BIBLIOGRAPHY

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ABSTRACT

The study was conducted to determine the effect of supplementing broiler ration with 100g ground mungbean during the starting to finishing period (15 to 35 days old) and during finishing period (28 to 35 days old) on the growth performance of broilers using day old cobb broiler for a period of 21 days of supplementing mungbean.

Results revealed that supplementing broiler ration with 100g mungbean during the starting to finishing period and during finishing period had no effect on final weight, gain in weight, feed intake, feed cost per kilogram broiler produced, feed efficiency and production efficiency factor of birds among treatments.

Birds in this study had an average daily gain of 0.066 kg and a feed conversion ratio of 1.84 for a period of 21 days from 15 up to 35 days of age. The mean feed cost to produce a kilogram gain in weight using starter and finisher ration was Php 57.83. The production efficiency factor (PEF) of birds under control was 245.64 and the PEF of birds given 100g mungbean/kg of commercial ration during starting and finishing period and during finishing period were 277.98 and 265.55, respectively.

For the cost of production, birds fed with mungbean at finishing period had higher return on investment (ROI) which was 14.62% than birds fed with pure commercial ration (13.98%) and birds fed with mungbean at starting and finishing period had the lowest ROI (11.94%) during the experimental period.

INTRODUCTION

Mungbean (*Vigna radiate* L. Wilzeck), commonly called mungo is widely grown in the Philippines. It is rich in vitamins, minerals and contains about 24% protein. Although it is costly than feeds, researchers used it as feed substitute or feed supplement. Also, there are places in the Philippines where mungbean is a poor man's meal especially in low lands where mungbean is abundant.

In most of the researches conducted, mungbean was used as a feed substitute. Mungbean has been prepared in various ways, either boiled, toasted, roasted, heat treated, germinated or ground but the most often used was simply ground. Some reported that broilers fed with 10% ground mungbean as feed substitute and feed supplement to commercial feed resulted in higher gain in weight (Lipang, 1993, Sittigipong, 1994 and Bumohya, 1979) while other concluded that birds gain less or that their growth was not affected (Mocati, 2006 and El-moniary *et.al*., 2001).

This study was conducted to find out whether ground dried mungbean used as feed supplement to broiler rations resulted in more gain or loss of weight in broilers compared with birds given commercial broiler ration only.

Specifically, the study aimed to determine the performance of broilers in terms of gain in weight, feed efficiency and feed intake fed with commercial ration supplemented with 100g ground mungbean, to determine when is the best age of birds to add the mungbean and to determine the effect in cost of production.

The study was conducted at Lucnab, Baguio City from November 2011 to December 2011 for a period of 35 days.

REVIEW OF LITERATURE

Bumohya (1979), compared the effects of germinated mungo meal, roasted mungo meal, raw mungo meal as feed supplement in broiler ration at 10% each and found out that there were highly significant differences between raw mungo meal and roasted mungo seed with the control in terms of gain in weight, feed conversion efficiency, feed consumption and final weight. Control incurred the highest cost of feeds followed by germinated mungo meal, roasted mungo meal and raw mungo meal respectively. Birds fed with raw mungo meal and roasted mungo meal were superior with the highest average final weight, gain in weight, feed consumption and feed conversion efficiency as compared with those given germinated mungo meal and control. Therefore, he recommended that the best method of preparing mungo meal for broilers supplement ration is to give it raw or roasted.

Lipang (1993) conducted a research to determine the effect of ground yellow corn, ground mungo and ground camote on the performance of broilers and found out that the diet of the birds that contains 10% mungbean, camote or corn + 90% commercial feed do slightly improve the performance of broilers and lessened the expense on feed cost of the birds. This study showed that ground corn, ground mungo and ground camote can be used as partial substitute that would give better results than the pure commercial feed.

Mungbean meal can be used as feed supplement in the broiler rations at levels 5 to 10%. The use of high levels of mungbean meal decreases the growth performance of the broilers as well as the feed conversion efficiency of the birds. Likewise, the different

levels of mungbean meal in the diets significantly affect the dressing percentage of the birds (Shamaileh, 1986).

Mungbean meal replacement for rice bran in broiler diets were not only significantly increased on average daily gain of chicken and average daily feed intake but also highly significant increased on feed conversion ratio as well as decreased feed cost per kilogram weight gain from the control diet. Among the carcass qualities of broilers fed experimental diets, there were no significantly different (Sittigipong, 1994).

Based on the study of El-moniary *et. al.* (2001), broiler chicks fed with different levels of mungbean at expense of soybean meal protein has the same weight gain and feed conversion ratio to those chicks fed with control diet at the end of 28 days. On the seventh week old of the broilers, the values of weight gain, feed conversion, protein and energy utilization, performance index of carcass characteristics of birds fed with mungbean diets had also no significant differences with those fed with control diet.

