

Addition of Tumeric Flour in Ration on The Growth of Super-Native Chickens Aged 11-18 Weeks

Ni Ketut Ety Suwitari¹, Luh Suariani^{2*}, Ni Made Yudiastari³, Agung Pamuji⁴,
Adi Wiratama⁵

Warmadewa University

Corresponding Author: Luh Suariani aniekwidiarsa@gmail.com

ARTICLE INFO

Keywords: Tumeric Flour,
Native Chickens, Growth

Received: 2 July

Revised: 10 August

Accepted: 20 September

©2023 Suwitari, Suariani, Yudiastari,
Pamuji, Wiratama: This is an open-
access article distributed under the
terms of the [Creative Commons](https://creativecommons.org/licenses/by/4.0/)
[Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).



ABSTRACT

The main components in turmeric are essential oils and curcuminoids, which are yellow color substances in turmeric, essential oils, and Curcuminoids can increase the digestibility of dry matter and protein, increase digestive enzymes so that feed digestibility increases and results in the digestive tract emptying faster, and ultimately provide consumption increases. The design used is a completely randomized design (CRD) with 5 (five) treatments and 3 (three) replicates. The experimental treatments are designated as follows: P0 represents the control group without the addition of turmeric flour, P1 represents the group with 1% turmeric flour, P2 represents the group with 2% turmeric flour, P3 represents the group with 3% turmeric flour, and P4 represents the group with 4% turmeric flour. This study's variables recorded and analyzed included initial body weight, final body weight, weight gain, ration consumption, and feed conversion ratio. The findings of this investigation demonstrated that The incorporation of turmeric flour showed a statistically significant effect ($P < 0.05$) on Final Body Weight, Weight Gain, and Feed Consumption Ratio. However, it was shown that the variables under investigation did not significantly impact ration consumption ($P > 0.05$). Giving turmeric flour up to 2% can provide the best results

INTRODUCTION

In realizing the livestock development program operationally, the livestock subsector begins with forming or arranging areas through a system approach that cannot be separated from the livestock business, namely increasing income and community welfare (Nurzaman, 2002).

The cultivation of super-native chicken presents a highly profitable emerging commercial prospect. The consumer demand for super-native chicken meat has experienced a substantial surge. Super native chickens, also known as superior local broilers, result from a breeding process involving native and purebred chickens. These hybrid chicks exhibit accelerated development rates compared to local chicken breeds, earning the moniker "super native chickens." Triswi (2016) stated that super native chickens grow faster than local native chickens.

To provide proper nutrition, the preservation of Super-native chicken necessitates the provision of high-quality feed. Achieving optimal outcomes can be facilitated by providing a well-balanced diet with a harmonious combination of essential nutrients. Today's reality is that commercial feed prices are costly (Saputra, 2021). Commercial feed is feed designed to produce optimal development, growth, health, and appearance because it has been compiled based on the value of the nutritional needs of livestock from complete dietary content. To achieve rapid chicken growth and maximize output, it is essential to provide sufficient quality and quantity of feed containing all necessary nutritional ingredients. Including critical food components, namely carbs, protein, fat, minerals, and vitamins, is crucial within the dietary composition. Rations are the most significant cost component of about 60 - 80% of all production costs in poultry livestock (Saputra, 2021).

Turmeric flour is one of the additives that need to be known to positively affect the digestibility of feed ingredients. It is mixing turmeric flour in the ration because turmeric contains curcumin that can increase digestion, improve fat metabolism, prevent disease, and increase appetite (Darwis et al., 1991).

Using turmeric flour in the ration does not significantly affect ration consumption and conversion. Still, it substantially affects broiler chicken's body weight gain, namely, using turmeric flour as much as 0.3% and 0.4% (Hendriana et al. 2018). Based on the research, a mortality rate of 0% was obtained. The mortality rate in this study was relatively low due to the addition of turmeric flour with feed and drinking methods and relatively high doses, causing the mortality rate of chickens to be quiet. In turmeric rhizomes, curcumin compounds contain anti-bacteria that can increase the immunity of chickens (Rahmawati and Megaaprilla 2017).

