

Research Article

In vivo activity of different feeding levels of Greater Celandine (*Chelidonium Majus*) extract on the growth performance and digestibility in broilers

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Abstract

The present research work was conducted to investigate the effect of *Chelidonium Majus* Extract (CME) on growth performance and digestibility in broiler chickens *In vivo*. 100-day-old chicks were used in study. Distributed in to 4 groups i.e. (A, B, C and D) 25 chicks in each group with 5 replicates. Group A kept as control without supplementation of (CME), group B with 0.5ml/L, group C with 1ml/L and group D with 1.5ml of supplemented with CME. Our findings regarding growth performance showed significantly ($P<0.05$) highest live body and Feed Conversion Ratio (FCR) in the birds of group C followed by D and B as compared to A group, significantly ($P<0.05$) highest feed intake and dressing% was detected in various treated groups. Moreover, water consumption showed significantly ($P<0.05$) increase in birds in group B as compared to C, D and A groups. Whereas decrease in mortality percentage was recorded in groups B and C as compared to A and D groups, however difference was non-significant ($P>0.05$) between all treated groups. morbidity percentage showed significantly ($P<0.05$) increased in A group as compared to B, C and D groups. Relative organs weight, spleen weight remained unaffected between all treatment groups. highest relative weight of gizzards and heart was observed in all treated groups; Similarly, maximum relative weight of liver was observed in C and D groups followed by A and B groups. Furthermore, digestibility of various nutrients, dry matter, crude protein showed significantly ($P<0.05$) increased between various treatment groups, However, crude fiber showed non-significantly ($P>0.05$) difference in all treatment group. Likewise, ash matter was recorded significantly ($P<0.05$) increased in C and D groups as compared to B and A groups. Furthermore, economically proved that more profitable in group C followed by groups A, B and D. Based on above results, it was concluded that providing *Chelidonium majus* extracts at the dose of 1 ml/litter had the better impact on growth performance, enhance the digestibility of various nutrients and best for the health aspects of broiler without any adverse effects.

Introduction

To get higher poultry production two factors are under consideration one is feed efficiency and other is more growth rate. Other factors to get top quality performance of poultry i-e, quality of feed, genomic potential of birds, outbreak of diseases and condition of environment. Aside from these declare factors health of gut has newly been the focus of intense studies in poultry production [1].

Herbs play a significant role in poultry now a days that's why many herbs are utilized as growth promoter to increased poultry production in the form of feed additive and are nonnutritive material utilized in feed of poultry such as prebiotics, antibiotic, antioxidant, enzymes and antimicrobial. Feed additive are usually used to improve feed consumption and to increase the growth performance in broiler [2] Figure 1.

Aromatic plants and their extracts are used in animal feed as growth promoter. Few herbs or its extract improve intake of feed, digestive tract juice secretion as well as immune booster [3]. *Chelidonium majus* is a famous medicinal herb distributed in Europe, Asia and north Africa and is extensively used towards numerous disease [4]. It has been commonly called greater celandine [5]. Currently, the extract of *Chelidonium majus* shown to be safe for the use in veterinary as well as human Phyto preparation [6]. Extracts of flower, leaves and root are internally utilized to trigger the bile production and digestive enzymes which ultimately improve nutrient digestibility [7]. It is broadly used to treat the dyspepsia, biliary disorder and bowel syndrome because of spasmolytic and choleric activity [8]. It contains alkaloid, which is bitter in taste, used for treatment of digestive disorder mostly for bacterial infection [9]. It also contains lot of secondary metabolites i.e an isoquinoline, caffeic acid derivatives, many flavonoids and phenolic acid [10]. *Chelidonium majus* extract used in poultry feeding and have biologically active ingredient mainly in roots and leaves. The main ingredient of such medicines is fresh celandine juice. As few authors, considered the juice irritative and therefore recommended dry powder mixing it with feed and water for poultry [11]. Extract of *Chelidonium majus* supplied to poultry feeding as additive increased weight gain, feed conversion ratio as well as improved the growth performance [2,12]. Presence



