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Effect of Insulin Plant (Costus igneus) Leaf Powder in Broiler Chickens (Gallus galluus domesticus)

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A B S T R A C T

This experiment was conducted to evaluate the effects of insulin plant leaf powder in broiler chickens. One hundred (100) chicks of the same age and random sexes were purchased from the local agrivet supplier and were used in the study. There were five (5) treatments replicated four (4) times following the Completely Randomized Design (CRD) of the experiment. The treatments were as follows: Treatment A - basal diet with 5 grams of insulin plant leaf powder per kilogram of feeds, Treatment B- basal diet with 10 grams of insulin plants leaf power per kilogram of feeds, Treatment C- basal diet with 15 grams of insulin plant leaf powder per kilogram of feeds, Treatment D- positive control (antibiotics) and Treatment E- without insulin plant leaf powder (control). The result of study on basal diet of broilers with insulin plant leaf powder significantly affects the body weight, body weight gain, and feed consumption of broilers at 21 and 35 days of feeding. The broiler given insulin plant leaf powder on their basal diet lowers their feed consumption as the amount of insulin plant leaf powder increases. The dressing percentage of broilers given insulin plant leaf powder on their basal diet is slightly higher compared to those given with a plain basal diet. The broiler given insulin plant leaf powder on their basal diet gives higher income compared to the controls. The analysis of results revealed that insulin plant leaf powder had a significant effect on the growth performance of broilers varies on the amount added per kilogram of basal diet. The period of feeding the broilers with insulin plant leaf powder on their basal diet affects their health since it was observed that after 21 days of feeding, treated birds show signs of stress/sickness.

RESUMO

Este experimento foi conduzido para avaliar os efeitos da insulina em pó de folhas de plantas em frangos de corte. Cem (100) pintos da mesma idade e sexos aleatórios foram adquiridos do fornecedor local de agrivet e foram utilizados no estudo. Houve cinco (5) tratamentos replicados quatro (4) vezes seguindo o Design Completamente Randomizado (CRD) do experimento. Os tratamentos foram os seguintes: Tratamento A - dieta basal com 5 gramas de pó de folha de planta de insulina por quilo de ração, Tratamento B- dieta basal com 10 gramas de pó de folha de planta de insulina por quilo de ração, Tratamento C- dieta basal com 15 gramas de pó de folha de planta de insulina por quilograma de alimentos, Tratamento D- controle positivo (antibióticos) e Tratamento E- sem pó de folha de planta de insulina (controle). O resultado do estudo da dieta basal de frangos de corte com pó de folha de planta de insulina afeta significativamente o peso corporal, ganho de peso corporal e consumo de ração de frangos de corte aos 21 e 35 dias de alimentação. O frango que recebe pó de folha de planta de insulina em sua dieta basal reduz seu consumo de ração à medida que a quantidade de pó de folha de planta de insulina aumenta. A porcentagem de cobertura de frangos de corte que receberam pó de folha de planta de insulina em sua dieta basal é ligeiramente maior em comparação com aqueles fornecidos com uma dieta basal simples. O frango que recebeu pó de folha de planta de insulina em sua dieta basal fornece maior rendimento em comparação com os controles. A análise dos resultados revelou que o pó de folha de planta de insulina teve um efeito significativo sobre o desempenho de crescimento de frangos de corte variando na quantidade adicionada por quilograma de dieta basal. O período de alimentação dos frangos de corte com pó de folha de planta de insulina em sua dieta basal afeta sua saúde, pois foi observado que após 21 dias de alimentação, as aves tratadas apresentam sinais de estresse/doença.

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Introduction

In poultry production the main cost of production is for feed which is due to a problem of feed-food competition, particularly for those non grain self-sufficient countries. Therefore, alternative feeds resources of low cost should be properly utilized and the poor feeds also improved by technologies for better utilization (Mammo 2012). One of the effective and promising approaches to increase feeds efficiency in poultry is by utilization of additives (Chen et al 1997 as cited in Mammo 2012). Additives are substances that are added to a nutritionally balanced diet which provoke response towards the exploitation of maximum genetic potential of the host in terms of growth and feed conversion efficiency. In this regard, antibiotics have ruled the poultry industry since several decades as a growth promoter. However, their over usage in livestock feeds threatens the human community with the emergence of drug resistant pathogens (Yadav et al., 2016). This has made it necessary to look for alternatives to antibiotics to maintain good production and health of poultry (Dhama et al., 2014).