In the research of Mocati (2006), in evaluating the growth performance of broilers fed with ground mungbean showed significant differences among treatments in terms of final weight, gain in weight, feed consumption, feed conversion and cost of feed with 10 to 30% mungbean as partial substitute. She concluded that the ground mungbean is not recommended as substitute to commercial feeds.

Table 1. Composition of mungbean, 100 g edible portion

NUTRIENTS	COMPOSITION (100g)
Moisture	6.10
Food energy (cal)	356.00
Protein (g)	24.40
Fat (g)	1.00
Total CHO (g)	64.60
Fiber (g)	4.30
Ash (g)	3.90
Ca (g)	125.00
P (g)	340.00
Fe (mg)	5.70
Na (mg)	6.00
K (g)	1141.00
Vit. A value (IU)	130.00
Thiamine (mg)	0.66
Riboflavin (mg)	0.22
Niacin (mg)	2.40
Ascorbic (mg)	10.00

PCARRD, 1991

MATERIALS AND METHODS

The study was conducted using 120 cobb broiler day old chicks, commercial feeds, disinfectant, brooding and rearing pens, weighing scale, feeding and drinking troughs, electric bulbs, newspapers, empty sacks, cleaning materials and ground mungbean.

The cages were thoroughly cleaned and disinfected a week before the arrival of the chicks including all the necessary materials needed. The brooders were provided with a 100-watts electric bulb. The floor of the brooders was covered with newspaper sheets to help conserve heat during the brooding period. It also served as feed receptacles during the brooding period. The sheets of newspaper were changed daily for a period of two weeks. Floor mats were no longer used starting at 15 days old of birds. The feces were taken out daily.

Upon arrival of the birds, they were given clean drinking water. After 14 days of brooding or at 15 days of age, the birds were distributed at random into three treatments. Each treatment was replicated four times with ten birds per replicate making a total of forty birds per treatment following the completely randomized design (CRD). The birds were fed ad libitum from day old to 21 days of age. Starting 22 days of age, birds were given 200g of feed per replicate five times a day at 6 am, 10am, 2pm, 6pm and 11pm until 27 days of age. Then from 28 to 35 days of age, birds were given 300g of feed four times a day at 6am, 10am, 2pm and 6pm. Water was made available all the time. At 15 days of age, the birds were weighed individually to obtain their initial weight then distributed at random to the different treatments and replicates. In treatment one, 100g of mungbean was added to 1000g commercial feed given to the birds from 15 up to 35

days of age and in T_2, 100g of mungbean was added to 1000g commercial feed from 29 days of age to 35 days of age. The treatments were as follows:

T_0 = pure commercial feed (CF) throughout the experiment

T_1 = 100g/kg of commercial ration (CR) during starting to finishing period (15 to 35 days old)

T_2 = 100g/kg of CR during finishing period (28 to 35 days old)

The ground mungbean seeds were bought from the market and mixed to the Commercial ration.

Data Gathered

1. Initial weight (kg). This was taken by weighing the birds individually at 15 days of age.

2. Final weight (kg). This was taken by weighing the birds individually at 35 days of age.

3. Feed offered (kg). This referred to the amount of feed given to the birds each day from 15 until 35 days of age.

4. Feed left-over (kg). This referred to the amount of feeds not eaten by the birds from 15 up to 35 days of age.

5. Cost of Production (Php). This included the cost of feeds, medication and other expenses that were used in the study.

6. Number of sick birds.

7. Number of dead birds.

8. Number of birds at the end of the study.

From the data gathered above, the following were computed:

1. Feed consumption (kg). Total feed consumption was obtained by adding the amount of feeds consumed by the birds in each treatment from 15 up to 35 days old of the birds. Daily feed consumption was determined by dividing the total feed consumed to the number of experimental days (21 days).

2. Gain in weight (kg). Total gain in weight was obtained by subtracting the final weight of birds taken at 35 days of age from the initial weight taken at 15 days of age. Daily gain was obtained by dividing the total gain in weight to the number of experimental days (21 days).

3. Feed conversion ratio. This was computed by dividing the total feed intake by the total gain in weight of the birds during the experimental period.

4. Feed cost per kilogram of broiler produced. This was obtained by using the formula:

FC = FCR x Average price per kilogram of feeds

5. Mortality rate (%). This was computed by dividing the number of dead birds by the initial number of birds per replicate multiplied by 100.

