Sys Rev Pharm 2020;11(12):725-729
A multifaceted review journal in the field of pharmacy

The Effect of Fermented Corn Straw as a Substitute for Rice Bran in the Ration on the Performance of Cross Breed Native Chickens

Ellen Saleh[1], Suyadi[2], Irfan Hakim Djunaidi[2], and Eko Widodo[2]

[1]Student of Animal Science Faculty, Brawijaya University, 65145, East Java, Indonesia
[2]Animal Science Faculty, Brawijaya University, 65145, East Java, Indonesia
Email: ellensaleh9@gmail.com

ABSTRACT

This study aims to determine the effect of the use of fermented corn straw (FCS) as a substitute for rice bran on cross breed native chicken productivity. The research method used was a field experiment using a Completely Randomized Design (CRD) with 5 treatments and 5 replications so that there were 25 experimental units. Each test consisted of 10 chicks, so that the number of cross breed native chickens used was 250. Cross breed native chicken basal feed is prepared based on the nutritional needs of cross breed native chicken, *starter* and *finisher* periods. The treatment given to livestock is P0 = 100% Basal Feed without fermented corn straw, P1 = 95% P0 + 5% FCS of total bran in the feed, P2 = 90% P0 + 10% FCS of total rice bran in feed , P3 = 85% P0 + 15% FCS of total rice bran in feed, P4 = 80% P0 + 20% FCS of total rice bran in feed . Parameters observed include: Feed Consumption (g / head / day), Weight gain (g / head / day), Feed Conversion and *Income Over Feed Cost* (IOFC). The data obtained were analyzed using analysis of variance (ANOVA) and continued with Duncan's Multiple Range Test. The results of the analysis of variance showed that the treatment of the use of fermented corn straw instead of rice bran in cross breed native chicken feed had a very significant effect (P <0.01) on feed consumption, weigh gain, feed conversion and IOFC. Discussion, it can be concluded that the replacement of bran with corn straw fermentation to the extent of 10% to produce performan good on cross breed chicken value high IOFC.

Keywords: Corn straw fermentation, cross breed native chicken, performance, rice bran, substitutions

Correspondence:
Ellen Saleh
Student of Animal Science Faculty, Brawijaya University, 65145, East Java, Indonesia
Email: ellensaleh9@gmail.com

INTRODUCTION

One of the determining factors for the success of a livestock business is the feed factor. The cost of feed in a livestock business, especially intensive maintenance techniques, cross breed chicken is the largest component of the total production cost, which is around 60 to 70%. Therefore, for the native chicken farms to be successful, the feed factor must receive serious attention, especially the quality and price of feed. Good quality food is food that meets the requirements for the adequacy of the contents of food substances, especially protein, energy, vitamins and minerals. Therefore the content of harmful substances such as crude fiber and other anti-nutrients that can harm and inhibit the utilization of food substances in the body of poultry, is kept as low as possible so that their utilization can be optimal.

The price of expensive feed increasingly makes maintenance costs higher for the required use of feed efficiency. Efficient use of feed is needed to reduce production costs. Therefore, economical substitute feed ingredients are needed (Muharlien, Achmanu and Kurniawan, 2010; Nuningtyas, 2014). Some feed ingredients tend to have fluctuating prices, which causes variable production costs as a result, the size of the profits cannot be predicted. One of the feed ingredients is rice bran as a source of energy for chicken. Bran is a by-product of rice milling process in the process Results s a mping millers earn as much as 2-3% of bran (Damayanthi and Listyorini, 2006). The use of rice bran as animal feed can be combined with other feed ingredients. Provision of bran in poultry feed is limited to maximum 10% due to the high content of fiber in bran can not be digested by cattle, and protein content lower than that there are good anti-nutrients such as phytat that would interfere with the nets n its process of utilization of phosphorus and calcium (Supartini and Fitasari , 2011). One effort to minimize the cost of feed is to replace it with cheaper feed but with the same quality . Utilization of agricultural waste can reduce the cost of feed which is the largest cost in the operation of chicken farms.