Figure 1: Greater Celandine plant and their powder.

of alkaloids in *Chelidonium majus* feed conservation ratio as well as improved broiler performance when incorporated in broiler feed also author reported their toxic effect on rat that mitochondrial toxicity was related to DNA genotoxicity and hepatotoxicity intercalating properties due to presence of sanguinarine and chelerythrine when used in high dose [13]. *Chelidonium majus* possess antibacterial compounds are sanguinarine and chelerythrine which decrease disease interference in broiler farms when used in poultry feeding result in enhanced feed conservation ratio, water intake and improved growth performance, increased water consumption and increased appetites as well as modified the microorganism of intestine thus improved growth performance of birds [14]. It has been determined that helminthes cease the growth performance of poultry via decrease appetite and decrease weight gain while *Chelidonium majus* have ant-helminthes property which increase FCR, water intake as well as weight gain result the growth performance improved when used poultry feeds [15]. It has been reported that (*Chelidonium majus*) have immune modulatory effect through enhanced the tonsillar activity, humoral and cellular immunity as well as increase production of inflammatory cytokine in macrophages and dendritic cells which help them fighting against diseases causes pathogen result in increased feed conservation ratio, increased appetite as well as weight gain [16].

Keeping the view of importance of *Chelidonium majus* extract. To the best of our knowledge, so far seldom study has been carried out to determine the in vivo activity of *Chelidonium majus* extract in poultry. Therefore, considering the importance of poultry feed cost as poultry production, this study has been designed.

Material and method

A total 100-day old broiler chicks were purchased from market provider of Hyderabad and transported to poultry experimental area, Sindh Agriculture University, Tandojam.

Parameter to be study

Feed and water consumption: Iso-nitrogen and iso-caloric feed were provided to all groups of broilers during morning and evening. Provided *Chelidonium majus* extract in drinking water according to describe in Table 1, At morning, the refusal of feed from all groups were weighed, recorded and deducted from the offered feed to get amount of feed consumed. Feed and water were calculated by following formula;

$$\text{Water intake (ml/b/d)} = \frac{\text{Total water offered (ml)} - \text{Total water refused (ml/group/d)}}{\text{Total broiler (\#)}}$$

Live body weight: Three birds per group were randomly selected and weighed (using electric weigh scale) and recorded at the end of 36 days of experiment.

Weight gain: At the end of experiment, 3 birds from each group were weighed and to calculated weight gain following formula.

**Table 1:** Grouping of birds and treatment.

Groups	Group A	Group B	Group C	Group D
	Control	(C. majus)	(C. majus)	(C. majus)
No. of Birds	25	25	25	25
Treatment	Control	0.5 ml /L Drinking water	1ml / L Drinking water	1.5 ml / L Drinking water
Replicates	5	5	5	5

Weight Gain = Initial Weight – Final Weight

Dressing percentage: After dressing, carcass weight were recorded. Dressing percentage were calculated by the following formula;

$$\text{dressing (\%)} = \frac{\text{Total Carcass Weight (kg)}}{\text{Total Live Body Weight (kg)}} \times 100$$

Feed Conversion Ratio (FCR): To calculate feed conversion ratio, cumulative weight gain and feed intake were recorded at 36th days of age by following formula;

$$\text{FCR} = \frac{\text{Total amount of feed consumed}}{\text{Total amount of product produced}}$$

Organ weight: The organs spleen, liver, gizzard, heart, and weight of intestine was recorded from four slaughtered broilers of each group. according to the given formula;

$$\text{Relative Weight of the Organ} = \frac{\text{Organ weight}}{\text{Total Live Body Weight}} \times 100$$

Morbidity (%): Sick birds were collected when observed; morbidity was recorded and finally, morbidity % were calculated by following formula:

$$\text{Morbidity (\%)} = \frac{\text{Total No. of broiler sick}}{\text{Total No. of reared broiler}} \times 100$$

Mortality (%): Each mortality was recorded, and final mortality rate were calculated by using following formula;

$$\text{Mortality (\%)} = \frac{\text{Total Broiler Died}}{\text{Total Broiler Reared}} \times 100$$