LITERATURE REVIEW

The research was conducted for six weeks at Kesiman Village, Denpasar City, Bali. The study was performed using the Completely Randomized Design (CRD) method with 5 (five) treatments and 3 (three) replications. The treatments are as follows:

P0 (Control) = Ration without the addition of turmeric flour

P1 = Ration containing 1% turmeric flour

P2 = Ration containing 2% turmeric flour

P3 = Ration containing 3% turmeric flour

P4 = Ration containing 4% turmeric flour

Super-Native Chicken

The chickens utilized in this study were super-native chicks between 11 and 18 weeks. The participants were chosen based on their relatively consistent body weight and were not classified according to their gender (unsexed). The experimental enclosure employed in this investigation is a battery cage with 15 compartments. The section is within a specific structure, with 50 x 50 x 47 (length x width x height) centimeters to accommodate each property. Cage equipment for feed and drinking places uses long pipes, and the bottom of the cage is filled with sacks to accommodate chicken droppings, making it easy to clean the cage.

Ration

The rations used in this study were local feed ingredients in the Bali area, including fish meal, yellow corn, coconut meal, soybean meal, coconut oil, salt, chicken premix, and turmeric flour. The ration was prepared according to the nutrient requirements for super native chickens, using allocations with a metabolic energy content of 2709.40 - 2833.36 Kcal/kg, with a crude protein content of 19%.

The instruments utilized in this study are:

- a. Electric/digital weigher with a capacity of 5000 grams and a sensitivity of 0.1 grams: used to weigh the feed and chicken ingredients used in the study.
- b. Bucket: used to store the treatment feed that is being weighed.
- c. Label paper: used to mark each treatment feed that has been weighed.
- d. Stationery: recorded every amount of feed used daily during the study.

METHODOLOGY

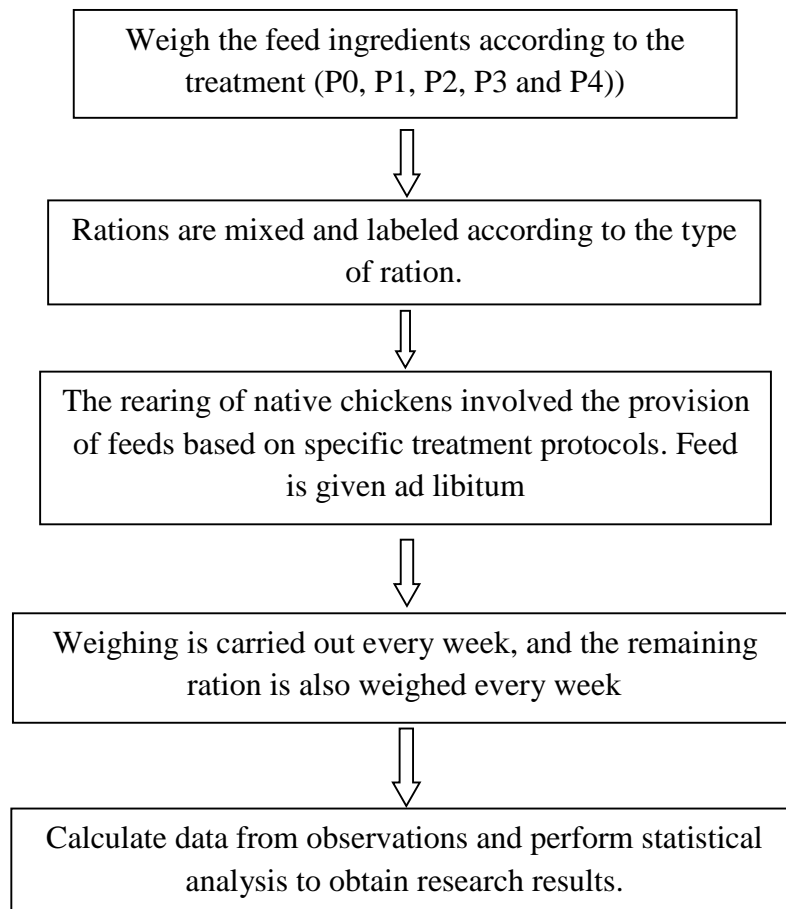


Figure 1. Course of Research

Research Parameters

The variables that were observed in this investigation are as follows:

1. Initial Body Weight is the weight of the chicken at 11 weeks of age.
2. Determining weight increase involves subtracting the beginning body weight from the final body weight.
3. Final Body Weight is the weight obtained at the end of the study at the age of 18 weeks.
4. Ration consumption can be achieved by decreasing the quantity of ration provided in conjunction with the leftover ration.
5. Ration conversion refers to the ratio between the quantity of ration ingested and the subsequent increase in body weight.