Corn straw has the potential to be used as alternative feed ingredients for cross breed native chicken, this is because corn straw contains organic compounds and inorganic compounds. The composition of organic compounds in corn straw consists of protein, fat, fiber, pentose, cellulose, hemicellulose, and lignin. While the composition of inorganic compounds is usually found in the ashes. Potential corn crop waste is 50% stems, 20% leaves, 20% cob, and 10% corn husk is produced annually, but the utilization of corn crop waste is not optimal because it is *bulky* , and quickly damaged after harvesting (Umiyasih and Wina, 2008).

The crude protein content of corn plant waste varies between 5 - 11 % so that the corn crop waste has nutritional value that is good enough for animal feed. The content of young corn forage in 90% dry matter reported by Sudirman and Imran (2007) was protein 11.33%, fiber 28.00%, fat 0.68%, BETN 49.23%, Ash 10.76%, NDF 64.40%, ADF 32.64% and TDN 53.00%.

MATERIALS AND METHODS

The research material used in this study is corn straw which has been fermented in advance . Corn straw (leaf) obtained from local farmers who will be fermented with the first enumerated the size of 1- 3 cm ± 1kg and then sprayed with water to 55-60% moisture, and then sprinkled 7% inoculum *Trichoderma viride* until evenly distributed. Then put in a plastic bag that is given holes to the cil and then incubated for 2 weeks. After sufficient time the plastic is opened, physical conditions (odor, color, texture and fungal growth) are observed. The number of *Trichoderma viride* fungi colonies was 8.6 x 10^6 cfu / ml.

Livestock used in the field are day-old cross breed native chickens with no sex (*un-sexed*) of 250 chicks, which were divided into 5 treatments and 5 replications. The cages used were 25 pens. Each cage is filled with 10 chicks, and is equipped with a place of feed and drinking water. Chicks are kept for 8 weeks.

The experimental cage used in this study was a battery cage, totaling 25 pens with an area of 1.25 m x 1 m x 1 m each, each cage filled with 10 chicks, and equipped with a place of feed and drinking water made of plastic. Lighting in the form of incandescent lamps 40 watts and 25 watts as a heater is used until the chicken is 3 weeks old.

The feed used in this study was basal feed, ie concentrate, corn, rice bran plus cornstarch which was fermented by *Trichoderma viride* (FCS) with the best analysis results with several levels of treatment.

RESEARCH METHODS

The research method used was a field experiment using a Completely Randomized Design (CRD) with 5 treatments and 5 replications so that there were 25 experimental units. Each test consisted of 10 chicks, so that the number of cross breed native chickens used was 250. Cross breed native chicken basal feed is prepared based on the nutritional needs of cross breed native chicken from *starter* and *finisher* periods (Anonimous, 2014). The basal composition of *starter* and *finisher* periods can be seen in table 1 and table 2.

The treatment given to livestock is as follows:
P0 = 100% Basal Feed without fermented corn straw
P1 = 95% P0 + 5% FCS of the total bran in the feed
P2 = 90% P0 + 10% FCS of the total bran in the feed
P3 = 85% P0 + 15% FCS of the total bran in the feed
P4 = 80% P0 + 20% FCS of the total bran in the feed

Table 1. Composition of cross breed native chicken feed for *starter* period aged 0 - 30 days

Feed Ingredients (%)	P0	Q1	P2	Q3	Q4
Yellow sorn	40	40	40	40	40
FCS	0	5	10	15	20
803 M broiler concentrate	38	38	38	38	38
Rice bran	20	15	10	5	0
Premix	2	2	2	2	2
Total	100	100	100	100	100
Nutrition Content					
Dry ingredients (%)	87.07	87.22	87.36	87.50	87.65
Met. Energy (Kcal / kg)	3009.00	2974.45	2939.90	2905.34	2870.79
Crude Protein (%)	21.52	21.62	21.72	21.82	21.92
Coarse Fiber	4.39	4.84	5,28	5.73	6.17
Coarse Fat (%)	6.87	6.73	6.59	6.45	6.31
Calcium (%)	.82	.83	.84	0.85	.86
Phospor (%)	0.68	.67	.67	.67	.67

T **abel 2 .** The composition of cross breed native chicken feed for *finisher* period aged 30 – finisher

