Research Article

Evaluation of Date Pit Flour (*Phoenix dactylifera* L.) in Feed on Internal Organs, Growth Performances, and Carcase of Broiler Chickens

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Abstract | In this study, the impact of date pit flour feed on broiler chicken was assessed, with a focus on internal organs, growth performances, and carcase percentage. The initial phase involved conducting a date pit flour meal experiment using a complete randomized design with 5 treatments and 4 replications to examine the internal organs, growth performances, and carcase percentage. Following this, a second experiment was conducted using 200 Day Old Chick (DOC) broiler chickens with MB 202 type unsexed with an average body weight of 45.03 g with a diversity coefficient of 7.35%, employing a completely randomized design with five treatments and four replications. The feed treatments consisted of T0: basal feed without the use of date pit flour, T1: basal feed with the use of 2.5% date pit flour, T2: basal feed with the use of 5% date pit flour, T3: basal feed with the use of 7.5% date pit flour, T4: basal feed with the use of 10% date pit flour. Data were collected and analyzed using analysis of variance (ANOVA) and continued with Duncan's Multiple Distance Test. The results showed that the use of date pit flour in feed had an intangible effect (P>0.05) on internal organs which include the liver, heart, gizzard, spleen, and pancreas, as well. However, the use of date pit flour in feed has a very real effect (P<0.01) on body weight gain, carcase percentage, abdominal fat, and cholesterol. In conclusion, date pit flour feed was recommended as an alternative feed for broiler chickens.

Keywords | Broiler chicken, Carcase, Internal organs, Growth performance, Date pit flour

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INTRODUCTION

Feed has the largest component in broiler chicken production costs reaching 60-70%. According to Sjofjan, *et al.* (2021) feed costs use 65-75% of total production in the poultry industry. Feed has been recognized as the primary factor contributing to land occupation, primary production use, acidification, climate change, energy consumption, and water dependence. Decreasing the importation of feed ingredients serves as a method to diminish greenhouse gas emissions, with sea freight being a significant contributor to these emissions (Adli *et al.*, 2020). The availability of chicken feed and water is very important for the continuity of chicken growth and development. To get the appropriate composition, the feed industry usually uses ingredients in the form of corn, bran, concentrates and other ingredients to support nutrition. Especially, corn which is still the main feed ingredient for poultry in Indonesia. Bran, sorghum, fish meal, and so on also used as other additional feed ingredients (Ramon and Efendi, 2015).

Meanwhile, those feed ingredients have a high price that affects the current price of broiler chicken concentrate. Therefore, feed ingredients that have lower prices with good quality are needed. Broiler chicken feed consumption is influenced by the form of feed, smell and color. This

alternative use of date pit flour is suitable to be used as a substitute feed in the manufacture of broiler chicken feed. The amount of date pit waste is still a lot that has not been utilized optimally.

The use of date pits in Indonesia is usually used as a mixture of ingredients for making beverage products, but has not been widely marketed. Therefore, the competition for the use of date pits as animal feed is not high and to obtain it is still easy. The shortage in obtaining date pits in Indonesia is still large, because dates will be abundant in certain seasons such as during the fasting month. One way to get date pits is to make cooperation partners with date fruit processing companies or date juice in Indonesia. Import of date pits is still the main reason for obtaining continuously, especially in the Middle East region which is a country that is the largest importer of date fruit to Indonesia, because the number of date plantations there reaches 5000 hectares. Feed in broiler chickens can affect the growth performance, carcase and internal organs of livestock. The feed consumed by broiler chickens will be absorbed and produced by internal organs which will affect protein digestibility and metabolic energy and increase production performance. There are two purposes of the research that we will do, namely to analyze the effect of evaluating the digestibility value of protein and metabolic energy of date seed flour (*Phoenix dactylifera* L.) on broiler feed. and to evaluate the level of use of date seed flour in feed on production performance, internal organs and carcase percentage of broilers

MATERIALS AND METHODS

Experimental design

The research method used was a field experiment using Complete Randomized Design. The treatment applied is testing feed ingredients with different levels into 5 treatments and each treatment consists of 4 replications. Furthermore, 20 experimental units will be obtained. Each experimental unit used 10 broiler chickens, bringing the total number of broiler chickens used to 200.