Statistical Analysis

The data acquired from this investigation's findings were analyzed using variance analysis. If the accepted results demonstrated a statistically significant effect ($P < 0.05$), the researchers proceeded to conduct Duncan's least important difference test (Stell and Torrie, 1993) to assess the impact of variations between the different treatments.

RESULTS AND DISCUSSIONS

From the research results conducted with the title of the addition of turmeric flour in the ration of native chickens to the growth of native chickens aged 11-18 weeks, the following results were obtained, as listed in Table 1.

Table 1. The Impact of Including Turmeric Into the Dietary Regimen on the Growth Patterns of Super Native Chickens Aged 11 to 18 Weeks

Variables	Treatment					SEM
	P0	P1	P2	P3	P4	
Initial body weight (g/head)	842,975 ^a	845,334 ^a	846,922 ^a	877,305 ^a	846,850 ^a	
Final body weight (g/head)	1.861,231 ^c	2.061,867 ^a	1.952,211 ^a	1.875,622 ^{ab}	1.845,167 ^b	59,541
Weight Gain (g/head)	918,256 ^b	1.216,533 ^a	1.105,289 ^a	1.026,789 ^b	998,317 ^b	60,143
Ration Consumption (g/head)	4.262,543 ^a	4.228,628 ^a	4.365,780 ^a	4.354,540 ^a	4.463,070 ^a	77,249
FCR	4,64 ^a	3,47 ^b	3,94 ^b	4,24 ^{bc}	4,47 ^{ac}	0,253

Description: Different letters in the same row indicate significantly different (P, >0.05)

Final Weight

The statistical analysis results indicate that including turmeric flour in the diet had a statistically significant impact ($P < 0.01$) on the ultimate body weight of super-native chickens at 18 weeks of age. Including 1% turmeric flour in P1 resulted in a higher final body weight of 2,061.87 grams per tail in native chickens aged 18 weeks, compared to the control group P0, which did not contain turmeric flour. The observed difference was found to be statistically significant at a significance level of 0.05. The experimental treatments P2 (2% turmeric flour), P3 (3% turmeric flour), and P4 (4% turmeric flour) exhibited considerably higher outcomes compared to P0, with statistical significance at a significance level of $P < 0.05$.

Including turmeric flour in the diet had a statistically significant impact ($P < 0.05$) on the ultimate body weight of Super-native chickens within the age range of 11-18 weeks. The best results were obtained in the perpetrator P1 (addition of 1% turmeric flour), which amounted to 2.061, 867 g / tail when viewed from the control treatment (P0). Providing turmeric flour in the ration can increase chickens' growth and body weight. Thus, turmeric flour can be used as an additional feed because it has good protein and energy. Pratikno (2010) believes that the inclusion of turmeric in the diet has been found to have potential benefits such as promoting weight gain, improving feed efficiency, and decreasing adipose tissue deposition. According to Yuniusta et al. (2007),

turmeric has been found to facilitate the enzymatic metabolic processes within the avian organism due to the presence of curcuminoid chemicals and essential oils. When viewed from the provision of turmeric with a level of 2,3,4%, there is a decrease in body weight from P1 (1%), thus meaning that the optimal condition of turmeric flour is with the addition of 1%.

Weight Gain

From the statistical analysis results, the incorporation of turmeric flour had a substantial effect ($P < 0.01$) on the final weight gain of 18-week-old super-native chickens. Including turmeric flour at a concentration of 1% (P1) led to a notable increase in body weight, with a mean gain of 1,216.53 grams per individual. The observed increase demonstrated statistical significance ($P < 0.01$) in comparison to the control therapy (P0), where turmeric flour was not added, resulting in a mean weight gain of 918.26 grams per individual. In treatment P2, which used 2% turmeric flour, the observed data demonstrated a statistically significant distinction ($P < 0.05$) compared to treatment P0. However, treatments P3 (3% turmeric flour) and P4 (4% turmeric flour) did not demonstrate a significant difference ($P > 0.05$) in comparison to P0.