6. Morbidity rate (%). This was computed per replicate by dividing the number of sick birds by the initial number of birds per replicate, multiplied by 100.

7. Harvest rate (%).This was computed using the formula:

$$\text{Harvest Rate} = \frac{\text{Number of Birds Alive at the End of the Study}}{\text{Initial Number of Birds}}$$

8. Net profit. This was obtained by subtracting the total cost from total sales.

9. Production Efficiency Factor (PEF). This was computed using the formula:

$$PEF = \frac{\text{Harvest recovery (\%) x Average live weight (kg)}}{\text{Harvestable age (days) x Feed conversion ratio}} \times 100$$

10. Return on investment (ROI). This was obtained by using the following formula:

$$ROI = \frac{\text{Net Profit}}{\text{Total Cost of Production}} \times 100$$

RESULTS AND DISCUSSION

Initial and Final Weights

The initial and final weights of birds taken at 15 days old and 35 days old respectively are shown in Table 2. Statistical analysis showed no significant differences in the initial weight of birds given pure commercial ration and those given commercial ration supplemented with 100g mungbean/kg during the starting to finishing period, and during the finishing period. This indicates that experimental units were homogenous at the start of the study. The average weight of birds at 15 days of age was 500g.

No significant differences were also observed in the final weight of birds at 35 days of age between treatments. The average final weight of birds was 1.88kg. This implies that supplementing broiler ration with 100g mungbean per kg commercial ration during the starting to finishing period and during the finishing period did not improve nor adversely affect the final weight of birds. Result of this study reached the marketable weight at marketable age which was 1.88 kg on average at 35 days old as what PCARRD (2006) suggested which is 1.6 kg to 2.0 kg at 36 to 42 days old for market assurance.

Table 2. Initial weight at 15 days old and final weight at 35 days old of birds (kg)

TREATMENT	INITIAL WEIGHT	FINAL WEIGHT
Control	0.49[a]	1.87[a]
100g mungbean per kg of starter and finisher ration	0.50[a]	1.88[a]
100g mungbean per kg of finisher ration	0.50[a]	1.90[a]

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

Finding of this study is similar to the observation of Lipang (1993) who reported that the final weight of birds did not increase when 10% mungbean was used as feed substitute compared with the birds given pure commercial ration.

Result of this study did not agree with the result of the study of Bumohya (1979) and Mocati (2006). Bumohya (1979) reported that birds fed with commercial broiler ration supplemented with 100 g mungbean/kg had higher final weight than birds fed with pure commercial ration, while Mocati (2006) reported that birds fed with pure commercial ration had higher final weight than birds fed broiler rations with mungbean. Differences in the results may be attributed to the different duration of the studies. Mocati (2006) substituted 10% of commercial feed with mungbean starting from 22 to 45 days old of birds while Bumohya (1979) supplemented the mungbean from day old until market age, while in this study mungbean was added to the broiler rations to the birds starting at 15 up to 35 days old and 28 up to 35 days old of birds.

Gain in Weight

The average and total gain in weight of the birds were shown in Table 3. Statistical analysis revealed no significant differences among treatments.

Table 3. Total gain in weight from 15 up to 35 days old and average daily gain (kg)

TREATMENT	TOTAL GAIN	AVERAGE DAILY GAIN
Control	1.38[a]	0.066[a]
100g mungbean per kg of starter and finisher ration	1.38[a]	0.066[a]
100g mungbean per kg of finisher ration	1.39[a]	0.066[a]

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

Birds fed with pure commercial ration and those given commercial ration supplemented with 100g mungbean/kg during the starting to finishing period, and during the finishing period gained an average of 1.38 kg for 21 days with an average daily gain of 66 g. This result is similar with the study of Bumohya (1979) and Lipang (1993) where mungbean did not affect nor improved the gain in weight of birds. However, this contradicts the study of Mocati (2006) who started substituting 10% commercial feed with mungbean from 22 to 45 days old of birds and reported that birds fed with mungbean gained more body weight than birds under control. Differences in results may be due to how the mungbean given to the birds, Bumohya (1979) and Lipang (1993) supplemented 100g mungbean/kg commercial ration while Mocati (2006) substituted 10% of commercial feed with mungbean.

Feed Intake

In Table 4, the average daily feed intake and total feed intake are shown. Statistically, there were no significant differences among the treatments. The total and daily feed intake of birds given pure commercial ration was 2.62 kg and 0.125 kg, respectively.

