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Influence of herbal supplementation on dressed yield and percent organ weights of broilers during coccidiosis

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Abstract
Present investigation was conducted to evaluate the influence of herbal supplementation on percent dressed yield and percent organ weights of broilers during coccidiosis. 168, one day old broiler chicks were divided into 7 groups, with 2 replicates of 12 chicks each. Broilers of group I and II were provided unsupplemented diet. Broilers of group III and IV were provided 0.0125% amprolium supplemented diet, whereas broilers of group V and VI were provided diet supplemented with 0.2% madar leaf powder and broilers of group VII were provided 0.4% madar leaf powder supplemented diet. On 15th day of experiment, broilers of group II, IV, VI and VII were infected with 50,000 mixed *Eimeria sp.* sporulated oocysts. Carcass traits as dressed yield % and organ weight % were higher in both infected and uninfected madar leaf powder supplemented groups followed by amprolium and unsupplemented groups, but difference was non-significant for percent dressed yield whereas significant for percent organ weights.

Keywords: Poultry coccidiosis, percent dressed yield, percent organ weight, herbal powder

Introduction
Coccidiosis is commonly called as Red Dysentery. It is caused by the intracellular protozoan parasite *Eimeria*, which undergoes its life cycle in the intestinal mucosa of the infected bird. Nine *Eimeria* species (*Eimeria tenella*, *Eimeria acervulina*, *Eimeria necatrix*, *Eimeria brunetti*, *Eimeria maxima*, *Eimeria mitis*, *Eimeria mivati*, *Eimeria hagani* and *Eimeria praecox*) infect chicken. *Eimeria* parasites colonise intestinal cells and may lead to a massive epithelial destruction. Consequently, the host may suffer from diarrhoea, malabsorption and poor weight gain (Novaes *et al*., 2012) [16]. *Eimeria tenella*, cause of caecal coccidiosis is the most common and pathogenic species among all *Eimeria* sp. affecting chickens (Ayaz *et al*., 2003) [3]. Difficulties in tackling avian coccidiosis with chemical coccidiostats and vaccines due to resistance development, residual effects as well as high cost stimulated the scientists to explore further newer methods of control and the natural products are being investigated to this effect (Kayser *et al.*, 2003) [10]. A number of natural feed additives have shown anticoccidial activity. Some plants i.e. *Azadirahta indica*, *Hobrrhena antidysentrica*, *Barberis aristata*, *Embelia ribes*, *Acorus calamus*, *Artemisia annua*, and *Artemisia absinthium* have been shown to possess anti-coccidial activity (Kostadinovic *et al.*, 2019) [11]. Zhang *et al.*, 2020 [26] also evaluated the anticoccidial property of *Camellia sinensis*.
Plant of our study, *Calotropis procera* (Madar) was investigated by many scientists for medicinal properties. Study of Mueen *et al.* (2003) [15] observed the antioxidant properties of madar. Similarly Arya and Kumar (2005) [2] reported its anti-inflammatory activity. Al-Qarawi *et al.* (2001) [1] also illustrated the anthelmintic activity of *Calotropis procera* latex against *Haemonchus contortus* infection in Najdi Sheep. Singh *et al.* (2009) [21] and Zaman *et al.* (2011) [25] studied the anticoccidial effect of *Calotropis sp.* supplementation. Based on various beneficial and therapeutic effects of *Calotropis procera*, current experiment was conducted to study the influence of 0.4% as well as 0.2% madar leaf powder and amprolium on percent dressed yield and percent organ weights of coccidiosis infected broiler chicks.

Materials and Methods
The experiment was conducted on 168, one day old broiler chicks for 30 days. On arrival, chicks were randomly allocated to seven groups. Each group had two replicates with 12 chicks each.