The body weight gain of super native chickens between the ages of 11 and 18 weeks was found to be significantly affected ($P < 0.05$) by the inclusion of turmeric in their diet. The treatment group P1 (1% turmeric inclusion) yielded the highest results, with an average weight gain of 1.216,533 grams per bird. This is because turmeric can increase the appetite of chickens and optimize the function of the body organs of super-native chickens. This is by Mengaaprilia's research (2017), which states that the provision of turmeric extract significantly affects the body weight gain of broiler chickens. The appropriate quantity and quality of feed significantly impact the rate of body weight gain. The correlation between the proportion of food items in the feed and the resultant body weight is a significant factor to consider (Handayani, 2017). Chicken weight gain is the increase in the value of the difference in body weight versus the length of time of maintenance. Controlled body weight gain in the P0 treatment (without turmeric flour) The higher the administration level up to 4%, the lower the body weight gain. In addition, Sabrin et al. (2021) explained that the addition of turmeric flour. Up to 4% in super-native chicken rations can increase body weight gain and reduce the value of Ration Conversion and fixed ration consumption.

According to Pratikno (2010), the increase in chicken body weight illustrates the efficient utilization of feed through metabolism assisted by turmeric extract given through feed to produce greater body weight. Turmeric flour contains several nutrients that can play a role in the growth of native chickens, including:

1. Curcumin is an active turmeric compound with anti-inflammatory and antioxidant properties. Curcumin can help increase the appetite of native chickens and speed up the process of emptying stomach contents, thereby increasing feed consumption and growth of native chickens.
2. Protein: Turmeric flour contains protein that can help repair and build body tissues in native chickens.

3. Fat: Turmeric flour contains fat that can help increase the energy and growth of native chickens.
4. Carbohydrates: Turmeric flour contains carbohydrates that can provide a source of energy for native chickens.
5. Minerals: Turmeric flour contains calcium, magnesium, and potassium, which can help strengthen the bones and muscles of native chickens. In addition, according to Sabrina (2021), giving turmeric flour to super-native chickens provides benefits.
 - Increase the appetite of native chickens
 - Increase body weight gain of native chickens
 - Optimizing feed conversion (FCR value)
 - Increase the body resistance of native chickens
 - Improves carcass quality and yolk color
 - Anti-bacterial
 - Lower fat content in native chickens
 - Improving the efficacy of the concluding phase super native chickens (Sabrin Muhamad et al., 2021)

Ration Consumption

Incorporating turmeric flour into the diet did not provide statistically significant outcomes ($P > 0.05$) regarding the feed intake of 18-week-old super-native chickens. The lowest ration consumption was 4,228.63 grams/head in P1 (1% turmeric flour). Adding turmeric flour increased the ration consumption of super-native chickens aged 11-18 weeks. The quantity of ration consumption in treatment P0 was recorded as 4,262.54 grams, treatment P2 as 4,365.78 grams, treatment P3 as 4,353.54 grams, and treatment P4 as 4,463.70 grams. Nevertheless, the statistical analysis failed to provide a lack of statistical significance between the variables, as indicated by a P-value over 0.05.

The statistical research on including turmeric flour in the diet revealed no statistically significant impact ($P > 0.05$) on the feed intake of super-native chickens between the ages of 11 and 18 weeks. This is to the research of Jihadulhahah (2016) that adding turmeric flour up to 2% in ducks does not significantly affect ration consumption.

The findings derived from the investigation acquired ration consumption. In the context of therapeutic interventions, P2 (2%), P3 (3%), and P4 (4%) were higher than in the treatment of P1 and P0. This is because the provision of turmeric flour can increase appetite, thereby increasing the consumption of super-native chicken rations, where turmeric flour contains curcumin, which has properties that can affect appetite. Dahrut (2017) states that the content of curcumin and atsiri oil can accelerate gastric emptying; thus, hunger and thirst will arise. Furthermore, Alfian and Munir (2015) state that turmeric is an herbal plant with anti-bacterial properties and reduces pathogenic bacteria so that it can increase the consumption and health of the chicken digestive tract.