Table 4. Total feed intake from 15 up to 35 days old and average daily feed intake

TREATMENT	TOTAL FEED INTAKE (kg)	AVERAGE DAILY FEED INTAKE (kg)
Control	2.62[a]	0.125[a]
100g mungbean per kg of starter and finisher ration	2.47[a]	0.118[a]
100g mungbean per kg of finisher ration	2.57[a]	0.122[a]

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

Birds given commercial ration supplemented with 100g mungbean/kg during the starting to finishing period had a respective total and average feed intake of 2.47 kg and 0.118 kg while 2.57 kg and 0.122 kg on finishing period. It was observed that birds were less active when mungbean was added during starting period. This may be due to the larger size of ground mungbean than the crumbled starter ration and crumble commercial ration is more palatable for birds at starting period. Result of this study collaborates with the study of Lipang (1993) who reported that feed intake of birds given pure commercial ration and birds given 1kg commercial ration supplemented with 100g mungbean did not vary. The same results may be because Lipang (1993) fed the birds three times a day and for this study, the birds fed 4 to 5 times a day and not ad libitum at starting and finishing period. On the other hand, Bumohya (1979) reported that birds fed with mungbean as feed supplement from one day of age consumed more feed and result of this study contradicts it, this may be due to the reason that birds fed with mungbean from one day of age learned to eat the ground mungbean regardless of the size. Different findings among the studies were due to the different age of the birds when mungbean was added. Mocati (2006) substituted 10% of commercial feed with mungbean at 22 to 45 days old while Bumohya (1979) supplemented the mungbean at one day of age until market age.

Feed Conversion Ratio

The analysis of variance showed that the differences in feed conversion ratio (FCR) among treatments as shown in Table 5 were not significant. The FCR of birds given pure commercial ration was 1.90, 1.78 for birds given commercial ration supplemented with 100g mungbean/kg during the starting to finishing period while birds given 100g mungbean/kg during the finishing period was 1.84.

Table 5. Feed conversion ratio (FCR) from 15 up to 35 days old of birds

TREATMENT	FCR
Control	1.90[a]
100g mungbean per kg of starter and finisher ration	1.78[a]
100g mungbean per kg of finisher ration	1.84[a]

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

In comparing with the study of Bumohya (1979), by using it as feed supplement, birds fed with 100g mungbean/kg finisher ration ate lesser (2.77kg) to produce a kilogram gain in weight than birds fed with pure commercial ration of 3.14 FCR. Ten percent mungbean as feed substitute from 22 up to 45 days of age however, increased the feed consumption of birds to produce a kilogram gain in weight (Mocati, 2006). Lipang (1993) reported that 100g mungbean/kg finisher ration had no effect nor did not improve the FCR of birds. Differences in the results may be attributed to the different age of birds when mungbean was added to broiler ration among studies. Mocati (2006) added mungbean from 22 to 45 days old and Bumohya (1979) supplemented mungbean kg from day old up to market age, while in this study mungbean was added to the broiler rations starting 15 up to 35 days of age and 28 up to 35 days old of birds.

Percentage of Mortality
and Morbidity

The mortality and morbidity rate are shown in Table 6. Statistical analysis showed no significant differences among treatments. The overall mortality rate was 13.33%.

Table 6. Percentage of mortality and morbidity from 15 up to 35 days old of birds (%)

TREATMENT	MORTALITY	MORBIDITY
Control	15.00	2.5
100g mungbean per kg of starter and finisher ration	12.50	2.5
100g mungbean per kg of finisher ration	12.50	2.5

The mortality started at 3 weeks of age. It was observed that 1 to 2 birds per cage almost refused to eat up to three days before their death in different days for different birds. The birds affected were neither the smallest nor the largest birds but it affects any bird in the cage. Mortality was started when the cages were covered with plastic in order to prevent the birds from getting wet due to unexpected rainfall. It was also observed that birds within the cages that near fully covered were affected most. When the plastic covers were removed, the mortality was lessened until no more mortality was observed. The cause of mortality then was due to ventilation problem because of the observed above. When the birds were opened after their death, large quantities of brown-yellow liquid emerged. According to Sainsbury (2000), accumulation of fluid, or ascites, occur because the circulation of the blood system may in some way be impaired. This is believed to be primarily due to the very fast growth of broilers, together with insufficient ventilation and too high stocking rate. The mortality may not be attributed to the treatment imposed which was a commercial ration supplemented with 100g mungbean/kg during the starting to finishing period and during the finishing period due to almost the same rate among treatments.

As for morbidity, one bird per treatment during the finishing period became lame and the average morbidity rate was 2.5%. The sick birds could not stand to eat on feeders so, hand fed was applied to them and the birds continue to grow. The bird belongs to treatment one was recovered from lameness at the end of the study and the two were not. The morbidity may not be attributed to the treatment imposed due to the same rate among treatments. According to Stevenson (2000), the muscle grows quickly but the bones of the legs fail to keep pace with the rapid body growth and so cannot support the overdeveloped body of broilers that results in leg disorders.