Chicks of different replicates were kept in separate cages and maintained under similar managemental conditions. The groups were designated as group I, II, III, IV, V, VI and VII. Broilers of group I and II were provided standard control diet without any supplement. In broilers of group III and IV, standard feed was supplemented with 0.0125% amprolium and broilers of group V and VI were provided with basal diet supplemented with 0.2% madar leaf powder. Broilers of group VII were provided standard control diet supplemented with 0.4% madar leaf powder (Table 3.1). On 15th day of experiment broilers of group II, IV, VI and VII were infected with 1 ml suspension containing 50,000 sporulated oocysts of *Eimeria species*. *Eimeria* spp. mixed culture contained *E. tenella* (80%), *E. necatrix* (10%), *E. acervulina* (6%), *E. maxima* (2%) and *E. mitis* (2%), which were identified on the basis of guidelines of Levine (1985) [13]. To isolate the oocysts of *Eimeria sp.*, method described by Holdsworth *et al.* (2004) [8] was used with few modifications.

For percent dressed yield and percent organ weight studies, 3 broilers from each replicate were slaughtered at 15th days post infection or 30th day of experiment. Before slaughter, each broiler was weighed and weight gain was recorded. It was slaughtered by severing the jugular vein. After complete bleeding, weight was recorded. The weight was again recorded after manual defeathering using hot water at 50-55 °C. Head, shank and wing tips were removed by giving cuts at atlanto-occipital, hock and knee joints respectively and their weights were taken.

After this, a horizontal cut was applied posterior to keel bone. Breast was pushed forward to expose the viscera and the carcass was eviscerated. Weight of the carcass was again recorded and from this dressed yield per cent was calculated. Liver, heart and gizzard were detached from rest of the viscera. Gall bladder was removed from liver. Gizzard was opened and its contents were removed and epithelial linings were detached. Individual weights of all these organs were recorded. Dressing yield were calculated by following formula:

$$\text{Percent dressed yield (\%)} = \frac{\text{Live weight} - \text{Weight loss as blood, skin, head, shank, wing tips and viscera} \times 100}{\text{Live weight}}$$

$$\text{Percent organ weight (\%)} = \frac{\text{Organ weight} \times 100}{\text{Live weight}}$$

Results and Discussion

Per cent dressed yield and percent organ weights as gizzard, liver, heart or giblet of different groups of broilers on 30th day of experiment or 15th day post infection are presented in Table 1.

On 15th days post infection or 30th day of experiment, among uninfected groups, numerically maximum percent dressed yield were recorded in group V (66.33), whereas minimum in group I (65.22). Group III showed moderate percent dressed yield (65.81), but significant difference was not found between treatments. Durrani *et al.* (2006) [6] reported higher dressing percentage and giblet weight in broilers fed with diet containing turmeric. Among uninfected groups weight gain was significantly maximum in madar leaf powder supplemented groups. This may be due to the growth promoting effect of its saponin content **(**Kumar *et al*., 2013; Tiwari *et al.*, 2014; Zaman *et al.*, 2011) [12, 22, 25] and antioxidant effect of its phenols and flavonoides content (Joshi *et al.*, 2009) [9]. Minimum weight gain among uninfected groups was observed in broilers of amprolium supplemented group. Similar findings were observed by Bahadhoran *et al.* (2014) [4].

Among infected groups, maximum per cent dressed yield was showed by broilers of group VII (66.30) followed by group VI (66.27) and group IV (65.71), whereas minimum per cent dressed yield was recorded in group II (65.15), but significant effect of supplementations on dressed yield was not observed. Weight gain among infected groups was maximum in madar leaf powder supplemented group and concentration dependent effect was observed. Coccidiosis neutralizing effect of madar leaf powder may be attributed to its constituent as saponin, which act on the protozoan development by interacting with cholesterol present on the parasitic cell membrane and resulting into parasitic death (Wang *et al.*, 1998) [23]. Singh (2006) [19] noticed significantly higher dressed yield in wheat grass juice supplemented infected group than control infected group. Singh *et al.* (2007) [18] reported that supplementation of amla and turmeric powder in broiler diet improved dressing percentage in broilers. Durrani *et al.* (2008) [7] noticed significantly higher dressing percentage in aqueous aloe-vera gel supplemented infected group than infected unsupplemented group. Waskar *et al.* (2009) [24] also revealed that supplementation of herbal toxin binder product in basal diet is efficacious in improving overall meat quality attributes such as carcass yield and dressing percentage (%). Minimum weight gain among infected groups was observed in unsupplemented group, which is due to pathogenic effect of *Eimeria spp.* When the coccidial infection was introduced into the flock, the growth depressing effect of amprolium was neutralized by the effective control of the infection. Bozkurt *et al.*, 2013 [5] also have similar findings.

