 if Fcount ≥ F table 0.5α

III. Results and Discussion

General Conditions of Farmers

The average breeder in Malang has been raising ducks for 4-6 years. The livestock commodities that are kept are laying and broiler ducks with a nomad intensive, intensive and extensive maintenance system. This farm in Malang was obtained in the areas of Tasikmadu, Tlaseh, Ampeldento, tumpang, and bumiaji. The land area ranchers ± 500 m2. Ambient temperature ranges from 17 o - 23 o C and to humidity ranges from 50 - 70%. Temperatures ka ndang range between 26 ° C (1)states that the optimal cage temperature for laying ducks ranges from 26 - 30 o C with a maximum humidity of 90%.

Location distance of livestock 100m from the highway, 2 00 m - 1000M with p Housing Position. The location of the farm is already good because it was established on paddy fields which during the harvest season and the location of intensive and semi-intensive cages are close to the settlements but do not cause resentment of the population around because the wall fence is quite high and sanitary enclosure is quite clean, although it does not meet the minimum distance of the livestock business with resident settlements (1). The location of duck farms is at least 250 m from residential areas. The location of livestock should be in accordance with the location determined by the local government and close to the market and production center of livestock commodities (2).

Total sampling petern ak laying ducks were taken amounting to 5 farmers who use the stem intensive maintenance, breeders who use semi-intensive maintenance system , and an extensive system of nomadic breeders . Age of laying farmers in Malang ranges from 29-4 years. Age of laying duck farmers who use intensive and semi-intensive maintenance systems are both in the productive age. Productive age affects the ability of farmers to work. Ability to work will decrease along with aging. The population of productive age in Indonesia ranges from 15 - 64 years (3). The productive age the possibility of an increase in productivity and income is very high because farmers are more optimal in managing livestock (4). Increasing age can maintain emotional stability and can reduce physical abilities (5).

The experience of laying ducks in Malang is mostly relatively long. The experience of farmers that use intensive rearing system berkisar between 3-4 tahun with. The experience of farmers who use the maintenance system of semi -intensive range between 4 ta hun and maintaining an extensive experience of more than 5 years. Experience laying duck farmers who use the system maintenance intensif, semi-intensive, and an extensive nomadic do not differ much. The experience of the farmer is related to the knowledge of the farmer and the skills of the farmer in doing work. The experience of farmers in raising livestock is related to critical and careful actions in doing work (4). Increasing the experience of farmers can improve the skills and knowledge of farmers (5).

The type of cage used by laying ducks in Malang is the postal type cage. Postal type cages in addition to the relatively inexpensive manufacturing costs can also facilitate farmers to sanitize so as to reduce odors. The materials used as roofs, walls and base of the cage are materials that are easily obtained around the farmer's location and the price is relatively cheap. The material used for the roof of the cage is mainly tiled soil and there are some breeders who use tarpaulins. Cage construction materials used are wood and bamboo. The bottom of the cage is the soil and is added with straw so that it can prevent the egg from breaking easily. Duck cage construction materials that are widely used are wood and bamboo because they are cheap and durable (6).

Ducks in Greater Malang are generally maintained using an intensive, semi-intensive and extensive nomadic maintenance system . Extensive maintenance system is done by way of keeping ducks in a cage and feed needs dise are delivered by farmers. Intensively maintained ducks are given food every morning and evening. Semi-intensive system maintenance is done by way of herding ducks in paddy fields and then returned to the cage in the afternoon. Ducks that are kept semi-intensive are fed before and after grazing. Grazing is carried out for ± 8 hours, from 07.00 - 15.00 WIB. Ducks will meet their needs by consuming natural feed ingredients during pasture. Natural food ingredients that are widely available around grazing areas include scattered grains of rice, grain, forage, water algae, rice snails and insects. The system of intensive maintenance is done by way of keeping ducks in the cage and all the needs met by the farmer (7). Ducks that are grazed on paddy fields or river banks allow ducks to get food to meet their needs (8).

Feed ingredients used by breeders in raising ducks come from around the location. Rice bran comes from the milling pad around the farm, concentrate comes from the poultry shop and Aking rice comes from collectors and restaurants around the farm. The composition of duck feed ingredients that use

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intensive maintenance systems, namely the composition of concentrated protein sources more than the semi-intensive and extensive maintenance systems, states that feed for laying ducks should have 18% PK nutrient content, 7.5% SK, LK 3.5%, EM 2,800 kcal, Ca 3,25 - 4% and P 0,6% (1).