The level of ration consumption in native hens can be influenced by the type of feed provided. Feed quality, feed digestibility, the crude fiber content in the feed, and feed palatability are some factors that can affect the level of ration consumption in native chickens. Furthermore, the ration's morphology, the

proportion's magnitude, the arrangement, and how the quota is fulfilled can also influence the consumption of rations in indigenous chicken populations. Therefore, in native chicken farming, focusing on the type of feed given is vital to achieve optimal ration consumption rates and increase production efficiency (Eriko et al., 2016).

FCR (Ration Conversion)

The impact of incorporating turmeric flour into the chicken feed was found to have statistically significant effects ($P < 0.05$) on the conversion efficiency of the ration. In the P1 treatment (1% turmeric flour), the allocation showed minor ration conversion results (3,47), significantly lower than P0 (0% turmeric flour), which amounted to 4,64 and was statistically quite different ($P < 0.05$). Adding turmeric flour at all levels resulted in lower values than the P0 treatment.

From the statistical analysis of the provision of turmeric flour in the ration, there is a natural effect ($P < 0.05$) on the FCR value of general super-native chicken at 11-18 weeks. The treatment with 1% turmeric flour (P1) yielded the most favorable outcomes, which was 3,491. This is because the ratio consumption in the P1 treatment is the lowest while the body weight gain is the highest, so the FCR in the P1 treatment is the most efficient.

The feed conversion ratio (FCR) calculation involves comparing the value of ration consumption to the amount of body weight growth. Compared with the treatment without turmeric (P0) provision, it is still better than the FCR-given turmeric flour. This means that giving turmeric can improve FCR.

Sinta (2002) stated that providing turmeric flour as much as 2 grams in one gram of ration can give the best results on ration conversion and body weight gain. Furthermore, Nuraini (2009) explained that the better the ration quality, the smaller the ration conversion value. A low conversion rate indicates that The quantity of feed utilized in producing one kilogram of meat is getting less.

Feed conversion is one of the benchmarks for assessing the efficiency level of feed use. The feed conversion value displayed is high, indicating a low feed utilization efficiency. On the contrary, when the feed conversion value is low, it shows high efficiency in feed utilization. Similarly, a more significant ration conversion rate suggests a lower level of efficiency in ration utilization; otherwise, a more down the ration conversion rate means a higher level of efficiency (Sintya T et al., 2020)

CONCLUSIONS

Based on the study's findings, it can be deduced that incorporating turmeric flour into the diet of indigenous chickens has a noteworthy impact ($P < 0.01$) on the ultimate body weight and weight gain of super-native chickens within the age range of 11-18 weeks. The best results were obtained in treatment P1 (1% turmeric flour). The lowest FCR value obtained by adding 1% turmeric flour (P1) was significantly lower than the control treatment (P0). The findings about ration consumption yielded comparable outcomes, with a P-value greater than 0.05 either given additional turmeric flour or not given extra turmeric flour.

RECOMMENDATIONS

From the study results, using as much as 2% turmeric flour can be recommended to obtain optimal growth results. In addition to helping in the growth of livestock, turmeric also plays a role in preventing diseases in ungags.

ACKNOWLEDGMENTS

Thank you to the individuals referred to in this message, including the Rector of Warmadewa University, the leader of the Warmadewa University Research Institute, the Dean of the Faculty of Agriculture, and all fellow faculty members of the Faculty of Agriculture, Warmadewa University.