Feeding programmed

The feed treatments included T0 (Feed without using date pit flour (0% in feed)), T1 (Feed using date pit flour by 2.5% in feed), T2 (Feed using date pit flour by 5.0% in feed), and T3 (Feed using date pit flour by 7.5% in feed), and T4 (Feed using date pit flour of 10.0% in feed). The chicken feed formulation comprised concentrate (concentrate, maize, rice bran, and date pit meal presented on the Table 1.

After chickens are weighed, then laid out in cages randomly. The starter phase of chickens is given feed that corresponds to their respective treatment and phase. Ad libitum feeding and drinking and changing feeder trays twice a week to avoid excess bacteria. The vaccination carried out during maintenance is the gumboro vaccine which is used to prevent CRD given at the age of 14 days through drinking water. Gumboro vaccine and ND vaccine to prevent the onset of tetelo disease. During maintenance, vitamins are also given in the form of vita stress to prevent stress during weighing and *Neobro* (chicken supplement) to support broiler chicken growth.

Table 1: Nutrient composition of formulated feed during trial.

Feed ingredients	Composition (%)				
	T0	T1	T2	T3	T4
Starter phase					
Maize	60.00	57.25	54.49	51.74	48.98
Concentrate	40.00	40.25	40.51	40.76	41.02
Date pit flour	0.00	2.50	5.00	7.50	10.00
Total	100	100	100	100	100
Nutritional content					
ME	2582.00	2969.88	2957.77	2945.65	2933.54
CP	21.56	21.56	21.56	21.56	21.56
Fat	3.94	3.95	3.97	3.98	3.99
CF	3.60	3.78	3.97	4.15	4.34
Ash	7.40	7.58	7.77	7.95	8.14
Finisher phase					
Maize	56.00	53.15	50.40	47.65	44.89
Concentrate	35.00	35.26	35.51	35.76	36.02
Rice barn	9.00	9.09	9.09	9.09	9.09
Date pit flour	0.00	2.50	5.00	7.50	10.00
Total	100	100	100	100	100
Nutritional content					
ME	2983.70	2971.10	2971.10	2971.10	2971.10
CP	19.89	19.89	19.89	19.89	19.89
Fat	4.30	4.32	4.32	4.32	4.32
CF	4.30	4.49	4.49	4.49	4.49
Ash	7.32	7.51	7.51	7.51	7.51

CF, crude fibre; CP, Crude protein; ME, metabolizable energy.

Date pit meal preparation

The processing of date pit is carried out at the Integrated Laboratory of the Faculty of Agriculture, Gorontalo State University (UNG). Samples are provided by PT. Rumah Desa Sejahtera, Surabaya. First, the processing procedure involves separating fruit with date seeds, draining them with sun drying and oven, grinding date seeds into flour with grinding machine, drying again with oven, finally packaging using airtight packaging. Date seed flour that has been processed by PT. Rumah Desa Sejahtera conducted an analysis to determine the content of food substances consisting of Dry Matter (BK), Ash, Crude Protein, Crude Fat, and Crude Fiber at the Livestock Nutrition Laboratory of Universitas Brawijaya.

Research procedure

Preparation of cages and equipment

The first stage of cage preparation is cleaning from the remnants of manure at the time of raising chickens previously and cutting bushes around the cage. Furthermore, the second stage prepares cage materials and equipment (feed bins, drinking places, heater, 3kg lpg gas, lamps, sacks, chaff, bulkheads, feed, vitamins, and vaccines) that will be used. The third stage carries out sanitation which is divided into 2 stages, namely the first to wash all equipment and partitions using soap and running water, then left until completely dry for 1 day and covered with tarpaulin. The second stage is spraying the entire cage, the environment around the cage, and equipment using disinfectant with a mixture of Antiseptic with Disinfectants and waiting for 1 day.

The next preparation of the cage is to install a partition as a guardrail made of bamboo and sacks with a length of 1 meter, width of 1 meter and height of 50 cm. Then install the sack as a base and sprinkle the husks until evenly distributed 5-10 cm high on the treatment cage. Tarpaulin installation is carried out around the plot to regulate temperature and air conditions in the cage during the starter phase. After that, use 4 incandescent lamps 40 watt around inside and outside the cage, and use 4 incandescent lamps 25 watt above the bulkhead to maintain the temperature in the cage covered by tarpaulin. Lighting given to livestock for 12 hours per day from 18.00 – 06.00. After all equipment is ready, turn on the gas for 3 hours before chick in so that the cage temperature feels warm and prepare a brown sugar solution to prevent dehydration and reduce stress. In the starter phase, chickens are laid out on 5 plots, separated from each treatment without repetition. Then after releasing brooding chickens began to be spread according to the repetition of the research cage for 35 days. Furthermore, sampling is carried out 1 time every week.