Physical Quality of Eggs

The results of the study in the form of average physical quality of duck eggs that are maintained intensively and semi-intensively can be seen in Table 1.

TABLE I. Average physical quality of duck eggs maintained intensively, semi-intensively

Parameter	Semi-intensive F1	intensive f2	f3 semi intensive	intensive f4	f5 extensive
Weight (g)	60.76[a]	70.81[b]	74.33[b]	75.4[b]	56.46[a]
Index	0.753[a]	0.726[a]	0.769[a]	0.766[a]	0.771[a]
Thick shell (mm)	0. 81[a]	0. 79[a]	0. 75[a]	0. 78[a]	0. 81[a]
weight egg shell (g)	7.83[a]	9.06[b]	9.21[b]	10.37[c]	8.08[a]
Yolk Color	9,13[a]	13.7[b]	11.56[b]	12[b]	7.46[a]
HU	78.31[a]	78.1[a]	76.35[a]	78.26[a]	81.54[a]

Egg Weight

The average weight of duck eggs maintained intensively is in the range of research results which states that the weight of duck eggs maintained intensively ranges between 62.35 - 72.13 g (9). The average weight of duck eggs that are kept semi-intensive is in the range of research results of which the weight of duck eggs that are maintained in semi-intensive ranges between 68.74 - 72.74 g (10). The results of the statistical analysis showed that there were differences ($P < 0.05$) in the weight of duck eggs that were maintained intensively, semi-intensively , and extensively. The difference in egg weight can be caused by the feed given to ducks that are maintained intensively, semi-intensively , and extensively in different compositions .

Weight of duck eggs can be influenced by consumption of protein and amino acids. An increase or decrease in protein consumption can affect the weight of the eggs produced. The amount of feed in accordance with the needs of ducks and balanced nutrient content will produce egg weight according to the standard (11). Tugiyanti and Iriyanti (2012) stated that egg weight can be influenced by genetic, duck weight, egg laying period, environment, egg composition and feed

Kementan states that feed for laying ducks should have a PK content of 18%. Protein consumption ducks that are kept in intensive allegedly able to be supplied by the breeder (1). Feed containing protein is thought to come from concentrates . This is consistent with the opinion of which states that intensive maintenance systems allow ducks to get food to meet their needs (8).

Egg Length and Width (Index)

Factors affecting egg shape are expressed in egg index or egg shape index, which is the ratio between the wide axis and the long axis multiplied by 100 percent (12). The results of statistical analysis showed that there was no difference ($P>0.05$) on the index of eggs that were maintained intensively, semi-intensively and extensively. The average value of egg index in intensive 74, 6 %, semi intensive 76.1% and extensive 77.1%. Eggs that are short and round without being affected by egg weight will show a high egg index number. The egg index that reflects the shape of the egg is strongly influenced by genetic characteristics, nation, can also be caused by the processes that occur during egg formation, especially when the egg through the magnum and isthmus (13). Index of egg shape shows the level of egg slump (14). The greater the index number of the egg shape, the egg will be more round and vice versa. According the shape of the egg is closely related to the age of the ducks that produce it (15).

A good egg shape is proportional, not bumpy, not too oval and not too round. Egg shape is a trait that is inherited so that the egg shape of each poultry has a distinctive shape in accordance with the shape of the egg and large reproductive organs (16). According to factors that play a role in giving the shape of an egg include: the number of albumen secreted in the oviduct, the size of the lumen of the isthmus, the activity and strength of the muscular wall of the isthmus and other parts through which the egg passes (17).

Shell weight

The average weight of duck eggshell produced was higher than the results of which states that intensively reared ducks produce shell weight ranging from 6.99 - 7.09 g and semi intensive 6.97 - 7.05 g (18). The weight of eggshells is approximately 10 - 12% of the weight of whole eggs. The results of analysis of s statistics show that there are differences ($P<0, 05$) in the heavy duck egg shell yang maintained intensive, semi-intensive and extensive (19). A difference in the weight of shells can be caused by the feed given to ducks that are kept intensively and semi-intensive and extensively different in composition. Weight of duck eggshells can be influenced by consumption of Ca and P. Increases or decreases in Ca and P consumption can affect the weight of eggshells (20). The higher calcium content in feed will produce greater eggshell weight. The weight of shells can be influenced by maintenance management, health, nutrient content of rations, adequacy of livestock nutrients and environmental conditions (21).