Feed Ingredients (%)	R0	Q1	R2	R3	Q4
Yellow Corn	50	50	50	50	50
FCS	0	5	10	15	20
803 M Broiler Concentrate	28	28	28	28	28
Bran	20	15	10	5	0
Premix	2.0	2.0	2.0	2.0	2.0
Total	100	100	100	100	100
Nutrition Content					
Dry ingredients (%)	86.14	86.24 2	86,344	86.45	86.55
Met. Energy (Kcal / kg)	2833,56	2862.26	2890, 9 6	2919.66	2948,36
Crude Protein (%)	18.86	18,939	19,018	19,097	19, 1 8
Crude Fiber (%)	6.24	6.63	7,017	7,403	7,789
Fat (%)	4.91	4.73	4,56	4.39	4.22
Calcium (%)	0.85	0.85	.86	.86	.86
Phospor (%)	0.64	0.64	0.64	0.64	0.64

Statistical analysis

Data obtained were analyzed using analysis of variance (ANOVA) and continued with Duncan's Multiple Range Test according to Steel and Torrie (1997) instructions.

The research data obtained were tabulated using Microsoft Office Excel 2007 program, then the resulting data were analyzed by analysis of variance (Anova) based on a Completely Randomized Design (CRD) with 5 treatments and 5 replications. If there is a significant effect between treatments, it will be continued with Duncan's Multiple Range Test

RESULT AND DISCUSSION

Table 3. Effect of treatment of rice bran replacement with fermented corn straw in the ration on average feed consumption, weight gain, feed conversion and IOFC of cross breed native chickens during the study (gr / head / day)

Parameter	Treatment				
	P0	P1	P2	P3	P4
Feed consumption	38,024 ± 0.467 [b]	37,155 ± 0.578 [b]	38,141 ± 0.439 [b]	35,314 ± 0.285 [a]	35,725 ± 0.380 [a]
Weigh gain	15,099 ± 0,776 [d]	14,022 ± 0.157 [c]	15,170 ± 0.062 [d]	10,758 ± 0,183 [b]	9,748 ± 0,137 [a]
Feed conversion	2,466 ± 0.142 [a]	2,596 ± 0.028 [b]	2,444 ± 0.023 [a]	3.144 ± 0.056 [c]	3,456 ± 0.063 [d]
IOFC	19,068.02 ± 1348.88 [a]	17,387.12 ± 219.83 [b]	19,324.16 ± 48.12 [a]	12,388.39 ± 345.13 [c]	10,815.16 ± 213.43 [d]

P0 = 100% Basal Feed without fermented corn straw, P1 = 95% P0 + 5% FCS of total rice bran in feed , P2 = 90% P0 + 10% FCS of total rice bran in feed , P3 = 85% P0 + 15 % FCS of total bran in feed , P4 = 80% P0 + 20% FCS of total bran in feed ; Different letters on the same line show very significant differ at p <0.01

Feed consumption

The average consumption of cross breed native chicken feed that gets feed by replacing fermented corn straw is presented in Table 1. Replacement of bran with 10% fermented corn straw (P2) has the same effect as feed without substitution of fermented corn straw (P0) and P1 treatment (replacement of bran with 5% fermented corn straw). Numerically it shows that the average feed consumption from P2 treatment (replacement of bran with 10% FCS) tends to be higher compared to P0 and P1 treatments. Statistically significantly different from the treatment of P3 (replacement of bran with FCS 15%) and P4 (replacement of bran with FCS 20%). Increased dietary consumption in P2 treatment due to palatability of rations with a composition of 10% fermented corn straw and 90% basal ration. In addition to the palatability of aroma and freshness of the ration the same in the treatment P0, P1 and P2 even though the level of FCS use in the ration was different (Wahyu, 2004) states that palatability is one of the factors that can influence ration consumption. The consumption of different rations is strongly influenced by the quality and quantity of the ration, the palatability of the ration and its processing.