Growth performances, relatively organ weight, carcase percentage, and total cholesterol

Chicken weighing is carried out during rearing to determine the body weight and feeding control is carried out by weighing the feed given and the remaining feed to determine feed consumption, and feed conversion ratio. Furthermore, weight growth, feed consumption, and feed conversion ratio data are processed to obtain data on growth patterns. Broilers aged 35 days are harvested, which begins with weighing all livestock to determine the weight of the harvest. Then one head was selected from each experimental unit, so that 20 broilers were obtained.

After 35 days of chicken harvesting, 2 chickens were taken for data collection of internal organs, carcasses and cholesterol for each repetition to be analyzed. Each chicken that has been selected is weighed alive one by one to get live weight, then slaughter and separation of carcase and non-carcase are carried out. Carcasses are weighed one by one and raw data is obtained for the percentage of carcasses. Then each tail was taken each abdominal fat and weighed so as to obtain raw data for abdominal fat. Next, each chicken is taken a portion of breast meat to be tested for cholesterol.

Before the cholesterol test of the prepared meat is then dried using an oven until it has a moisture content of 0%. Then grinding is carried out using a grinding machine. After that, each treatment is put together to take a small sample for testing cholesterol samples. Cholesterol analysis was conducted at Padjajaran University, Sumedang, West Java.For the internal organs of each selected chicken taken liver, heart, gizzard, spleen, pancreas then weighed one by one. Then the average of each treatment is taken and processed into internal organ data using axels.

Statistical analysis

The data obtained were then analyzed using variety analysis (ANOVA) with the percentage of date pit flour usage. If different results are obtained between treatments, it will be continued with Duncan's Multiple Distance Test. The mathematical model of the Complete Randomized Design experiment used is by following (Adli *et al.*, 2023).

$$Yij = \mu + Ti + eij$$

Where; Yij represents the observed parameters, μ is the overall mean, Ti indicates the different of date pit offal meal effects, and eij is the error term. The treatments are defined as follows: T0 (basal feed), T1: (Feed using date pit flour by 2.5% in feed), T2: (Feed using date pit flour by 5.0% in feed), and T3: (Feed using date pit flour by 7.5% in feed), T4: (Feed using date pit flour of 10.0% in feed). If the results obtained are significantly different ($P<0.05$) or very significantly different ($P<0.01$) then continued with Duncan Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

The effect of treatment on the internal organs of broiler chickens

Organs in broiler chickens are a part of the digestive system of poultry that functions to convert nutrients that enter through feed used for productivity. When feed enters the body, metabolic processes will occur. This metabolic process will affect the work activity of the liver, heart, gizzard and spleen. The weight of internal organs is influenced by the nutritional content of feed, especially the crude fiber content. The digestive system works in absorbing nutrients in feed so that it can meet the needs of chickens which are

influenced by the performance of internal organs including the pancreas, bile, spleen, liver, and heart (Auza, *et al.* 2021).

Liver

Table 2 shows the average results of liver weight based on the use of date pit products. The average liver weight with the use of date processing products from the highest to the lowest in grams/ chick is 46.45g (T0), 44.02g (T2), 39.62g (T1), 36.94g (T3), and 35.76g (T4). The weight of the liver in this study is greater than the research of Zaefarian *et al.* (2019) which has an average liver weight ranging from 24-28.2 g. Differences related to liver weight can be caused by genetic factors and feed given. Reski *et al.* (2021) stated that liver weight is influenced by several factors such as the type of livestock, livestock weight, genetics and feed consumed. According to Alshamy *et al.* (2019) factors that affect liver weight are body weight, species, sex, age, and pathogenic bacteria. The high heaviness of the liver in this study can be caused by the high content of crude fiber in the feed. The increased fiber content in feed will inhibit the absorption of bile acids into the blood so that the liver will synthesize bile acids from body cholesterol and this will cause an increase in liver activity (Pantaya *et al.*, 2020). Leeson and Zubair (1997), added that feeding factors containing high crude fiber can increase the metabolic ability of chickens, resulting in enlargement of chicken liver size. Based on the results of statistical analysis showed that the treatment had an intangible effect (P>0.05) on broiler chicken liver weight. This shows that the use of date processing products can have a positive effect on broiler chicken liver weight. Normal liver indicates that the feed consumed does not affect the performance of organs in the body of livestock. If the feed consumed contains toxic, the performance of the liver is heavier so that the weight increases and detoxification of toxic substances that enter the body. Silanikove and Tiomkin (1992) added that the liver will be damaged if there are excess toxic substances in the body.