Plant derived additives used in poultry nutrition to increase performance have been designated “phytogenic feed additives” (Windish et al, 2008). Natural growth promoters like as prebiotics, probiotics, synbiotics, enzymes, spice herbs, plant extracts etc., can be extensively used to feed broiler chickens without any hostile effect on the performance of birds (Borazjanizadeh et al, 2011). The crucial mode of action of this natural growth promoting feed additives can be accredited predominantly to the maintenance of feed hygiene and also from the beneficial effect on the gastrointestinal microbiota through regulatory pathogens (Roth and Kirchgessner, 1998), stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, stimulation of immune responses and antibacterial, antiviral and antioxidant activity (Hosseini-Vashan et al, 2012).

Costus igneus, commonly known as insulin plant in India, belongs to the family Costaceae. Costus igneus is a traditionally used medicinal herb which is native to Southeast Asia. This plant has been recently introduced into India and it is grown as an ornamental plant in south India. Insulin plant contains various phytochemical constituents like steroid, alkaloid, flavonoids, triperpene, glycoside and saponins. Its leaves are being used as a dietary supplement in the treatment of diabetes mellitus.

The catchphrase of the plant is: “a leaf a day keeps diabetes away”. Various pharmacological activities include antidiabetic effect, antiproliferative potential, antimicrobial activity, antiurolithiatic property antiflammatory potential, its effect on learning and memory, antioxidant activity, neuroprotective role, hypolipidemic activity etc. (Mathew Flowerlet and Varghase Bimi (2019).

Materials and Methods

Research Design and Experimental Unit

This research was conducted using Completely Randomized Design (CRD). One hundred heads of chicks (100) were used and distributed to the twenty (20) cages randomly, with five (5) birds per cage. Five treatments replicated in four times. The treatment used in the study were the following: Treatment A- basal diet with 5 grams of insulin plant leaf powder per kilogram of feed; Treatment B- basal diet with 10 grams of insulin plant leaf powder per kilogram of feed; Treatment C- basal diet with 15 grams of insulin plant leaf powder per kilogram of feed; Treatment D- positive control (antibiotic); Treatment E- without insulin plant leaf powder (control)

Materials and Procedure of the Study

A total of 100-day-old broiler chicks were purchased and used in this study. Poultry house was constructed using locally available materials. Feeders and waterers were provided for feeding and watering.

Some materials used were plywood and flat sheet for identification purposes. Bamboo, nail, bolo, hammer and plastic screen and other carpentry tools were used for constructing the poultry house and cages. Brooding equipment such as bulb, charcoal as heater and dropping paper. Ballpen, weighing scale and record book were provided for recording and gathering data.

Shed and Cage Preparation

The poultry house was constructed with twenty (20) cages before the arrival of the stock. Each cage measures 2x3 feet level in percentage. Take note that battery would be allowed to discharge up to 50% level of its charge.

Preparation and Application of Treatments

The day-old chicks were place in the brooding cage for the period of 7 days for brooding. After few days, the birds were vaccinated against common poultry diseases to ensure good health of the birds. The birds were supplied water with sugar on the first day to lessen the stress and a 50- watt bulb was used to supply enough heat for chicks. These ensure the readiness and capability of the birds to grow in a period of 7 days prior to transfer to the experimental cages.

Commercial ration was given and mix with different level of insulin plant leaf powder. Insulin plant leaf powder was mixed properly in the feed following the levels assigned per treatment. The treatment inclusions are as follows: Treatment A- basal diet with 5 grams of insulin plant leaf powder per kilogram of feed; Treatment B- basal diet with 10 grams of insulin plant leaf powder per kilogram of feed; Treatment C- basal diet with 15 grams of insulin plant leaf powder per kilogram of feed; Treatment D- positive control (antibiotic) and Treatment E- without insulin plant leaf powder (control).

Care and management

The poultry house was cleaned and disinfected before the arrival of the birds and regular cleaning of cages, feeder and waterer was done to prevent the possibility of diseases outbreak. The broilers were fed ad libitum and fresh water was provided at all the time.

