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PREFACE

Sustainable agriculture is "a way of practicing agriculture which seeks to optimize skills and technology to achieve long-term stability of the agricultural enterprise, environmental protection, and consumer safety. It is achieved through management strategies which help the producer select hybrids and varieties, soil conserving cultural practices, soil fertility programs, crop rotations, weed, pest and disease biological management programs, and strategic use of animal and green manures and use of natural or synthetic inputs in a way that poses no significant hazard to man, animals, or the environment. The system is envisioned in its broadest sense, from the individual farm, to the local ecosystem, and to communities affected by this farming system both locally and globally. The goal of sustainable agriculture is to minimize adverse impacts to the immediate and off-farm environments while providing a sustained level of production and profit. Sound resource conservation is an integral part of the means to achieve sustainable agriculture.

Sustainable agriculture integrates three main goals--environmental health, economic profitability, and social and economic equity. A variety of philosophies, policies and practices have contributed to these goals. People in many different capacities, from farmers to consumers, have shared this vision and contributed to it. Despite the diversity of people and perspectives, the following themes commonly weave through definitions of sustainable agriculture.

Sustainable agriculture presents an opportunity to rethink the importance of family farms and rural communities. Economic development policies are needed that encourage more diversified agricultural production on family farms as a foundation for healthy economies in rural communities. In combination with other strategies, sustainable agriculture practices and policies can help foster community institutions that meet employment, educational, health, cultural and spiritual needs. By helping farmers to adopt practices that reduce chemical use and conserve scarce resources, sustainable agriculture research and education can play a key role in building public support for agricultural land preservation. Educating land use planners and decision-makers about sustainable agriculture is an important priority.

Consumers can play a critical role in creating a sustainable food system. Through their purchases, they send strong messages to producers, retailers and others in the system about what they think is important. Food cost and nutritional quality have always influenced consumer choices. The challenge now is to find strategies that broaden consumer perspectives, so that environmental quality, resource use, and social equity issues are also considered in shopping decisions. At the same time, new policies and institution must be created to enable producers using sustainable practices to market their goods to a wider public.

We are yet a long way from knowing just what methods and systems in diverse locations will really lead to sustainability. In many regions of the country, however, and for many crops, the particular mix of methods that will allow curtailing use of harmful farm chemicals or building crop diversity, while also providing economic success, are not yet clear. The stage is set for challenging not only farm practitioners, but also researchers, educators, and farm industry.

New policies are needed to simultaneously promote environmental health, economic profitability, and social and economic equity. For example, commodity and price support programs could be restructured to allow farmers to realize the full benefits of the productivity gains made possible through alternative practices. Government and land grant university research policies could be modified to emphasize the development of sustainable alternatives. Marketing orders and cosmetic standards could be amended to encourage reduced pesticide use. Coalitions must be created to address these policy concerns at the local, regional, and national level. In addition to strategies for preserving natural resources and changing production practices, sustainable agriculture requires a commitment to changing public policies, economic institutions, and social values. Strategies for change must take into account the complex, reciprocal and ever-changing relationship between agricultural production and the broader society.

Critical discussion of the sustainable agriculture concept will and should continue. Understanding will deepen; answers will continue to come. On-going dialog is important for another reason: with more parties, each with its own agenda, jumping into the sustainable agriculture "tent," only a continued focus on the real issues and goals will keep sustainable agriculture from becoming so all-encompassing as to become meaningless.

Finally, it is important to point out that reaching toward the goal of sustainable agriculture is the responsibility of all participants in the system, including farmers, laborers, policymakers, researchers, retailers, and consumers. Each group has its own part to play, its own unique contribution to make to strengthen the sustainable agriculture community.

Dr. Mithat DIREK

Contents

EFFECT OF CURCUMA (CURCUMA ROXB XANTHORRHIZA) MEAL AS FEED ADDITIVE IN BROILER RATIONS ON PERFORMANCE AND AN ANTIBODY TITRES AGAINST ND