REFERENCES

- Agustini, M. A., G. A. M. K. Dewi dan I. W. Wijana. (2014). Pengaruh Imbangan Energi dan Protein Ransum Terhadap Kualitas Telur Ayam Kampung Umur 20-30 minggu. *J. of Tropical Animal Science*
- Ariyanto AN, Iriyanti N, Mufti M. 2013. Pemanfaatan tepung kunyit dan sambiloto dalam pakan terhadap konsumsi pakan dan pertumbuhan bobot badan broiler. *Jurnal Ilmiah Peternakan* 1(2): 471 - 478.
- Aisjah dan Rahmat. (2009). *Management Ternak Unggas*. Universitas Hasanuddin. Makasar.
- Anonymous, 2002. *Statistik Peternakan Tahun 2002*. Direktorat Jenderal Bina Produksi Peternakan, Departemen Pertanian Republik Indonesia, Jakarta.
- Aman, (2011). *Ayam kampung Unggul*. Penerbit Penebar Swadaya, Jakarta.
- Alfian NA dan Munir (2015) pengaruh pemberian tepung lempuyang (2 mg ber aromaticum vial) dan tepung kunyit (curcum domiticum terhadap konsumsi dan konversi, ransum boiler J. balung tropika.
- Blakely, J. & D. A. Bade. (1998). *Ilmu Peternakan*. Terjemahan: B. Srigandono. Yogyakarta: Gadjah Mada University Press
- Dahrut A. (2017) Penggunaan ekstrak temulawak (curcuma xanthorrhiza roxb) dalam air minum terhadap produksi dan kualitas telur burung putih (coturnix-cotumix japonica) fase layer. Skripsi.
- Darwis SN, Madjoindo ABD, Hasiyah S. 1991. *Tanaman Obat Famili Zingiberaceae*. Badan Penelitian dan Pengembangan Pertanian. Pusat Penelitian dan Pengembangan Tanaman Industri, Bogor.
- Djulardi. A., H. Muis dan S. A., Latif. 2006 *Nutrisi Aneka Ternak dan Satwa Harapan*. Andalas University Press, Padang.

- Erikola, Jatmiko, dan H Nur. 2016. PENGARUH PENGGANTIAN SEBAGIAN RANSUM KOMERSIAL DENGAN DEDAK PADI TERHADAP PERFORMA AYAM KAMPUNG. *Jurnal Peternakan Nusantara* ISSN 2442-2541 Volume 2 Nomor 1, April 2016
- Gunawan, B. dan T. Sartika. 2001. Persilangan Ayam Pelung Jantan X Kampung Betina Hasil Seleksi Generasi Kedua (G2). Pusat Penelitian dan Pengembangan Peternak, Deptan. Bogor.
- Handayani A. (2017) Penambahan Tepung Kunyit (*Curcuma domestica*) dalam ransum terhadap Performans itik Hibrida fase Grower. *Jurnal skripsi Program studi Perternakan fapet Univ. Nusantara PGRI. Kediri.*
- Hendriana A., T.Nurhayatin, I Hadist. 2016. Pengaruh Penambahan Tepung Kunyit (*Curcuma Domestica*) Dalam Ransum Terhadap Performance Ayam Broiler. *JANHUS Journal of Animal Husbandry Science. Jurnal Ilmu Peternakan Fakultas Pertanian, Universitas Garut* ISSN:2548-7914.
- Pratikno (2010) Pengaruh ekstrak kunyit (*curcuma domestica* Vatil) terhadap bobot badan ayam boiler (*gallus SP*) *Buletin anatomi dan Fisiologivol XVIII, No.2 okt 2010.*
- Rahmawati,N dan F. Megaaprilia,.2018 Pengaruh Dosis dan Metoda Pemberian Tepung Kunyit Terhadap Performance Ayam Kampung “Jawa Super” Prodi Peternakan Fakultas Pertanian Universitas Islam Kediri. <http://ejournal.fp.uniska-kediri.ac.id/>
- Iskandar, S. 2006. Ayam silangan pelung dan kampung: Tingkat protein pakan untuk produksi daging umur 12 minggu. *Wartazoa* 16(2): 65-71.
- Jihadulhalah Bin Marra (2016) Pengaruh penggunaan tepung kunyit (*curcuma domestica val*) terhadap ferforman itik lokal (*Anas Sp*). Program studi peternakan, fafet Univ. Hasanudin makasar.
- Kartasudiana, R dan F Suprijatna (2010). *Manajemen ternak unggas, penebar swadaya, Jakarta.*
- Kaleka 2015. *Berternak ayam tanpa bau. Arciata. Yogyakarta*
- Kompiang, I.P., M.H. Supriyati, Togatorop, dan S.N. Jarmani. 2001. Performance of Native Chicken Given Free Choice Feed. *Jurnal Ilmu Ternak Dan Veteriner* 6(2):94-99.
- Kustiningrum, D. R. 2004. Pengaruh Pergantian Pakan *Starter* Terhadap *Performance* Ayam Kampung. *Skripsi. Universitas Brawijaya Fakultas Peternakan: Malang.*