Heart

Statistical analysis of the effect of adding date pits (*Phoenix dactylifera* L.) as an alternative feed on heart weight is presented in the Appendix. This means that the addition of alternative feed in the form of date pits (*Phoenix dactylifera* L.) given to broiler chickens has no real effect (P>0.05) on heart weight. The addition of feed in the form of date pits (*Phoenix dactylifera* L.) has a heart weight value that has no real effect, this is because the feed given is more intended in the formation of carcasses. In addition, heart weight is also influenced by the nutritional content of the ration, especially the crude fiber content Lipiński *et al.* (2019). The factor of feed consumption also affects the weight of the heart, the more feed consumed, the greater the weight of the heart. This is in line with Gobezie (2022) opinion that feed consumption is one of the factors that can affect giblet weight. If the ration consumption is high, then the weight of the giblet will also be high.

Table 2: The average effect of treatment on the weight of the liver. heart. gizzard. spleen and pancreas in broilers.

Treatment	Variable (grams)				
	Liver	Heart	Gizzard	Spleen	Pancreas
T0	46.45	8.68	36.96	3.03	5.46
T1	39.62	9.31	43.81	2.86	5.79
T2	44.02	8.56	41.05	2.97	4.93
T3	36.94	8.53	35.58	3.03	5.32
T4	35.76	8.32	35.55	2.29	5.03

Table 3: Average body weight of broilers every week.

Treatment	Ages (week)					
	0	1	2	3	4	5
T0	45	150	334	695	1125	1475
T1	45	149	317	675	1117	1399
T2	46	150	308	701	1084	1462
T3	45	152	315	686	1153	1485
T4	45	151	315	703	1049	1345

Here is the sum of the results of R2. T0 has a value of y = 207.75x + 86.734 so that the value of R^2 is obtained 0.9747. T1 has a value of y = 206.8x + 85.74 so that the value of R^2 is obtained 0.975. T2 has a value of y = 207x + 80.899 so that the value of R^2 is obtained 0.9772. T3 has a value of y = 208.19x + 83.701 so that the value of R^2 is obtained 0.9767. T4 has a value of y = 205.82x + 89.372 so that the value of R^2 is obtained 0.9723.

Table 4: The effect of treatment on broiler carcass.

Treatments	Variable		
	Carcass percentage (%)	Abdominal fat (g/head)	Cholesterol (mg /100 g sample)
T0	66.05	13.73	75.68
T1	65.11	16.07	75.69
T2	65.70	18.95	71.41
T3	66.00	20.93	68.54
T4	64.74	23.86	67.85

The average results of heart weight values in broiler chickens with date pits (*Phoenix dactylifera* L.) as alternative feed are presented in Table 2. The results of broiler chicken heart weight values T0 8.68g, T1 9.31g, T2 8.56g, T3 8.53g, and T4 8.32g. From the description of the average heart weight data, it can be seen that the lowest heart weight value is at T4 with a value of 8.32g while the highest is at T1 with a value of 9.31g. The high and low value of heart weight depends on several factors such as ration consumption, poultry metabolism and genetics or type of livestock. This metabolic process will affect the work activity of the gizzard, liver and heart. Poultry will increase its metabolic ability to

digest crude fiber thereby increasing the size of the gizzard, liver, and heart (Hetland *et al*., 2005). According to Alaku, *et al*. (1984), the size of the heart depends on sex, age, body weight, and animal activity.