The use of FCS up to the level of 10% in cross breed native chicken rations did not significantly influence the consumption of rations. The use of up to 10% (with 10% bran reduction) in the ration is as palatability as the use of 5% corn straw and without FCS. Fermented products are preferred by poultry compared to non-fermented feed ingredients (Djulardi and Tisna, 2016). Besides fermentation products also increase amino acids. Sulistiawan, (2015) states that the nutritional value of fermented feed will increase by breaking down carbohydrate polymers into simple compounds so that they will be easily digested by livestock. Anang and Agustina's research (2019) on fermented cassava flour showed that the use of TOT as a substitute for rice bran had a positive influence on the consumption of super native chicken feed, which was shown by observing the data on feed consumption at a higher treatment than the control treatment. This shows that the fermentation process of feed ingredients with *Trichoderma viride* can increase the nutritional value of feed by breaking down carbohydrate polymers into simple compounds so that they will be easily digested by livestock.

The higher the replacement of bran with FCS there is a tendency to decrease ration consumption in P3 and P4 treatments. In fact, the consumption of P3 and P4 rations consumption by P0 treatment. P1 and P2 are due to increased use of FCS in feed so that the texture of the feed is smoother and the color of the feed gets darker (dark brown). While chicken prefers food in the form of granules rather than in the form of flour. Wahju (2004) states that poultry prefers granulated feed to flour feed. The color and shape of the ration affects the consumption of poultry, where feed which has a bright color will be favored and consumed more. Another cause of low feed consumption in P3 and P4 treatments is that there is a tendency to increase the ration of the metabolic energy as a result of replacing bran with FCS in feed. Chickens try to reduce the consumption of rations to reduce excessive body heat due to high ration energy content. Kartasudjana and Suprijatna (2006) stated that chickens will consume rations to meet their energy needs, chickens will continue to eat before their energy needs are met. If chickens are fed with a low energy content, they will eat more. The energy content of feed P0, P1 and P2 is lower than other treatments so that the consumption of rations increases. Anggorodi (2005) states that the energy content of feed greatly influences feed consumption. Feed with lower energy content will cause an increase in feed consumption and vice versa feed with higher energy content will cause a decrease in feed consumption. In addition, the reduction in ration consumption in the treatment of P3 and P4 crude fiber content of feed is higher than that of feed in the treatments P0, P1 and P2. The high content of crude fiber causes poultry to feel full quickly, so it can reduce consumption because crude fiber is voluminous (Amrullah, 2004).

Weight gain

Table 1 shows that the highest average superficial chicken body weight gain was in the treatment of P2 (15,170 g / head / day), P0 (15,099 g / head / day), P1 (14,022 g / head / day)), P3 (10.758 g / head / day) and P4 (9,748 g / head / day). The same average daily weight gain in treatments P0 and P2 is most likely influenced by nearly the same feed consumption. Consumption of the same feed shows that the amount of nutrients consumed and digested is also the same, especially protein and energy, resulting in the same daily body weight. Nutrient content in food and feed consumption greatly affects body weight. Wahyu (2004) states that to achieve optimal growth rates in accordance with genetic potential, we need foods that contain nutrients qualitatively and quantitatively so that there is a relationship between growth speed and the amount of feed consumption. This is because the formation of muscles, the shape and composition of the body is essentially the accumulation of feed consumed into the body of livestock. Fanani *et al* ., (2016) stated that protein is a substrate for protein deposition. The more protein is absorbed, the more protein is deposited in the meat thereby increasing the final weight.

The weight of super native chicken in P2 treatment (904.23 g / head) is equal to P0 treatment of 897.832 g / head, followed by P1 treatment of 838.36 g / head. This shows that the use of fermented corn straw as a substitute for bran to the level of 10% in super native chicken rations has no negative effect and can be applied in the preparation of super native chicken rations. Another possibility is that the raw fiber content of feed is almost the same so that the feed is easy to digest in the body and absorption of normal nutrients. Life weight is related to body weight gain, while weight gain is influenced by nutrient intake. The treatment of P3 and P4 significantly decreases body weight gain, this is in line with the decrease in ration consumption in both of these treatments so that the nutrient intake needed by chickens is low so that life weight will also be low. Decrease in feed consumption in treatments P3 and P4 in line with a decrease in live weight. The higher the crude fiber content in feed (in this study the crude fiber feed in P3 treatment (6.79%) and in P4 (6.96%), the higher feed energy resulting in lower feed consumption. Energy is one of the factors influences the carcass weight besides protein (Hatta, 2005). As Tillman *et al* ., (2005) argues that crude fiber in feed has a great effect on digestibility, digestibility decreases with the higher content of crude fiber feed, feed consumption also Decrease resulting in weight gain also decreases. One factor that affects the size of the increase in body weight is the consumption of feed and the fulfillment of food needs.Thus food consumption has a positive correlation with weight gain.