Data Gathering

The following data were collected within the duration of the experiment:

Growth Performance of broiler

a. The initial weight of the one-hundred (100) experimental birds were taken on a lot basis at the 8th day of age using a digital grammer weighing scale.
b. Average body weight. The average body weight of the birds was taken after 21 and 35 days of age after brooding and start of the treatment and it was done by weighing the birds in every treatment using 10-kilogram capacity weighing scale.
c. The average body weight gain at 21 and 35 days of age were recorded. This was done by subtracting the present weight of the birds from the body weight of the birds at 21 and 35 days of age.

Feed Consumption and Conversion Efficiency

a. Average feed consumption. The feed consumption was properly determined. The average feed consumption for the 21 and 35 days were determined and recorded by using a weighing scale.
b. Average feed conversion efficiency. The average feed conversion efficiency at 21 and 35 days of age was calculated by dividing the average feed consumed by average body weight gain of the bird in the treatment.
c. Average feed conversion efficiency. The average feed conversion efficiency at 14, 21, 28, 35 and 42 days was calculated by dividing the average feed consumed by the average body weight gain of the birds in each treatment.

Livability and Dressing Percentage

a. Livability. Livability was determined by dividing the total numbers of birds at the end of the study by the total number of the birds at the start multiplied by 100.
b. Dressing percentage. The dressing percentage was determined by dividing the dressed weight by the live weight multiplied by 100.

Economic Benefits

a. Income Over Feed and Chick Cost (IOFCC). The income over feed and chicks were determined at the end of the study. This was done by subtracting the cost of chicks and feed consumed from the total sales of broilers in every treatment.

Data Analysis

The data was statistically analyze using analysis of variance (ANOVA) techniques involving Completely Randomized Design (CRD). Treatment means comparisons were done using Least Significant Difference Test (LSD) if the ANOVA shows significant difference among the treatment means.

Results and Discussions

Growth Performance

Average Body Weight

The effect of insulin plant leaf powder on the growth performance of broilers based on its average body weight is presented on Table 1.

Statistical analysis of data showed no significant differences among treatment means during the initial weighing of the birds. The data indicates that broiler chicks were of almost similar weights when they were transferred to their respective cages.

After 21 days of feeding, the insulin plant leaf powder on the basal diet significantly influenced the body weight of the experimental birds. It can be observed that broilers given with the minimal amount of insulin plant leaf powder had the highest body weight during this feeding period.

Still, a significant difference was observed after 35 days of feeding. It can be seen from the data that broilers given with 5 grams of insulin plant leaf powder on their basal diet had the highest body weight followed by broilers given with 10 grams and 15 grams respectively on their basal diet and with the control that had the lowest body weight at the end of the feeding period.

The result indicates that giving insulin plant leaf powder on the basal diet of broiler significantly influences their body weight after 21 and 35 days of feeding. Overall data showed that insulin plant leaf powder on the basal diet of broiler influenced their body weight as observed when compared to controls.

Table 1.
Average Body weight of broilers as affected by insulin plant leaf powder on their basal diet.

Treatment	Feeding Period		
	Initial	21 Days	35 Days
A - 5 grams of insulin leaf powder per kilogram of feeds	228.50	1750.00^{a}	2850.00^{a}
B - 10 grams of insulin leaf powder per kilogram of feeds	209.00	1680.00^{ab}	2625.00^{b}
C - 15 grams of insulin leaf powder per kilogram of feeds	225.00	1600.00^{abc}	2520.00^{b}
D - Positive control (antibiotic)	210.00	1565.00^{bc}	2480.00^{bc}
E – Control	212.50	1475.00^{c}	2300.00^{c}
CV (%)	7.41%	6.39%	5.46%

**Treatment means in column having the same superscript are not significantly different at 5% level*

Average Body Weight Gain

The effect of insulin plant leaf powder on the growth performance of broilers based on their average body weight gain is presented on Table 2.

Statistical analysis of data showed that different levels of insulin plant leaf powder on the basal diet of broilers significantly influenced their average body weight in all feeding periods.

The data above can be attributed to the results in the previous data presented. After 21 days of feeding, it can be observed that treated birds with insulin plant leaf powder on their basal diet gained the highest body weight gain. It is also observed that the treated broiler with the lowest level of insulin plant leaf powder on their basal diet gained the highest body weight gained.

Table 2.

Average body weight gain of broilers as affected by insulin plant leaf powder on their basal diet.