Gizzard

The gizzard or gizzard is located between the proventriculus and the upper part of the small intestine. Gizzard is inactive when it is empty and reactivates when feed has entered. Gizzard serves to crush feed by mechanical reaction with its main function is to pulverize the feed and mix it with water which then becomes a paste and is called chime. The weight of the gizzard in this study was obtained from weighing the broiler chicken gizzard on each repetition. Table 2 shows that the average weight of broiler chicken gizzards per treatment. Based on the results of the analysis in the Appendix, it shows that the treatment of adding date pit flour has no real effect (P>0.05). The average weight of gizzard on the addition of date pits with the highest to lowest values was 43.81 g in the addition of 2.5% date pits (T1), 41.05 g in the addition of 5% date pits (T2), 36.96 g in basal feed (T0), 35.58 g in the addition of 7.5% date pits (T3), and 35.55 g in the addition of 10% date pits (T4). The low weight of the gizzard can also be caused by other things, namely the weight of the gizzard can be affected by the hardness of the feed ingredients. It is also revealed by Grist (2006) that the weight of the gizzard is affected by the hardness of the feed ingredients because it requires even greater muscle contractions to pulverize the feed. According to Battley and Piersma (2005), the size of the gizzard is easy to change depending on the type of food commonly eaten by the poultry. Hetland *et al*. (2005) added that the ration that enters the body will eat metabolic processes. This metabolic process will affect the work activity of the gizzard, liver and heart.

Spleen

Table 2 shows the average result of spleen weight based on the use by date pit product. The average weight of the spleen with the use of date processing products from the highest to the lowest in grams/ head units was 3.03 g (T3), 3.03 g (T0), 2.86 g (T1), 2.97 g (T2), and 2.29 g (T4). The difference related to spleen weight is influenced by several factors such as the nutritional content in the feed and the amount of feed consumed. According to Park *et al*. (2013) the size of lymphoid organs that are below normal is thought to be caused by several factors, namely being in uncomfortable conditions (Discomfort index (DI)) which will have an impact on reducing feed intake so that the level of stressor caused by the discomfort index and feed intake that is below normal is thought to have an impact on reducing size. lower relative weight compared to the standard. In addition, the weight of the spleen is also influenced by the activity of the spleen. Increased lymph activity in turn will also have an impact on changes in lymph size Akter *et al*. (2006). This is also supported by the statement of El-Gogary (2015), that lymph activity can cause lymph to get bigger or even smaller in size because lymph is attacked by disease or foreign body disorders.

Based on the results of statistical analysis showed that the treatment had an intangible effect (P>0.05) on the spleen weight of broiler chickens. This shows that the use of date processing products can have a positive effect on the weight of broiler chicken spleen. The lowest average spleen weight is at T4 with the use of date processing products in feed by 10%. This shows that the use of date processing products in feed does not interfere with the performance of the spleen which will affect the body condition of livestock. The weight of the spleen organ is one indicator to determine the health condition of livestock (Kwak *et al*., 1999). According to Mandel *et al*. (1981) a heavier spleen indicates that there are many dendritic cells, so that more antigens and antibodies are produced. Substandard or abnormal spleen weight will also affect the condition of livestock. Makinodan and Peterson (1964), also explained that the spleen organ will be damaged if the relative weight is at an abnormal level, the spleen weight increases if there are antigens or due to the impact of the emergence of a disease in the body, and if there is no increase in the weight of the spleen, it shows no lymphocyte cell formation which also means that natural isotonic containing vitamin C, flavonoids, and citric acid do not cause negative effects in experimental animals.

Pancreas

Statistical analysis of the effect of adding date pits (*Phoenix dactylifera* L.) as an alternative feed on pancreatic weight is presented in the Appendix. This means that the addition of alternative feed in the form of date pits (*Phoenix dactylifera* L.) given to broiler chickens has no real effect (P>0.05) on pancreatic weight. The addition of alternative feed in the form of date pits (*Phoenix dactylifera* L.) has a pancreatic weight value that has no real effect, this is influenced that the feed given only has an effect of 0.05% on the weight of the pancreas, while 9.95% is influenced by other factors. In addition, the weight of the pancreas can also be affected by the amylase enzyme in the feed. The decrease in pancreatic weight is thought to be caused by decreased secretion of endogenous amylase by the pancreas due to exogenous amylase. It is known that the pancreas works secreting amylase and protease enzymes (trypsin and chimotrypsin) (Haroen *et al*., 2019). The addition of date pit flour in the feed does not affect the weight of the pancreas because the content of date pit flour bioactive compounds such as flavonoids, tannins and saponins may not be directly related to the performance of the pancreas whose function is to produce enzymes.