Feed conversion

The results of observations of mean feed conversion are presented in table 1. Table 1 shows that the average feed conversion in treatment P2 (2,444) is lower and is not different from treatment P0 (2,466). Treatments P0 and P2 did not differ (P> 0.05) and were significantly different from treatments P1 (2,596), P3 (3,144) and P4 (3,456). Feed conversion for P0 and P2 treatments was the same because there were no significant changes in feed consumption and body weight gain. These results indicate that the P0 and P2 treatments are more efficient in the use of feed compared to the P1, P3 and P4 treatments. With the increase in the percentage of FCS in feed in the treatment P3 (replacement of bran with F CS 15%) and P4 (replacement of bran with FCS 20%) causes an increase in the crude fiber content of the ration.

The results of this study indicate that the replacement of bran with FCS up to 20% in feed significantly increases the value of feed conversion. Feed conversion is the ratio between feed consumption and the amount of meat produced (Kapoor, 2009). Feed conversion can be used as an indication of the production coefficient where a lower value indicates the use of more efficient feed to produce meat. Conversion of the same feed between treatments P0 (feed without FCS) and P2 (replacement of bran with FCS 10%) in this study showed that the replacement of rice bran with FCS in feed up to a level of 10% in super native chicken ration did not significantly affect feed consumption, evenly average daily body weight gain or meat production. Decrease in feed conversion value is due to optimal absorption of food substances in the digestive tract. Amrullah (2014) the lower the feed conversion rate, the better the feed quality. High and low feed conversion rates due to the difference that is getting greater or lower in the ratio of feed consumption and body weight gain. Feed conversion rates indicate the level of feed efficiency, which means that the lower the feed conversion rate, the higher the feed efficiency value and the more economical. Sinurat et al (2016) states that the addition of enzymes can increase body weight, improve feed conversion.

Treatments P1, P3 and P4 contain feed with high crude fiber content (6.91%), (6.79%) and (6.96%) respectively, which will reduce the feeding time in the stomach and intestine and increase volume the stomach and intestines in chickens. This can also illustrate why the treatment groups P1, P3 and P4 have a higher tendency to feed conversion ratio than the other treatment groups. This is due to the low consumption of feed so that the feed that is converted for growth is small. Feed conversion value is determined by the amount of feed consumed and the resulting weight gain. Besides feed conversion is influenced by several factors including genetic potential, adequate temperature of the feeding environment and energy levels. The opinion of Esminger and Olentine (1992) in Wahyu (2004) that the feeding of good quality feed, the value of feed conversion ranges from 2.3 to 3.0.

Income Over Feed Cost

In this study the IOFC calculation is a measure that only looks at the cost of feed incurred for raising chickens during the study. Size of expenditure only compares with the cost of feed.

The results of analysis of variance showed that the use of fermented corn straw in super native chicken feed as a substitute for rice bran gave a very real effect on the value of IOFC. The highest IOFC values were highest in P0 treatment (without FCS treatment), followed by P2 treatment then P1, P3 and the lowest in P4 treatment. IOFC is calculated based on a comparison between the average amount of revenue from the sale of cross breed native chickens with the amount of food costs. The higher IOFC means that the revenue from selling cross breed native chickens will also be higher. In this study the value of feed conversion in treatments P0 (2,466) and P2 (2,444) was not different and lower followed by treatment P1 (2,596), compared to the treatment of P3 and P4 feed conversion was higher so that the value of IOFC in P0 and P2 treatments was getting better. The more efficient cross breed chicken will turn food into meat, the better the value of IOFC. In addition the calculation of feed costs greatly affect the value of IOFC. The increasing level of FCS use in chicken feed further decreases the value of IOFC. A very significant difference between treatments is due to the greater difference in the results of chicken sales with the cost of feed used during the study.