Proximate analysis of digestibility

Moisture content: Moisture contents was determined by evaporation method described in (Association of Official Analytical Chemists; AOAC, 2000). The process of drying, with dish, dried sample with dish and empty dish were placed in following formula was used to compute the percent of moisture contents:

$$\% \text{ Moisture content} = \frac{\text{Weight of dish with fresh sample} - \text{weight of dish with dried sample}}{\text{Weight of dish with fresh sample} - \text{weight of empty dish}} \times 100$$

Dry matter content: Dry matter of samples was analyzed using similar method which mentioned by (Association of Official Analytical Chemists; AOAC, 2000). However, observations noted at each step were placed in following

formula to compute the percent of dry matter content:

$$\% \text{ Dry matter} = \frac{\text{Weight of dried sample with dish} - \text{weight of empty dish}}{\text{Weight of dish with fresh sample} - \text{weight of empty dish}} \times 100$$

Ash matter: Ash matter content was determined using Gravimetric method (AOAC, 2000). The concentration of ash was calculated by using following formula:

$$\text{Ash matter} = \frac{\text{Weight of crucible with ignited sample} - \text{empty weight of crucible}}{\text{Fresh weight of sample}} \times 100$$

Crude protein: Kjeldhal method was performed to determine crude protein contents. And CP was calculated by following formula;

$$\text{Nutrient retention \% (crude protein)} = \frac{\text{CP Absorbed}}{\text{total CP supplied}} \times 100$$

Crude fiber (CF): The crude protein was performed on crude fiber extractor. And CF was calculated by following formula.

$$\text{Crude Fiber \%} = \frac{W1 - W2}{\text{Sample weigh}} \times 100$$

Experimental design: Chicks were weighed and divided into 4 groups (one control and three treatments). Treatment showed in (Table 1). The duration of this trial was 36 days.

Preparation of extract of *Chelidonium majus*: The prepared form of *Chelidonium majus* extract made in Japan was purchased from market.

Ration: The chicks were offered commercial starter ration for first three weeks followed by broiler finisher ration for rest of three weeks. The proposed ration was formulated according to the recommendations of NRC (1994). The nutrient compositions of the experimental feeds are shown in Table 2.

Data analysis

The collected data were tabulated and analyzed by one-way ANOVA (statistix 8.1 software). Significant differences among means will be evaluated by using LSD test and the level of significance was adjusted at P<0.05.

Results

Effect of *Chelidonium majus* extract on growth performance of broilers

Effects of feeding different levels of *Chelidonium majus* extract on weight gain of broilers are presented in Table 3.

Table 2: Nutrients composition of commercial poultry ration.

Composition	Starter				Finisher			
C.P(%)	22.5	22.2	22.6	22.4	19.2	19.4	19.3	19.6
E. E (%)	1.8	1.7	1.9	1.8	2.6	2.8	2.9	2.7
C.F(%)	2.8	3.1	3.2	2.9	2.7	2.9	3.1	2.8
M. E Kcal/kg	2412	2405	2401	2407	2719	2794	2787	2709

C.P= Crude Protein; E. E=Ether Extract, C.F=Crude Fiber; M. E=Metabolized Energy



There was significant difference among several treatment groups. Birds in group C showed significantly ($P < 0.05$) highest weight gain followed by birds in groups D and B compared to control group A. Also, birds in group C showed significantly highest FCR values followed by birds in group B and D when compared to control (A) group. Significantly ($P < 0.05$) higher feed intake was observed in group D birds followed by B and C groups compared to the control group. Additionally, significantly ($P < 0.05$) higher dressing% was recorded in B group followed by D, C and A group. Moreover, water intake was significantly ($P < 0.05$) higher in B group followed by C, D and A group (control).

Effect of *Chelidonium majus* extract on broiler mortality and morbidity percentage

Mortality and morbidity percentage of broilers is given in Table 4. There was non-significant ($P > 0.05$). Difference among several treatment groups with *Chelidonium majus* extract in water. However, feeding different levels of *Chelidonium majus* extract on morbidity percentage of broilers was significantly ($P < 0.05$) difference. Moreover, birds reared in B, C and D group by providing *Chelidonium majus* extract in water showed less morbidity than control A group.