Consumption of intensively reared cucumber was 3,69 g with a Ca content in feed of 1,31%. Consumption P ducks intensively reared by 2, 78g of the P content in the feed of 0.98%. Consumption of Ca duck that was kept semi-intensive was 0, 96g with Ca content in feed of 1.67%. Consumption of Pigs maintained semi-intensive is 2,7g with a P content in feed of 1,03%. Consumption of Ca and P duck that is kept semi-intensive has not met the needs and can affect the weight of the shells. The Ca requirement for ducks is 3.5 g / head / day and P 1.4 g / head / day (7). According to the Ministry of Agriculture, the feed for laying ducks should have a Ca 3, 25-4% and P 0.6% content. Consumption of Ca and P duck that is kept semi-intensive is thought to be fulfilled from natural food that is around the grazing place (1). Natural food containing Ca and P is thought to originate from rice snails and small crabs. This is consistent with the states that the semi-intensive

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and extensive maintenance system allows ducks to get feed to meet their needs (8). Snails and small crabs are feed ingredients that contain Ca and P (22) .

Shell Thickness

The average balance of duck eggshell produced is higher than that of (18) which states that intensively maintained ducks produce a mean thickness of shells ranging from 0.785 mm, semi-intensive 0.78 mm and 0.81 extensive. Normal duck eggs have shell thickness ranging from 0, 35- 0.56 mm (23). The results of statistical analysis showed that there was no difference (P> 0.05) in the balance of duck eggshells which were maintained intensively and semi-intensively. The lack of differences in the thickness of the shells can be caused because the feed given to ducks that are maintained intensively and semi-intensive already meets the needs. Duck eggshell thickness can be influenced by Ca and P consumption. Increasing or decreasing Ca and P consumption can influence egg shell thickness. The greater calcium content will produce a thicker eggshell thickness (24). The thickness of the shell can be influenced by age, physiological conditions of the body, stress, components of the shell layer and nutrient content of the ration (21).

The Ca requirement for ducks is 3.5 g / head / day and P 1.4 g / head / day (7). According to the Ministry of Agriculture, the feed for laying ducks should have a Ca 3, 25-4% and P 0.6% content. Consumption of Ca and Pucks that are kept semi-intensive and extensive is thought to be fulfilled from natural food that is in the vicinity of the grazing area (1). Natural food containing Ca and P is thought to originate from rice snails and small crabs. This is consistent with states that ducks that are kept semi-intensive and extensive can meet their own needs and get a lot of additional feed (25). The rice field snails had a high Ca content (26).

Egg Yolk Color Score

Average rat a duck egg yolk color were dipelih fig intensive higher than the results of research the color of duck egg yolk intensively maintained ranges from 5.47 - 5.65 (24). The average color of duck yolk which is maintained semi-intensive is in the range of research results which states that the color of the yolk of ducks that are grazed ranges from 7 , 7 - 13.74 (9). The results of the statistical analysis showed that there were differences (P <0.05) in the color of the yolk of duck eggs which were maintained intensively, semi-intensively and extensively. Based on the results of the study, the data obtained from the color of the yolk of duck eggs intensively maintained with an average of 12.85, semi-intensive 10.34 and extensive 7.46. The color of duck yolk that is intensively maintained is higher than that of other maintenance systems, whereas the color that is maintained extensively is lower than other maintenance systems. This is thought to be possible because ducks that are extensively nourished are fed with a lack of egg yolk pigment.

The color of the yolk can be influenced by the carotenoid content in the feed. Increasing or decreasing carotenoid content in feed can affect the color of the yolk. The more carotenoid content in the feed will produce an egg yolk index which is higher. Ducks cannot produce their own carotenoids, so they need a carotenoid feed source to produce egg yolk. The color of duck yolk which is maintained in a semi-intensive manner is higher than that of a duck maintained intensively. This is thought to be possible because semi-reared ducks have a higher chance of consuming egg yolk pigment feed in grazing areas. Natural feed containing carotenoids is thought to originate from grassland and water algae. The ducks that are kept semi-intensive can meet their own needs and get a lot of additional feed (25).