Treatment	Feeding Period		
	21 Days	**35 Days**	**Overall**
A - 5 grams of insulin leaf powder per kilogram of feeds	1521.50^{a}	1100.00^{a}	2621.50^{a}
B - 10 grams of insulin leaf powder per kilogram of feeds	1471.50^{ab}	944.50^{b}	2416.00^{b}
C - 15 grams of insulin leaf powder per kilogram of feeds	1375.00^{abc}	920.50^{bc}	2295.00^{b}
D - Positive control (antibiotic)	1355.00^{bc}	915.00^{bc}	2270.00^{bc}
E – Control	1262.50^{c}	825.00^{c}	2087.50^{c}
CV (%)	7.08%	7.02%	5.75%

**Treatment means in column having the same superscript are not significantly different at 5% level*

Based on the data presented above, it can be observed that broilers given with 5 grams of insulin leaf powder per kilogram of basal diet attained the highest average body weight gain of 2,621.50 grams after 35 days of feeding. It can also be observed that all broilers given with insulin plant leaf powder on their basal diet gained the highest average body weight gain when compared to the controls.

Feeds Consumption and Conversion Efficiency

Average Feed Consumption

Table 3 shows the average feed consumption (g) of broilers with insulin plant leaf powder on their basal diet.

Significant results were obtained after 21 and 35 days of feeding regarding the feed consumption of broilers with different levels of insulin plant leaf powder on their basal diet. However, it can be observed that broilers given with 5 grams of insulin plant leaf powder on their basal diet consumed the highest number of feeds and was followed by the controls. It was also observed that broilers given with 10 and 15 grams per kilograms of their basal diet consumed a lesser number of feeds. This observation may be attributed with the sour/bitter taste of the insulin plant leaf powder. Although the controls follow the birds at treatment A in terms of feed consumption, still they gained the lowest body weight and body weight gained when compared to the treated birds.

Table 3.

Average feeds consumed by the treatment at the full duration of the study.

Treatment	Feeding Period		
	21 Days	**35 Days**	**Overall**
A - 5 grams of insulin leaf powder per kilogram of feeds	1837.50^{a}	1937.50^{a}	3775.00^{a}
B - 10 grams of insulin leaf powder per kilogram of feeds	1637.50^{bc}	1775.00^{b}	3412.50^{bc}
C - 15 grams of insulin leaf powder per kilogram of feeds	1525.00^{c}	1725.00^{b}	3250.00^{c}
D - Positive control (antibiotic)	1825.00^{a}	1750.00^{b}	3575.00^{ab}
E – Control	1762.50^{ab}	1737.50^{b}	3500.00^{ab}
CV (%)	5.65%	4.87%	4.64%

**Treatment means in column having the same superscript are not significantly different at 5% level*

Feed Conversion Efficiency

Table 4 presents the average feed conversion efficiency of broilers on basal diet with insulin plant leaf powder.

Through statistical analysis, the data showed that different levels of insulin plant leaf powder on the basal diet of broilers had a significant effect on its feed conversion efficiency in all feeding periods.

Table 4.

Average feed conversion efficiency of broilers on basal diet with insulin plant leaf powder

Treatment	Feeding Period		
	21 Days	**35 Days**	**Overall**
A - 5 grams of insulin leaf powder per kilogram of feeds	1.208^{b}	1.762^{c}	1.485^{c}
B - 10 grams of insulin leaf powder per kilogram of feeds	1.114^{c}	1.882^{bc}	1.498^{c}
C - 15 grams of insulin leaf powder per kilogram of feeds	1.110^{c}	1.875^{bc}	1.493^{c}
D - Positive control (antibiotic)	1.348^{a}	1.914^{b}	1.631^{b}
E – Control	1.399^{a}	2.123^{a}	1.761^{a}
CV (%)	4.09%	4.86%	3.51%

**Treatment means in column having the same superscript are not significantly different at 5% level.*

As seen from the data, broilers in the control treatment had a lower feed conversion efficiency after 21- and 35-days feeding period. On the other hand, broilers treated with insulin plant leaf powder showed a remarkable difference in terms of feed conversion efficiency throughout the whole feeding period when compared to the other treatment. The lower the number for feed conversion efficiency the more efficient the treatment was.