Effect of *Chelidonium majus* extract on relative organs weight of broilers

Weight of relative organ given in Table 5. There was significant difference among several treatment groups treated with different levels of *Chelidonium majus* extract on broilers relative organs. On the source of above result, the weight of heart was determined significantly ($P < 0.05$) more in birds of D group followed by C group then control groups birds. Also, weight of liver significantly higher in birds of C and D group then control groups. Similarly, weight of gizzard was significantly ($P < 0.05$) higher in C group birds then B, D and control group birds. While spleen weight was remained non-significant ($P > 0.05$) between all groups.

Effect of *Chelidonium majus* extract on nutrients digestibility percentage of broilers

Effect of different levels of *Chelidonium majus* extract on nutrient digestibility of broilers was described in Table 6. There was significant difference among several treatment groups provided with (CME). The results indicated that birds reared in group C showed significantly ($P < 0.05$) improved dry matter (DM). Likewise, crude protein digestibility increased significantly ($P < 0.05$) in group D followed by group C when

Table 3: Effect of feeding different levels of *Chelidonium majus* extract on growth performance of broilers.

Parameters	Treatment Groups			
	A (Control)	B (<i>C. majus</i> 0.5 ml/L)	C (<i>C. majus</i> 1 ml/L)	D (<i>C. majus</i> 1.5 ml/L)
Live Body weight (LBW) (gm)	1860 ^a ±5.77	2010 ^b ±2.88	2100 ^a ±2.86	2030 ^b ±2.88
Feed Conversion Ratio (FCR) (%)	1.72 ^a ±0.10	1.64 ^b ±0.20	1.54 ^c ±0.10	1.66 ^b ±0.30
Feed Intake (FI) (gm)	3188 ^a ±12.24	3326 ^b ±10.36	3312 ^b ±14.16	3405 ^a ±13.23
Dressing percentage (%)	63.03 ^a ±1.15	65 ^b ±1.30	63.0 ^a ±1.52	64.6 ^c ±1.20
Water Intake (ml)	6592.7 ^b ±15.	7099.0 ^a ±18.50	6899.7 ^{ab} ±14.36	6700.3 ^b ±12.70

abcd different letter of superscript showed significantly ($P < 0.05$) increased.

Table 4: Effect of feeding different levels of *Chelidonium majus* extract on broiler mortality and morbidity percentage.

Parameters	Group A	Group B	Group C	Group D
Mortality (%)	4	3	3	4
Morbidity (%)	8	6	6	6

Table 5: Effect of feeding different levels of *Chelidonium majus* extract on relative organs weight of broilers.

Parameters	Treatment Groups			
	A (Control)	B (<i>C. majus</i> 0.5 ml/L)	C (<i>C. majus</i> 1 ml/L)	D (<i>C. majus</i> 1.5 ml/L)
Spleen	0.11 0.04	0.11 0.01	0.12 0.05	0.11 0.02
Gizzard	1.82 ^c ± 0.01	1.94 ^b ± 0.02	2.56 ^a ±0.01	1.87 ^c ± 0.01
Liver	1.73 ^b ± 0.01	1.44 ^c ± 0.02	2.01 ^a ± 0.04	1.94 ^a ± 0.02
Heart	0.41 ^c ± 0.02	0.45 ^{bc} ± 0.04	0.49 ^{ab} ± 0.02	0.54 ^a ±0.03

abcd different letter of superscript showed significantly ($P < 0.05$) increased.

Table 6: Effect of feeding different levels of *Chelidonium majus* extract on nutrients digestibility percentage of broilers.