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ABSTRACT

With the increasing public awareness of Indonesian in healthy nutrition, it is resulted in demand for animal products that are healthy and free of antibiotic residues also increased. One natural feed additive used as a substitute for antibiotic synthesis is Curcuma Roxb xanthorriza, which is often used by humans to increase of appetite and cure various diseases. Balitro (2008) states that ginger meal contains: 94.14% dry material, 53% starch, 9.04% fat, 9.88% protein, 2.26% fiber, essential oil 5.97%, 2% curcumin and 1.58 % xanthorizol. This content can work to improve kidney and anti-inflammatory. Another benefit of this plant rhizomes increase of appetite, anti-cholesterol, anti-inflammatory, anemia, anti-oxidants, cancer prevention, and anti-microba. The aim of this research is to determine the influence of the ginger in broiler diets to the performance, the percentage of the carcass, and abdominal fat. A Completely Randomized Design was used to analyze the data. Two hundred DOC were divided into 4 treatment groups with 5 replications and 10 DOC in each replication. Four treatment diets were control diet with 0% of curcuma meal (R0); 1% of curcuma meal (R1), 2% of curcuma meal (R2), and 3% of curcuma meal (R3). The parameters observed were feed consumption, gain of body weight, feed conversion, percentage of carcass, abdominal fat and ability as a antibody titre against ND. The results of research showed that feed consumption, gain of body weight, carcass percentage, and abdominal fat of broilers were significantly different ($p < 0.05$) for all treatment diets. Feed conversion and an antibody titres against ND did not show significantly different for all treatments. This research shows that 1% of meal curcuma in diet gave the best results of the chicken's broiler compared with other dietary treatment, Because the gain of body weight and percentage of the carcass are a higher and feed conversion is low but has not been able to reduce fat abdomen. In fact, the level of 2% and 3% of curcuma meal in diet can reduce fat in the abdomen.

Keywords : broiler, carcass, Curcuma xanthorriza Roxb, fat abdomen

INTRODUCTION

Recently, public awareness of healthy nutrition has increased in Indonesia. This has led to increased demand for healthy animal products healthy and free of antibiotic residues. Along with the weakening of the Indonesian currency against foreign currencies, the price of feed ingredients, that mainly imported, are also increased. This situation makes the price of animal feed also increased, so it makes the farmer to think and look for new alternatives in the natural feed additive by utilizing local resources that exist in farm area. This is in line with the ban on the use of antibiotics began in 1987, due to the emergence of antibiotic resistance cases (Salyers, 1999; Spring, 1999).

Therefore, various ways had been conducted to find a new alternative antibiotics that can maintained health status, appearance and production of livestock without any additional burden to consumer and environment. Essential oils, organic acids, and phytogenic compounds such as isoflavones are among the known important antibiotic alternatives which demonstrated to enhance production of gastric secretions and reduce pathogenic bacteria (Wenk, 2000).

One alternative that can be used is curcuma (Curcuma roxb xanthorrhiza) which has been frequently used by humans to improve appetite and cure various diseases. This rhizome contains 48 to 59.64% starch, 1.6 to 2.2% from 1.48 to 1.63% curcumin and essential oils and is believed to improve kidney function and anti-inflammatory (Sidik, et al., 1995) . Another benefit of the rhizome of this plant is to increases appetite, anti-cholesterol, anti-inflammatory, anemia, anti-oxidants, cancer prevention, and anti-microbial. This study aims to determine the effect of curcuma (Curcuma Roxb xanthorriza) as a natural feed additive in broiler rations on performance, carcass percentage and abdominal fat content.

MATERIALS AND METHODS

Location and Time

The study was conducted in the village of Balai Penelitian Ternak, Ciawi, Bogor.

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Experimental design

The experimental design used in this research was completely randomized design (CRD) with four treatments and five replications. There was 10 (ten) broiler for each repetition. So there was 200 broilers used in this study. The ingredients that are used in the ration were corn, soybean meal, coconut meal, rice bran, fish meal, coconut oil, CaCO3, premix, methionin, lysine and starbio. The ration was based on the National Research Council/NRC (1994), and was formulated so that the ration of each treatment could meet the needs of broiler chickens. Ration prepared with 24% protein content and energy 3200kal / kg isoprotein and isocalori. Rations and water were given ad libitium.

The treatment in this study were four types of rations. Four types of treatments were: R0 (control diet, without any addition of curcuma), R1 (1% of curcuma meal), R2 (2% of curcuma meal) and R3 (3% of curcuma meal). Variables measured in this study were body weight (g/chick), feed intake (g/chick), feed conversion, carcass percentage, abdominal fat content and antibody titres against ND.