Haugh Unit

The average Haugh units produced are in the range of the results of which states that intensively maintained ducks produce Haugh units ranging from 68.86 - 72.54 and semi-intensive 66.36 - 73.58 (18). A good duck egg has a Haugh unit which ranges from 75-100 and is classified as damaged if it is below 50. The results of statistical analysis show that there is no difference (P> 0, 05) on Haugh duck eggs units maintained use intensive, semi-intensive and extensive maintenance systems (27). The average value of HU intensive was 78, 18, semi-intensive 77.33 and extensive 81.54. The lack of difference in the Haugh unit can be caused because the feed given to ducks that are maintained intensively, semi-intensive and extensive already meets the needs. Haugh units can be influenced by protein consumption. An increase or decrease in protein consumption can affect the Haugh unit. This is consistent with the opinion the higher protein content in the feed caused the egg white to be thicker so as to produce a higher Haugh unit (28). The Haugh unit can be influenced by the content of feed protein, genetic, age of ducks, how to handle eggs, age of eggs and changes in air temperature (11).

The daily protein requirement for laying ducks in the production phase was 27.43 g / head / day (29). Feed for laying ducks should have a PK content of 18%. Consumption of duck protein that is maintained semi-intensive is thought to be fulfilled from natural food that is around the grazing place. Natural food containing protein is thought to originate from rice fields (1). This is consistent with the opinion which semi-intensive maintenance systems allow ducks to get feed to meet their needs (8). The snails are a source of cheap protein feed ingredients and abundant availability (26).

IV. Conclussion and Suggestion

The best laying duck maintenance system in Malang Raya from this study is the intensive maintenance system when compared to the semi intensive and extensive maintenance system. Intensive maintenance system among farmers is more improved because of several surveys more improve the quality of livestock products.

References

[1] Kementrian Pertanian Republik Indonesia. *Peraturan Menteri Pertanian* Nomor:35/Permentan/OT.140/3/2007 tentang Pedoman Budidaya Itik Petelur yang Baik. 2007.

[2] Eviyati R. Tinjauan agribisnis peternakan. *Jurnal Agrijati* 1(1): 30-37. 2005.

[3] Irianti AdF. *Demografi dan Kependudukan*. Edisi Pertama. Kencana. Jakarta. 2016.