The average result of pancreatic weight values in broiler chickens with date pits (*Phoenix dactylifera* L.) as an alternative feed is presented in Table 2. Data results of broiler chicken pancreatic weight values T0 5.46 g, T1 5.79 g, T2 4.93 g, T3 5.32 g, T4 5.03 g. From the description of the average result data, it can be seen that the lowest pancreatic weight value is in T2 with a value of 4.93 g while the highest is in T1 with a value of 5.79 g. The high and low value of pancreatic weight depends on the work of amylase, protease, and lipase enzymes in the digestive process. One of the functions of pancreas is to secrete amylase enzymes, proteases and 25 lipases that help the process of digestion of carbohydrates, proteins and fats. The pancreas also produces lipolytic, amylolytic and proteolytic enzymes (Basir and Toghyani, 2017). In addition, the content of tannins and saponins is not too high in feed, so the function of the digestive glands is not too heavy in breaking down tannins and saponins in feed. According to Faishal *et al.* (2013) stated the function of the pancreas is to produce lipolytic, amylolytic and proteolytic enzymes. These enzymes play a role in breaking down fats, starches, proteins and acids in the digestive system.

Effect of treatment on broiler chicken growth performances

The results of the study of the effect of the use of date pit flour in feed on broiler chicken growth performances observed for 5 weeks and calculated body weight every week can be seen in the graph (Figure 1). The average body weight of broiler chickens for one period calculated from each week can be seen in Table 3. The results of observations on broiler chicken growth performances influenced by date pit flour (*Phoenix dactylifera* L) are known that the best growth performance is obtained by treatment with the addition of date pits as much as 5% (T2) which has the equation y = 207x + 80.899 and R^2 = 0.9772 which means that 97% of the addition of date pits contained in feed affects broiler chicken body weight with a good growth performance, another 13% is influenced by other factors. The highest to lowest results seen from R2 are T2 (R2 = 0.9772), T3 (R2 = 0.9767), T1 (R2 = 0.975), T0 (R2 = 0.9747, T4 (R2 = 0.9723). Thus, the value of R2 does not show a significant difference.

The content of nutrients and the physical form of the feed affect growth in broiler chickens. Palatability is affected by the shape, smell, taste, texture and temperature of a given food. Broiler chickens prefer brightly coloured food ingredients. Feed consumption also affects broiler chicken weight growth. The more feed consumption, the more energy is produced for growth (Massuquetto *et al.*, 2020). In the research conducted, the best growth performance obtained T2 with the addition of date pits as much as 5%. This means that T2 has an efficient amount of feed consumption and weight gain compared to others. With an average consumed by T2 of 2719, 30 grams/ head with an increase in body weight produced 1530.95 grams and produced 1.78 for feed efficiency.

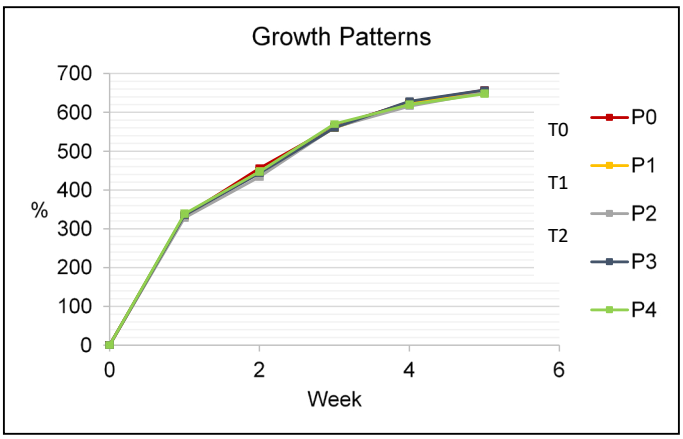

Figure 1: Graph of growth patterns in broilers.

T2 treatment is the best treatment of broiler chicken growth performances by being given feed in the form of adding date pits as much as 5%. The content of date pits that are not too much causes a balance of nutrients in the feed and also the physical form of the feed because the palatability will be high. The results of Hussein and Alhadrami (2003) study showed that the addition of date pits to the starter ration supported similar or better growth performance than basal feed. According to Masoudi *et al.* (2011) the addition of date pit in broiler chicken feed causes a decrease in body weight compared to control feed. This may be due to the high fibre content in date pit and gritty nature, which reduces digestibility and possible availability of nutrients especially amino acids. The results of research by Tareen *et al.* (2017) the use of date pits in feed by 0-4% with a maintenance period of 6 weeks resulted in a fairly high feed conversion value of 1.92–2.22. This indicates that the length of maintenance period can also affect the conversion value of feed. Supported from the results of Kolluri *et al.* (2022) that broiler chickens with type MB 202 with a rearing period of 4 weeks, 5 weeks, and 6 weeks have feed conversion values of 1.49, 1.70, and 1.82, respectively.