Body weights were weighed once a week at the end of the week. The ration consumption was calculated from the amount of ration consumed subtract by the amount of ration left each day in a week. Feed conversion was measured of an animal's efficiency in converting feed mass into body weight. Abdominal fat contents were taken at the end of the study by taking all the fat around chicken abdomen. Carcass percentage is calculated carcass weight (without heads, feet, and feathers) divided by the live weight and the multiplied by 100%.

Agglutination inhibition test (HI-test) was used to measure the high titre antibodies contained in the serum to describe the level of chicken immunity after being vaccinated with ND vaccine.

Data were analyzed statistically using analysis of variance (ANOVA) and if it shows a marked influence continued with Duncan test (Steel and Torrie, 1993).

Curcuma Meal Making

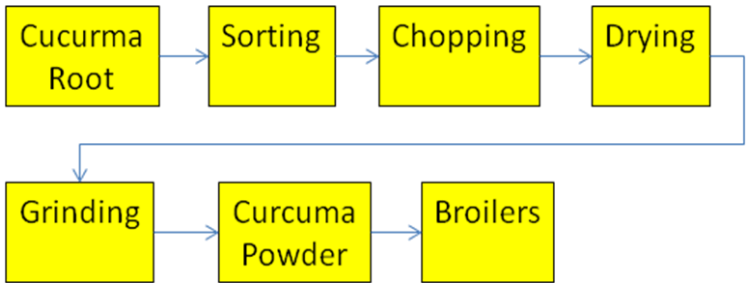

Figure 1. Process of Curcuma Meal

RESULTS AND DISCUSSION

Broiler Performances

The effect of curcuma meal in ration on feed consumption, weight gain and feed conversion of broilers can be seen in Table 1.

Table 1. Feed consumption, weight gain and feed conversion.

Treaments	Feed Consumption	Weight Gain	Feed Conversion
R0	1460.54 ^{a} ± 61.01	833.40 ^{a} ± 36.46	1.75^{ab} ± 0.08
R1	1452.74 ^{a} ± 66.11	850.02 ^{a} ± 61.52	1.71^{a} ± 0.07
R2	1385.93 ^{a} ± 73.20	763.69 ^{b} ± 44.82	1.82^{b} ± 0.03
R3	1252.42^{b} ± 90.01	701.44 ^{c} ± 16.15	1.78^{ab} ± 0.09

Note:

- Superscripts within column indicate significant differences (P <0.05)
- Description: R0 = control diet; R1 = 1% of curcuma meal; R2 = 1%of curcuma meal; R3 = 1% of curcuma meal

The average feed consumption of broiler during research for all treatments were ranged between 1460.54 -1252.42 g /chick. Results of analysis of variance showed that the feed intake (P <0.05) was significantly influenced by the provision of curcuma in the ration. From Table 1, it can be seen that the provision of 1% curcuma in the ration can increase feed intake. However, with the increasing of curcuma in the ration, feed consumption became decreases. This was in accordance with research by Sinurat, A.P (2009) which moderate doses of curcuma in ration produced a higher weight gain compared to control ration. The decreasing of feed intake was caused by a bitter taste and pungent smell of curcuma so it decreased the palatability of ration.

As presented in Table 1, the highest weight gain was found in broilers with ration R1 (1% of curcuma meal), while the lowest weight gain was in broiler with ration R3 (3% of curcuma meal). Statistical analysis showed that curcuma treatments had significantly (P <0.05) impact in weight gain of broilers. This was due to a decrease in palatability by increasing the level of curcuma in ration. It is known that the factors that influence body weight is consumption of nutrients, digestibility of nutrients, and the quality of the ration.

Feed conversion is a measure of efficiency in the use of the ration. The lower the value is the more efficient use of feed conversion ration, because lesser feed required to produce weight gain in a given period of time. The average feed conversion of broiler chickens during research on all treatments was ranged from 1.71 to 1.82. Results of analysis of variance showed that there were significant differences (P <0.05) among treatments. Broilers that were subjected to R1 (1% of curcuma meal) had a better feed conversion (1.71) compared other treatments (1.75 to 1.82). So it can be concluded that the R1 had the most efficient use of ration compared to control ration and other treatments.

Carcass Percentage

The effect of curcuma meal to the carcass percentage can be seen in Table 2.