Parameters	Treatment Groups			
	A (Control)	B (<i>C. majus</i> 0.5 ml/L)	C (<i>C. majus</i> 1 ml/L)	D (<i>C. majus</i> 1.5 ml/L)
DM	81.0 ^b ±1.56	80.0 ^b ±1.34	84.0 ^a ±1.15	80.0 ^b ±1.47
CP	43.0 ^c ±1.15	45.0 ^c ±1.73	54.0 ^b ±0.57	61.0 ^a ±0.57
CF	54.53±6.24	55.86±6.32	61.67±6.20	57.36±6.74
Ash	2.26 ^a ±0.29	3.03 ^{bc} ±0.28	4.50 ^a ±0.14	3.33 ^b ±0.44

abcd different letter of superscript showed significant ($P < 0.05$). DM: Dry Matter; CP: Crude Protein; CF: Crude Fibers showed non-significant ($P > 0.05$).



compared with control A group and B group. However highest crude protein digestibility values were calculated in group D. Furthermore, ash matter also founded to be higher in the birds of group C followed by group D. However, significantly ($P < 0.05$) better in ash matter was recorded in group C when compared to the birds reared under groups D, B and control A group. Moreover, these results also showed that there was non-significant ($P > 0.05$) difference exist on the digestibility of crude fiber contents between various groups of *Chelidonium majus* extracts and control treatment.

Effect of feeding different levels of *Chelidonium majus* extract on economics of broilers

The economic was taken into account on the basis of total feed cost, total live body weight, market sale price of chicken and subsequent impact on the net profit was worked out (Table 7). The average feed cost on broilers in group A, B, C and D was Rs. 124, 128, 132, 132 /bird respectively; while the total costs including the costs on feed, rice husk, other medication, labor and other miscellaneous expenditures in groups A, B, C and D were Rs.237,244,258 and 247/bird, respectively. The average live weight of birds in groups A, B, C and D were 1.98, 2.04, 2.15 and 2.06Kg per birds, producing average total income from broiler of Rs 237.6, 244.8, 258 and 247/bird, respectively, when marketed at the rate of Rs. 120/kg live body weight. Hence, from group A, B, C and D, the net profit remained Rs. 48.6, 46.8, 58 and 25.2 per birds respectively. It was determined that broiler managed in group C economically proved to be more profitable than other treated groups.

Discussion

During this study, providing different levels of *Chelidonium majus* extract in water exhibited positive effects on growth performance of broilers. Present finding is supported with [8] that broilers fed with *Chelidonium majus* extract result the weight gain significantly as compared with control group, due to presence of phenolic, antimicrobial and antioxidant substance present in it. Present finding also agreed with [12] that extract of *Chelidonium majus* has positive response towards the growth performance of broiler in which FCR and weight gain achieved. Present result also comparable with [12] that

herbs have no side effect and exhibited the growth promoter activity. Current result indicated that weight gain of broiler increased due to antimicrobial activity present in *Chelidonium majus* extract. this result can be supported by [6] that different extract of herbs exhibited the antibacterial effect when fed to poultry thus preventing infectious disease and improved growth performance. Moreover, it has been evaluated that due to presence of sanguinarine, it increases feed conservation ratio, enhanced the growth of broiler and decrease the catabolism of proteins [13]. It is already reported by [17] that herbs contain lot of alkaloids such isoquinolines, protopines, aporphinesetc which help to improved growth performance of broiler. It showed positive response might be due to presence of above alkaloids.

During this study, different levels of *Chelidonium majus* extract supplied in water increased feed intake of broilers. Present findings are line with [8] that reported *Chelidonium majus* have tendency to increase appetite result feed intake enhanced in broiler due to may be presence of appetizer substance in it. Present findings are agreement with [18] that reported *Chelidonium majus* have tendency to increase feed intake due to presence of appetites stimulators such as allocryptopine and protopine.

Furthermore, during this study highest water intake was noted by supplying different levels of Greater Celandine (*Chelidonium majus*) extract in water [19] author reported that *Chelidonium majus* have capability to stimulate thrust center leads the birds increase water intake which is essential for good growth performance through regulating temperature as well as electrolyte balance due to sanguinarine-like alkaloids in it. Present findings showed water intake increase in group which fed *Chelidonium majus*, it's activity might be the presence of micro nutrient in it and can supported with [20] reported that Na^+ , K^+ supplied with poultry fed increase thrust. Taken together, it can be summarized that the *Chelidonium majus* has ability to improve the thrust of broilers therefore birds in group B consumed more water.