Feed Cost per Kilogram
of Broiler Produced

Table 7 shows the feed cost to produce a kilogram of meat. The cost was a combination of commercial feed and mungbean. Birds given commercial ration supplemented with 100g mungbean at finishing period had the highest feed cost of Php 65.23 to produce a kg broiler compared to birds fed with pure commercial ration because of the high price of mungbean. The feed cost to produce a kilogram of broiler of birds under control was Php 57.95 and Php 63.92 for birds fed with mungbean from 15 up to 35 days of age.

Table 7. Feed cost per kilogram of broiler produced from 15 up to 35 days old (Php)

TREATMENT	FFED COST PER KILOGRAM OF BROILER PRODUCED
Control	57.95
100g mungbean per kg of starter and finisher ration	63.92
100g mungbean per kg of finisher ration	65.23

Return on Investment

The return on investment (ROI) among treatments is shown in Table 8. Total sale was obtained by multiplying the total live weight of birds in each treatment to the price of birds per kg. Birds fed with mungbean at finishing period had higher ROI and net profit of 14.62% and Php 1, 014.26, respectively because the sale was higher despite the higher cost of production compared to control. On the other hand, birds fed with mungbean from starting period until marketable age had the lowest ROI (11.94%) because of the additional labor cost in mixing the mungbean at a longer period. Birds fed with pure commercial ration had 13.98% ROI.

Production Efficiency Factor and Harvest Rate

Table 9 shows the production efficiency factor (PEF) and harvest rate (HR) of the birds in different treatments. Statistical analysis revealed no significant differences among treatments. This implies that ground mungbean as feed supplement did not improve the performance of broilers. PEF is a standard measurement for determining broiler performance. The higher the value of PEF, the better is the performance. The average harvest rate of birds was 86.67%.

Table 8. Return on investment from 1 up to 35 days old of birds

TREATMENT	TOTAL SALE (Php)	TOTAL COST OF PRODUCTION (Php)	NET INCOME (Php)	ROI (%)
T_0	7,622.40	6,687.17	935.23	13.98
T_1	7,897.20	7,054.98	842.22	11.94
T_2	7,951.20	6,936.94	1,014.26	14.62

The PEF of birds under control was 245.64, 277.98 for birds given commercial ration supplemented with 100g mungbean from starting to finishing period while birds given commercial ration supplemented with 100g mungbean at finishing period was 265.55 PEF.

Table 9. Production efficiency factor (PEF) and harvest rate (HR) of birds

TREATMENT	PEF	HR (%)
Control	245.64[a]	85.00
100g mungbean per kg of starter and finisher ration	277.98[a]	87.50
100g mungbean per kg of finisher ration	265.55[a]	87.50

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to find out the effect of supplementing broiler ration with 100g ground mungbean during the starting to finishing period (15 to 35 days old) and during finishing period (28 to 35 days old) on the growth performance of broilers.

The results revealed that supplementing broiler ration with 100g mungbean during the starting to finishing period and during finishing period had no effect on final weight, gain in weight, feed intake, feed cost per kilogram broiler produced, feed efficiency and production efficiency factor of birds among treatments.

As for the mean, birds had a mean initial weight of 0.500 kg at 15 days old. At 35 days old, a mean final weight of 1.88 kg was obtained. The average daily gain of birds was 0.066 kg. For feed intake, 0.122 kg of feed was consumed by the bird daily for 21 days. Moreover, the mean feed conversion ratio of the birds was 1.84 and the mean feed cost to produce a kilogram gain in weight using starter and finisher ration was Php.57.83. The overall mortality was 13.33% and the morbidity rate was 2.5%.

For the cost of production, birds fed with mungbean at finishing period had higher return on investment (ROI) which was 14.62% than birds fed with pure commercial ration (13.98%) and birds fed with mungbean at starting and finishing period had the lowest ROI (11.94%).

Conclusion

Based on the result of the study, ground mungbean as feed supplement on starter and finisher ration did not affect the final weight, gain in weight, feed intake and efficiency of the birds. For the return on investment (ROI), birds fed with mungbean at finishing period had higher ROI and if the cost of mungbean will be lowered, the ROI will increase.

Recommendation

From the results, mungbean may be used in supplementing finisher ration at the rate of 100g per kg of commercial ration when the cost of mungbean is cheaper than the commercial feed. For further study, it is also recommended to determine the digestibility of birds fed with munbean and mungbean used as an ingredient for formulating broiler ration.

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