[4] Fitriza YT, F. T. Haryadi dan S. P. Syahlani. Analisis pendapatan dan persepsi peternak plasma terhadap kontrak perjanjian pola kemitraan ayam pedaging di Propinsi Lampung. *Buletin Peternakan* 36(1): 57-65. 2012.
[5] Handayani M, A. Setiadi, S. Gayatri dan H. Setiyawan. Profil usaha peternakan itik di Kabupaten Brebes. *Journal of Animal Agricultural Socio-economics* 3(1): 20-25. 2007.
[6] Budi ES, Yektiningsih E, Priyanto E. Profitabilitas Usaha Ternak Itik Petelur di Desa Kebonsari Kecamatan Candi, Sidoarjo. AGRARIS: *Journal of Agribusiness and Rural Development Research*. 2016;1(1):32-7.
[7] Nugraha FS, Mufti M, Sulistiawan IH. Kualitas telur itik yang dipelihara secara terkurung basah dan kering di kabupaten cirebon. *Jurnal Ilmiah Peternakan*. 2013;1(2).
[8] Wibowo B, Juarini E, editors. Sumanto. 2007. Karakteristik pola pembibitan itik petelur di daerah sentra produksi Dalam: *Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner Bogor*, Indonesia Hal (pp. 658-663).
[9] Safarudin M. Pengaruh Pemberian Pakan pada Sistem Pemeliharaan Intensif dan Ekstensif terhadap Produksi dan Kualitas Telur Itik Tegal. *Skirpsi Jurusan Ilmu Nutrisi dan Makanan Ternak Fakultas Peternakan Institut Pertanian Bogor*. Bogor. 2000.
[10] Abraham J, Ravindran R. Studies on the Aroor system of sustainable duck rearing in Kerala, India. International *Journal of Poultry Science*. 2009;8(8):804-7.
[11] Ismoyowati I, Purwantini D. Produksi Dan Kualitas Telur Itik Lokal Di Daerah Sentra Peternakan Itik Egg Production and Quality of Local Ducks in Ducks Farming Center Area. *Jurnal Pembangunan Pedesaan*.13(1).
[12] Yuwanta T. Telur dan kualitas telur. *Gadjah Mada University Press*, Yogyakarta; 2010.
[13] Suretno ND. Kajian produktivitas dan fertilitas itik Cihateup: *tesis*. Bogor: Program Pascasarjana Institut Pertanian Bogor; 2006.
[14] Matitaputty P. Upaya Peningkatan Produktivitas Itik Petelur Secara Intensif dan Pemberian Pakan Berbahan Lokal di Maluku. *Jurnal Peternakan Sriwijaya*. 2018;7(2).
[15] Suharno BdA, K. Beternak Itik secara Intensif Cetakan 19. Jakarta: *Penebar Swadaya*; 2009.
[16] Sudaryani T. Kualitas Telur. Jakarta: *Penebar Swadaya*.2008.
[17] Jull M. *Poultry Husbandry*. Ed, ke-3, editors. New York.1977.
[18] Etuk IF, Ojewola GS, Abasiekong SF, Amaefule KU, Etuk EB. Egg quality of Muscovy ducks reared under different management systems in the humid tropics. *Revista Científica UDO Agrícola*. 2012;12(1):226-9.
[19] Bell DD, Weaver WD, North MO. Commercial chicken meat and egg production: *Springer Science & Business Media*; 2002.
[20] Permana D, Lamid M, Mulyani S. Perbedaan potensi pemberian bahan substitusi tepung limbah udang dan cangkang kepiting terhadap berat telur dan kerabang telur itik. *Jurnal Agroveteriner*. 2014;2(2):81-8.
[21] Widyantara P, Dewi GK, Ariana IN. Pengaruh lama penyimpanan terhadap kualitas telur konsumsi ayam kampung dan ayam Lohman Brown. *Majalah Ilmiah Peternakan.* 2017;20(1):5-11.
[22] Tumanggor BG, Suharti S. Evaluasi Pemberian Pakan Pada Itik Dengan Sistem Pemeliharaan Intensif Dan Semi Intensif DI Peternakan RakyaT (The study of duck feeding management kept under intensive and semi intensive systems by smallholder farmer). *Buletin Ilmu Makanan Ternak.* 2017;15(1).
[23] Juliambarwati M, Ratriyanto A, Hanifa A. Pengaruh penggunaan tepung limbah udang dalam ransum terhadap kualitas telur itik. Sains Peternakan: *Jurnal Penelitian Ilmu Peternakan.* 2012;10(1):1-6.
[24] Lestari D. Riyanti dan V. Wanniatie. 2015. Pengaruh lama penyimpanan dan warna kerabang terhadap kualitas internal telur itik Tegal. *Jurnal Ilmiah Peternakan Terpadu*.3(1):7-14.
[25] Simanjuntak R, Santoso U, Akbarillah T. Pengaruh Pemberian Tepung Daun Katuk (Sauropus androgynus) Dalam Ransum Terhadap Kualitas Telur Itik Mojosari (Anas javanica). *Jurnal Sains Peternakan Indonesia*. 2013;8(1).
[26] Rondonuwu CR, Saerang J, Utiah W, Regar M. Pengaruh Pemberian Tepung Keong Sawah (Pila ampulacea) Sebagai Penganti Tepung Ikan Dalam Pakan Terhadap Kualitas Telur Burung Puyuh (Coturnix coturnix Japonica). *ZOOTEC*. 2017;38(1):1-8.
[27] Prasetya FH. Karakteristik eksterior dan interior telur itik bali (kasus di kelompok ternak itik maniksari di dusun lepang, desa takmung kec. banjarangkan, kab. klungkung, provinsi bali). *Students e-Journal*. 2015;4(1).
[28] Argo LB, Tristiarti T, Mangisah I. Kualitas fisik telur ayam arab petelur fase I dengan berbagai level Azolla microphylla. *Animal Agriculture Journal*. 2013;2(1):445-57.
[29] Ketaren P, Prasetyo L, Prasetyo L. Pengaruh pemberian pakan terbatas terhadap produktivitas itik silang Mojosari X Alabio (MA): 2. Masa bertelur fase kedua umur 44-67 minggu. *Jitv*. 2002;7(2):76-83.