Present result indicates that *Chelidonium majus* have positive effect to improve the FCR. Current findings are supported with [8] that reported extract of *Chelidonium majus* have positive response towards the growth performance through improve weight gain, feed intake ultimately which lead to improve FCR. Present findings can be comparable with [2,12] that herbs have potential to enhanced the growth performance through improve feed intake as well as FCR because they have biological activities i.e, antioxidant, immunomodulatory, this biological effect also possessed the *Chelidonium majus* which have positive effect on feed conversion ratio of broiler might be due to better intake of feed and improved body weight which may ultimately affected the FCR of birds.

Present result indicates that *Chelidonium majus* extract have favorable effect upon internal organ of broiler such as heart, liver and gizzard when supplied in fed. Current findings are supported with [21] who reported that *Chelidonium majus* extract possessed hepato-protective, hypercholesteremic and growth stimulator effect which leads positive effect upon heart,

Table 7: Effect of feeding different levels of *Chelidonium majus* extract on economics of broilers.

Particulars	Groups			
	A	B	C	D
Day old chicks (Rs/b)	10	10	10	10
Feed consumed (kg)	3.1	3.2	3.3	3.3
Rate of feed / kg	40	40	40	40
Feed cost (Rs)	124	128	132	132
CM (Rs)	0	5	10	15
Medication (Rs)	10	10	10	10
Labor cost (Rs)	30	30	30	30
Misc. (Rs)	15	15	15	15
Total cost (Rs)	189	198	207	222
Final LBW (kg)	1.98	2.04	2.15	2.06
Marketing price (Rs)	120	120	120	120
Total Income (Rs)	237.6	244.8	258	247
Net profit (Rs)	48.6	46.8	51	25.2



liver and gizzard. It also reported that this plant is largely admired throughout the world for its therapeutic potency, which has now a days involved consideration for its pharmacological activities such as antimicrobial, antitumoral, anti-inflammatory, anticancer. Immunomodulatory, choleric, analgesic, hepatoprotective [22].

Present study revealed that *Chelidonium majus* extract enhanced the digestibility when supplied with fed. It has been reported that digestibility is directly proportional to the major nutrient, increase size of intestine, increase size of villi, decrease pathogenic microbial load. Present result line with [23] who stated that *Chelidonium majus* extract increase the digestibility through stimulation of hunger center which lead to increase gastrointestinal tract secretion and enhance major nutrient absorption, its effect may be due to presence of alkaloid such as Sanguinarine.

Present findings indicate that *Chelidonium majus* extract have beneficial effect to enhance the digestibility of broiler when incorporated with broiler feedings, it may be sanguinarine an alkaloid present in it. Present result can be supported with [24] who reported that sanguinarine an alkaloid presents in some medicinal plant which have positive effect upon digestibility through suppress the pathogenic bacteria of gut and modulation peristalsis and pH of intestine.

A new era has brought about in poultry industry by herbal growth promoters e.g (*Chelidonium majus*) extract and novel feed additives in which they are powerful weapons to materialize improvement in health status, production in poultry industry thereby increasing the net profit of economic. The results obtained from cost of chickens, feed, rice husk, and medication agreed by report of [25–28]. Our study was agreement with [24] who reported that some medicinal plant which have positive effect upon economy that is low cost on medication, feed which group contain herbal extract has a low economy and get the profit.

Conclusion

It was concluded from the present research that providing Greater Celandine (*Chelidonium majus*) extracts at the dose of 1 ml/litter of water had the better impact to improve weight gain, feed intake, water intake and feed conversion ratio, enhance the digestibility of various nutrients. It also seems that providing *Chelidonium majus* extracts in water is the best for the health aspects of broiler without any adverse effects.

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Author's contribution

Conceived and designed the experiments: M.U. Arain, G.A. Mughal & S. Bughio,

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