Table 2. Effect of curcuma meal on carcass percentage

Treatments	Carcass Percentage
R0	$60.51^{ab} \pm 0.88$
R1	$62.66^{b} \pm 2.01$
R2	$62.33^{b} \pm 1.73$
R3	$58.40^{a} \pm 3.30$

Note:

- Superscripts within column indicate significant differences (P <0.05)
- Description: R0 = control diet; R1 = 1% of curcuma meal; R2 = 1% of curcuma meal; R3 = 1% of curcuma meal

The mean of broiler carcass percentage on all treatments was ranged 58.40 - 62.66%. Results of analysis of variance showed that the carcass percentage was significantly (P <0.05) influenced by the provision curcuma in the ration. From Table 1 and 2, it showed that the provision of 1% of curcuma meal in the ration increased feed consumption and resulted in a higher weight gain and a higher carcass percentage. However, along with feed consumption, the increasing of curcuma level in the ration has decreased the of carcass percentage. This might be caused by the decrease in feed consumption was resulting in lower weight gain, and resulting in lowering carcass percentage. This was consistent with research Amaefule et al. (2006) which showed that the pattern of differences in the percentage of carcasses in accordance with the differences in body weight and weight gain, so the higher the weight, the greater the percentage of carcasses.

Carcass percentage obtained in this study remained within normal limits for broiler since in this study broilers were reared only until the age of 5 weeks and rations were prepared with no antibiotics. Leeson and Summers (2001) states that broiler carcass percentage at the age of six weeks was ranged between 64.7-71.2%. So if the study reared the broilers until the age of six weeks, it was possible the carcass percentage produced in the normal range.

Abdominal Fat Content

The effects of curcuma meal to the abdominal fat content can be seen in Table 3.

Table 3. Effect of curcuma meal on abdominal fat

Treatments	Abdominal Fat
R0	10.90 [ab] ± 3.14
R1	13.40[b] ± 3.20
R2	8.70 [a] ± 3.13
R3	8.70[a] ± 3.86

Note:

- Superscripts within column indicate significant differences (P <0.05)
- Description: R0 = control diet; R1 = 1% of curcuma meal; R2 = 1% of curcuma meal; R3 = 1% of curcuma meal

Abdominal fat content of broilers during research on all treatments were ranged from 8.70 g - 13.40 g. Results of analysis of variance showed that abdominal fat content was significantly (P <0.05) influenced by the provision curcuma in the ration. From Table 3, it can be seen that the provision curcuma in the diet had not been able to decrease abdominal fat content when compared to the control diet. This was similar to the results by Puastuti, W (1997) which states that supplementation of curcuma up to 1% had no effect on serum cholesterol and eggs cholesterol. This was a possibility of curcuminoid levels contained in curcuma is still too small to stimulate bile to produce anti-oxidant.

Antibody titres against ND

Effect on antibody against New Castle Disease (ND) (geometric mean of titre / GMT) for all treatments can be seen in Table 4.

Table 4. ND Antibody Titre

Treatments	ND Antibody Titre (Log2)
R0	3.85
R1	3.60
R2	5.55
R3	4.90

Note:

- Description: R0 = control diet; R1 = 1% of curcuma meal; R2 = 1% of curcuma meal; R3 = 1% of curcuma meal

The above results indicated that curcuma meal as a feed additive in feed did not give a significant impact, however, ration containing 2% and 3% of curcuma meal had a high antibody titre values compared to control ration. Based on these results, a dose of turmeric had not been able to stimulate antibodies to rise significantly. According to Butcher and Miles (1995), antibodies will reach its peak in week 2 to 3 post-vaccination.

So the level of curcuma meal has not been able to activate the lymphoid follicle in Bursa Fabricus, which function to produce lymphocytes that will be differentiate into B cells which produce antibodies. Therefore, an increase in the number of active lymphoid follicles will be able to increase the production of antibodies (Tizard, 1988; Baratawidjaja, 1996)

CONCLUSION

Provision 1% of curcuma meal in the ration had the best result to performance of broiler. It gave high weight gain, high carcass percentage and low feed conversion.

However, curcuma meal provision had not been able to decreased abdominal fat content of broilers. Higher decreased in abdominal fat content occured in 2 and 3% level of curcuma meal in broiler rations but it had bad impact in the performance of broiler.

Further research needs to be done with the highest dose of curcuma meal is 1% to see it impact in immunity of broilers.

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