Table 4. Average feed conversion efficiency of broilers on basal diet with insulin plant leaf poder

Livability Rate

The livability rate (%) of broilers with different levels of insulin plant leaf powder on their basal diet was presented on Table 5.

The result showed that after 35 days of feeding, the addition of different levels of insulin plant leaf powder on the basal diet of broilers did not harm the birds. This implies that insulin plant leaf powder can be safely mixed in the basal diet of broilers without affecting their health.

Table 5.

Livability rate (%) of broilers with different levels of insulin plant leaf powder on their basal diet.

Treatment	Livability
A - 5 grams of insulin leaf powder per kilogram of feeds	100%
B - 10 grams of insulin leaf powder per kilogram of feeds	100%
C - 15 grams of insulin leaf powder per kilogram of feeds	100%
D - Positive control (antibiotic)	100%
E – Control	100%
CV (%)	0%

Dressing percentage

The dressing percentage (%) of broilers with different levels of insulin plant leaf powder on their basal diet was presented on Table 6.

Results showed that adding insulin plant leaf powder on the basal diet of broilers did not significantly affect their dressing percentage.

As can be observed from the data, broilers given with 5 and 10 grams of insulin per kilogram of their basal diet had a slightly higher dressing percentage than the control. Also, as the amount of insulin added to the basal diet of broilers increases, the dressing percentage also decreases

Table 6.

Dressing Percentage (%) of broilers with different levels of insulin plant leaf powder on their basal diet

Treatment	With Giblets	Without Giblets
A - 5 grams of insulin leaf powder per kilogram of feeds	85.50^{a}	82.87^{a}
B - 10 grams of insulin leaf powder per kilogram of feeds	84.25^{ab}	81.16^{ab}
C - 15 grams of insulin leaf powder per kilogram of feeds	82.15^{b}	80.79^{ab}
D - Positive control (antibiotic)	82.56^{b}	80.10^{b}
E – Control	83.67^{ab}	80.54^{ab}
CV (%)	1.78%	1.93%

**Treatment means in column having the same superscript are not significantly different at 5% level*

Income Over Feed and Chick Cost

The cost and return analysis on broilers given with different level of insulin plant leaf powder on their basal diet was shown on Table 7.

As seen from the data presented, broilers given with different levels of insulin plant leaf powder on their basal diet gives the highest profit compared to control despite the fact that this treatment had an additional expense due to the cost of treatment. Nevertheless, though control has a lowest profit, it did not show negative profit.

Table 7.

Cost and return analysis on broilers given with different level of insulin plant leaf powder

Treatment					
	A	**B**	**C**	**D**	**E**
Expenses					
Cost of Chicks (₱)	50	50	50	50	50
Cost of Medicine (₱)	3.76	3.76	3.76	3.76	3.76
Cost of treatments (₱)	15.10	27.30	39.00	28	0
Cost of feeds					
Booster (₱)	11.40	11.40	11.40	11.40	11.40
Starter (₱)	55.20	48.02	43.98	54.75	52.50
Finisher (₱)	66.81	61.20	59.48	60.34	59.91
Total Feed Cost (₱)	133.41	120.62	114.86	118.65	123.81
Total Expenses (₱)	202.27	201.68	207.62	200.41	177.57
Return					
Average Body Weight (kg)	2.85	2.63	2.52	2.48	2.3
Price per kg Body weight (₱)	140	140	140	140	140
Gross Income from Sales (₱)	399	368.2	352.80	347.20	322
Net Profit (₱)	196.73	166.52	145.18	146.79	144.43

Conclusion

This study was conducted to determine the effect of insulin plant leaf powder in the growth performance of broilers if given in addition to the basal diet from February to March 2022 at Barangay Dayao, Mandaon, Masbate.

One hundred (100) chicks with the same age and random sexes were purchased from the local agrivet supplier and were used in the study. There were five (5) treatments replicated four (4) times following the Completely Randomized Design (CRD) of the experiment.

Based on the results of the study following conclusions were drawn:

1. The significance of the effect of insulin plant leaf powder on the growth performance of broilers varies on the amount added per kilogram of basal diet.
2. The period of feeding the broilers with insulin plant leaf powder on their basal diet affects its health since it was observed that after 21 days of feeding, treated birds show signs of stress/sickness.
3. Higher net income will be obtained if broilers will be given 5 grams of insulin plant leaf powder per kilogram of feeds only.

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