Carcase percentage

The results of statistical analysis in the Appendix showed that the addition of date pit flour (*Phoenix dactylifera* L.) in the feed does not have a noticeable effect (P>0.05) on the percentage of broiler chicken carcase, this is because the carcase value tends to be the same as the value of the chicken's body weight. According to Ikusika *et al.* (2020) the percentage of carcase that is not significantly different is due to the final body weight that is aligned with the carcase weight, so that the proportion of body parts or percentage of broiler chicken chicken carcasses is the

same. The high weight of the carcase is supported by the final live weight as a result of the increase in live weight of the livestock concerned. The data from the analysis above showed that the administration of fermented dates (*Phoenix dactylifera*) in feed did not have a noticeable effect (P<0.05) on the percentage value of carcase. The average percentage of carcasses obtained in this study ranged from 64.74% to 66.05%. This is in accordance with the opinion of Omojola *et al.* (2004). that the percentage of broiler chicken carcasses varies between 65–75% of body weight, the heavier the chicken slaughtered, the higher the carcase.

The average results of broiler chicken carcase weight values with fermented dates (*Phoenix dactylifera*) as feed additives are presented in Table 4. The results of broiler chicken carcase percentage values T0 66.05 %, T3 66 %, T2 65.70 %, T1 65.11 % and T4 64.74 %. From the description of the average result data, the carcase percentage value can be seen that the lowest carcase weight value is at T4 with a value of 64.74 % while the highest carcase percentage is at T0 with a value of 66.05 %. The high and low percentage value of carcase is caused because the crude fiber content in T0 tends to be smaller than the crude fiber content in other treatments, which is 4.30. According to Widodo *et al.* (2019), high crude fiber can cause poultry to feel full quickly so that it can reduce consumption because crude fiber is voluminous.

The percentage value of carcase does not have much effect on the quality of the carcase but greatly affects the appearance of livestock before being traded. The buyer of the livestock will estimate the carcase value of the appearance of the cattle while the cattle is still alive. According to Pečiulaitienė *et al.* (2015), factors that affect the percentage of carcase are body conformation and degree of obesity. Poultry are fat, the percentage of carcase is high and generally thick like blocks. Meanwhile, Conventional meat is associated with protein availability (Siddiqui *et al.*, 2022).

Abdominal fat

The results of statistical analysis in the Appendix showed that the addition of date pits (*Phoenix dactylifera*) in the form of flour to the feed did not have a significant effect (P<0.05) on broiler chicken abdominal fat. Abdominal fat is fat found around the gizzard, abdominal muscles and small intestine (Sonaiya, 1985). The average abdominal fat values of broiler chickens from the lowest included T0 (13.73 g/head), T1 (16.07 g/head), T2 (18.95 g/head), T3 (20.93 g/head), T4 (23.86 g/head). From the data that has been obtained, it is known that the lowest value is T0 with feed without using date pit flour (0% in feed) and the highest in T4, which is feed using date pit flour of 10.0% in feed. It can be seen that the average value of abdominal fat is very sequential from T0 to T4, it is known that the more use of date pit flour can affect the amount of abdominal fat in broiler chickens. In research conducted by Barakat and Alfheeaid (2023) said that date pit flour contains several important nutrients such as protein, carbohydrates and fat.

The best treatment is found in T4, namely with the addition of 10% date pit flour. This is influenced by the low fiber content and high fat in date pits, namely fiber ranging from 6-11% and fat ranging from 13-15% in feed. According to Hamada *et al.* (2002), date pits have the potential to be used as feed. This can be seen from the composition contained in date pits. Date pits contain 71.9–73.4% carbohydrates, 5–6.3% protein, and 9.9–13.5% fat. Date pits also contain vitamins and dietary fiber with a sufficient percentage, which is 6.4–11.5% (Al-Shahib and Marshall, 2003). We can be known that the provision of treatment feed as much as 10% (T4) with the highest amount in each treatment can affect the formation of abdominal fat in broiler chickens. One factor in the formation of abdominal fat is from the feed consumed by broiler chickens, the higher the fat content and the lower the fiber contained in the feed will be able to increase the process of abdominal fat formation of broiler chickens. Sarikhan *et al.* (2010) states that chickens that consume feed with higher crude fiber, will have a lower abdominal fat content. Increasing age and increased energy in the feed increase abdominal fat in broiler chickens. Differences in strains significantly affect abdominal fat weights (Griffiths *et al.*, 1978).