In both infected and uninfected groups, organ weights as gizzard, heart, liver or giblet percent weights were recorded significantly higher in madar leaf powder supplemented groups. Among infected groups, concentration dependent effect of madar leaf powder was not observed on percent giblet weight. Singh *et al.* (2008) [20] also showed significant effect (P<0.05) of herbal complex and sodabicarb on eviscerated weight, edible weight and giblet weight of treated groups. Milosevic *et al.* (2013) [14] also observed the effect of antioxidant rich plant garlic on carcass traits and found that internal organs as liver and heart were also under the influence of garlic as liver weight was higher in garlic supplemented groups compared to the control group.

Minimum per cent organ weights of gizzard, liver, heart and giblet among infected groups were recorded in infected untreated group i.e. group II.

In our study, gizzard, liver, heart percent weight as well as giblet percent weight was found to be higher in infected groups than respective uninfected groups, this may be due to the hypertrophy of these organs due to effect of coccidiosis, similar results were recorded by Panda and Comb (1964) [17] who noticed hypertrophy of liver, pancreas, adrenal gland, spleen and bursa in chicks which recovered from experimentally induced coccidiosis. Singh *et al.* (2008) [20] also recorded higher % weight of liver, gizzard, pancreas,

spleen and bursa in infected group than uninfected group indicating hyperactivity of these organs.

Conclusion

It was concluded from the study that percent dressed yield among different groups were non-significant as it was ratio of dressed weight and live weight and decrement or increment in both weights occur simultaneously. Madar leaf powder supplementation affect weight gain in infected and uninfected groups positively, but its significant effect was not observed on dressed yield. Percent giblet weight was significantly higher in uninfected as well as infected madar leaf powder supplemented groups and concentration dependent effect of madar leaf powder on percent giblet weight was not observed during coccidiosis.

Table 1: Carcass yield, organ weighs (% live weight) in broilers of different groups on 15 days post infection or 30th day of experiment

Groups		Weight gain (g)	Dressed yield without giblet (%)	Gizzard (%)	Liver (%)	Heart (%)	Giblet (%)
I	UC	$1314.3l^{b}$	65.22^{de}	2.14^{f}	229^{g}	0.603^{f}	5.03^{f}
II	IC	937.76^{f}	65.15^{e}	220^{e}	2.35^{f}	0.612^{e}	5.16^{e}
HI	UA	1258.94^{c}	65.81^{abcd}	225^{d}	2.40^{e}	0.618^{d}	5.27^{d}
IV	IA	1233.94^{d}	65.71^{abcde}	2.30^{c}	2.46^{d}	0.624^{c}	5.39^{c}
V	UM	1416.35^{a}	66.33^{a}	2.45^{b}	2.52^{c}	0.628^{b}	5.60^{b}
VI	IM-1	1172.37^{e}	66.27^{abc}	2.50^{a}	2.55^{b}	0.630^{a}	5.68^{a}
VII	IM-2	1228.11^{d}	66.30^{ab}	2.49^{a}	2.57^{a}	0.629^{ab}	5.69^{a}
CD at 5%		15.154	0.620	0.017	0.017	0.019	0.026

*Significant a, b, c, d means bearing different superscripts in a column differ significantly ($P \leq 0.05$)

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