- Margarita. (2007). Management Ternak Unggas. Universitas Hasanuddin. Makasar.
- Munandar, A. S. (2011). Psikologi Industri dan Organisasi. Jakarta: Universitas Indonesia (UI-Press)
- Mulyono, S. (2004). Memelihara Ayam Buras Berorientasi Agribisnis cet. VII (Edisi revisi). Penebar Swadaya. Jakarta.
- Nuraini (2009). Analisis pengaruh kualitas produk, kualitas pelayanan, desain produk, harga dan kepercayaan terhadap loyalitas pelanggan. Skripsi fax. Ekonomi Univ. Diponegoro.
- Nuroso. (2011). Teknologi Hasil Ternak. Universitas Padjadjaran. Bandung.
- Nurzaman, (2002). Perencanaan Wilayah di Indonesia pada Masa Sekitar Krisis. Penerbit ITB Bandung
- Rahayu,I., S. dan H. S. (2011). Panduan Lengkap Ayam. *Penebar Swadaya: Jakarta.*
- Rose. (2001). Anatomi dan Fisiologi Ternak Unggas. Universitas gajah mada. Yogyakarta
- Sabrin Mohamad, *Fahria Datau, dan Nibras K. Laya,2021. Evaluation of Weight Gain, Consumption, Conversion Ration of Super Kampung Chickens given Turmeric flour. Jambura Journal of Animal Science E-ISSN: 2855-2280 Volume 3 No 2 Mei 2021.
- Sinta Y.b. (2002) Pengaruh tingkat pemberian tepung kunyit (curcuma domesticas val) pada ransum terhadap konversi ransum dan income over feed and chick cost ayam broiler. Skripsi sarjana jurusan xlutrisi dan makanan ternak. Fak. Peternakan. Univ. Hasanudin Makasar.
- Sintia Tempomona, Betty Bagau*, Fenny R. Wolayan, Mursye N. Regar, 2020. PENGARUH PENGGANTIAN SEBAGIAN RANSUM BASAL DENGAN TEPUNG DAUN PEPAYA (Carica papaya L) TERHADAP PERFORMANS AYAM PEDAGING. Zootec Vol. 40 No. 2 : 676 – 683 (Juli 2020) pISSN 0852 – 2626 eISSN 2615 – 8698.
- Steel, R. G. D. dan J. H. Torrie. 1993. Prinsip dan Prosedur Statistika. Diterjemahkan oleh Bambang Sumantri. PT. Gramedia Pustaka Utama. Jakarta
- Sutama, I.K. 2011. Kambing Peranakan Etawah Sumber Daya Ternak Penuh Berkah. Balai Penelitian Ternak, Ciawi Bogor.

- Tantalo, S. (2009). Perbandingan performans dua strain broiler yang mengosumsi air kunyit. *Jurnal Ilmiah Ilmu-ilmu Peternakan*. Vol. 12. No. 3. Jurusan Peternakan. Fakultas Pertanian. Universitas Lampung, Lampung.
- Tillman, A.D., dkk. 1991. *Ilmu Makanan Ternak Dasar*. Gadjah Mada University Press. Yogyakarta.
- Toana NM. 2008. Pengaruh pemberian tepung kunyit dalam ransum terhadap performans produksi itik periode bertelur. *Jurnal Agroland* 15 (2): 140-143.
- Trisiwi, H.F. 2016. Pengaruh level protein pakan yang berbeda pada masa starter terhadap penampilan ayam kampung super. *Jurnal Ilmiah Peternakan Terpadu* Vol. 4(3): 256262.
- Wicaksono, D. (2015). Perbandingan Fertilitas, susut Tetas, Daya Tetas, dan Bobot Tetas Ayam Kampung Pada Peternakan Kombinasi. *Skripsi. Jurusan Peternakan. Universitas Lampung*.
- Wiranata. (2013). *Pengantar Ilmu Peternakan*. Universitas Hasanuddin. Makasar
- Woro I.D., U. Atmomarsono dan R. Muryani. 2019. Pengaruh Pemeliharaan pada Kepadatan Kandang yang Berbeda terhadap Performan Ayam Broiler.
- Yuniusta, Syahrío T, D. Septinova (2007) Perbandingan performan Antara Broiler yang diberi kunyit dan temulawak melalui air minum fak. *Pertanian Univ. Lampung*.