Some factors that affect fat formation are strains, nutrition, sex, age of chickens and environmental factors. According to Tumova and Teimouri (2010). The genotype, sex, and nutrition of broiler chickens are some of the factors that affect body fat deposition. The amount of abdominal fat of broiler chickens strain Cobb 500 is 0.4% lower compared to the Ross strain (Rahman, 2014). Fontana *et al.* (1993) said abdominal fat will increase in chickens fed rations with low protein and high energy rations. Excess energy will be stored in the form of fat in tissues. One part of the body used to store fat by chickens is the part around the abdomen (abdomen). Abdominal fat has a correlation relationship with total carcase fat, the higher the abdominal fat content, the higher the carcase fat content in broiler chickens (Pfaff and Austic, 1975; Leclerq and Witehead, 1988).

Cholesterol

The results of the variety analysis in the Appendix showed that the addition of date pit flour in chicken feed did not have a significant difference (P<0.05) on meat cholesterol in broiler chickens. The results of the analysis of breast meat cholesterol levels with the lowest cholesterol content

in the treatment of adding 10% date pit flour amounted to 67.70 mg/ 100g and the highest cholesterol content in the control treatment (T0) of 75.68 mg/ 100g. Meat cholesterol levels ranged from 67.07 to 76.98 mg/ 100g indicating cholesterol levels in breast meat were still within normal limits as conveyed by Dinh *et al.* (2011) explained that the cholesterol content of chicken breast ranged from 60–90 mg/ 100g.

Cholesterol synthesis can be influenced by the presence of fiber in feed, fiber will result in a decrease in the absorption of cholesterol amounts so that it will be wasted through excreta. This is supported by Cohn *et al.* (2010) stating that the provision of fiber in feed results in a reduction in cholesterol absorption. According to Krogdahl (1985) stated that the process of absorption of bile salts and cholesterol from the digestive tract is partly influenced by increased levels of dietary fiber which can interfere with the reabsorption process of cholesterol and bile salts so that the process of fecal excretion that removes cholesterol increases. The more faeces secreted the cholesterol levels synthesized are reduced.

Meat cholesterol decreases in proportion to cholesterol levels in the blood, crude fiber can increase and eliminate bile salts formed from cholesterol in the liver and stored in the gallbladder, so that more bile salts are wasted with excreta then cholesterol will be reused to form bile salts in the liver, this correlates with cholesterol levels in the body which will decrease (Smits *et al.*, 1998). Cholesterol levels are produced from two sources, namely from the body of livestock itself called endogenous cholesterol and those that come from outside or feed called exogenous cholesterol, factors that come from outside the cell blessed with lipoproteins, fatty acids and hormones while endogenous factors or in cells are related to enzyme systems that play a role in cholesterol synthesis and catabolism, precursors for cholesterol synthesis (Wallace *et al.*, 2010).

CONCLUSIONS

In conclusion, the processing date pits (*Phoenix dactylifera* L.) can increase the value of carcase percentage, abdominal fat, and reduce cholesterol. Date pits (*Phoenix dactylifera* L.) at the level of 7.5% in feed is the best result.

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NOVELTY STATEMENT

The novelty of this research is the use of five treatments of date pits on the broilers. Since there is lack of information of this date pit. The novelty quite applicable among develop countries.

AUTHOR'S CONTRIBUTION

MCR played a role in collecting data, conducting nutritional analysis, analyzing data, and preparing the manuscript. MHN and OS contributed to the design of the research, provided supervision, and participated in revising the manuscript. All authors have read and approved the final version of the manuscript submitted to the journal.

Ethical approval

This study will be conducted by evaluating and knowing the effect of the use of date pit flour in broiler chicken feed on growth performances, internal organs (liver, heart, gizzard, spleen, pancreas), carcase quality (carcase percentage, abdominal fat), and cholesterol. Ethical approval for the study was given by the Animal Care and Use Committee, University of Brawijaya, Indonesia No. 044-KEP-UB-2024.

Conflict of interest

The authors have declared no conflict of interest.

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