IOFC values in all treatments were significantly different. IOFC value is influenced by the amount of feed costs. In this study the cost of feed in the P0 treatment was lower and the cost of receiving chicken sales was higher thereby increasing the value of IOFC. Likewise, the IOFC value in P2 and P1 treatments. In the treatment of P3 and P4 in this study produced a high conversion value so that the value of IOFC decreased. This shows that the more increasing the use of FCS as a substitute for bran, the lower the IOFC value. In measuring the income value of a livestock business is usually compared with the cost of feed. Rasyaf (2011) states that business income is the multiplication of livestock production (in live kilograms), while feed costs are the total costs incurred to produce live chicken weight (kg).

In this study the price of feed in P0 treatment was Rp. 7,866,941 / kg, P1 treatment was Rp. 7763,676 / kg, P2 treatment amounting to Rp. 7802,803 / kg, P3 treatment of Rp. 7291,548 / kg, P4 treatment of Rp. 7192,280 / kg. The selling price of super chicken from the results of this study averaged Rp. 30,000 / kg / head. Feed consumption and feed prices are not the same every treatment causes the cost of feed incurred for the cost of feed is also not the same amount. Body weight gain in treatments P0 and P2 have the same range so that when calculated the value of income from total sales of super native chickens per head minus the cost of treatment feed tends to increase the value of IOFC. The higher the value of IOFC, the better.

CONCLUSION

The best response to feed consumption and weight gain was obtained by replacing bran with 10% fermented corn straw in cross breed native chicken feed, with low feed conversion and high IOFC values.

ACKNOWLEDGEMENT

I am grateful to my Supervisor; Prof. Dr. Sc. Agr. Ir. Suyadi, MS, Dr. Ir. Irfan H. Djunaidi, M.Sc, DR. Ir. Eko Widodo, M. Agr.Sc. M.Sc, who have accompanied and compilation of the results of this dissertation and Brawijaya University.

REFERENCES

1. Amrullah IK 2004 *Nutrition of Broilers.* One Mountain Budi Institute. Bogor.
2. Anang and Kunharjati 2019 Effect of the use of fermented cassava flour with *Trichoderma viride* as an alternative feed to feed consumption and body weight gain of super native chickens. *Journal of Animal Science* Vol. 7, 128-134
3. Damayanthi E and Listyorini DI 2007 The use of low-fat rice bran flour in making simulated chips. Journal of Nutrition and Food, 1, 34–44. https://doi.org/10.25182/jgp.2006.1.2.34-44
4. Fanani AF, Suthama N and Sukamto B 2016 The effect of adding dahlia flower bulbs as a source of inulin on protein digestibility and productivity of local crossbred chickens. *Journal of Veterinary Medicine.* 10, 58-62
5. Kapoor S, Khanna PK and Katyal P 2009 Effect of supplementation of wheat straw on growth and lignocellulolytic enzymes potential of *Lentinus edodes.* World J. Agric. Sci 5, 328-331.
6. Nuningtyas Y 2014 Effect of adding garlic flour (allium sativum) as an additive to the appearance of broiler production. LIVESTOCK TROPICS Journal of Tropical Animal Production. LIVESTOCK TROPICS Journal of Tropical Animal Production, 15, 21-30
7. Umiyasih, U and Elizabeth Wina 2008 Processing and nutritional value of corn plant waste as ruminant animal feed. Wartazoa, 18, 127-136.
8. Sinurat AP, Purwadaria T and Haryati T 2016 Testing the effectiveness of the BS4 enzyme on the performance of laying hens given different types of feed ingredients. JITV, 21, 1-8
9. Sudirman and Imran 2007 *Sumbawa Buffalo: as a true converter of fibrous feed.* The National Workshop on Buffalo Farming Supports the Beef Adequacy Program. Faculty of Animal Science, University of Mataram, West Nusa Tenggara.
10. Sulistiawan IH 2015 Improving the quality of Broiler Chickens Through Two-Stage Fermentation Using Trichoderma resei & Sacharomices cereviceae. Agripet, 15, 66-71
11. Supartini N, and Fitasari E (2011) The use of "Aspergillus Niger" fermented bran in feed on the characteristics of organs in broilers. Buana Sains, 11, 127–136. https://doi.org/10.33366/BS.V11I2.164
12. Wahyu J 2004 Poultry Nutrition Science. 5th printing. Gadjah Mada University Press, Yogyakarta.