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Feeding Value of Raw or Enzyme Treated Dandelion Leaves and Fenugreek Seeds Alone or in Combination in Meat Type Chicken

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Abstract: A study was conducted to evaluate the feeding value of dietary supplementation of locally available herbs Dandelion leaves and Fenugreek seeds with or without enzyme treatment in meat type chicken. To achieve the envisaged objective, two hundred seventy three day old commercial broiler chicks were procured from a reputed source and reared together until 7 days of age. On 7th day, the chicks were individually weighed, distributed randomly into 7 groups of 3 replicates with 13 chicks each. Birds in the control group were fed diets without additives (T₁). The other 6 treatment groups were fed the basal diet supplemented with 0.5% Dandelion leaves (T₂), 1% Fenugreek seeds (T₃), combination of 0.5% Dandelion leaves and 1% Fenugreek seeds (T₄), Enzyme treated Dandelion leaves 0.5% (T₅), Enzyme treated Fenugreek seeds 1% (T₆) and combination of Enzyme treated Dandelion leaves (0.5%) and (1%) Fenugreek seeds (T₇). There was no significant ($p>0.05$) effect on the carcass characteristics of chicken among various treatment groups and control except for the dressing percentage and length of various segments of small intestine which were significantly ($p<0.05$) higher in the groups raw or enzyme treated Dandelion leaves and Fenugreek seeds. Highest values were achieved in group fed combination of enzyme treated Dandelion leaves and Fenugreek seeds (T₇). Reduction in the feed cost per kg live weight gain among different treatment groups was observed when compared with the control group. Among different treatment groups, compared to control an additional profit of Rupees (Rs) 884 per 100 kg body weight was achieved in the group fed enzyme treated 0.5% Dandelion leaves (T₅), followed by Rs. 849 in the group fed enzyme treated 1% Fenugreek seeds (T₆). In conclusion, 0.5% Dandelion leaves and 1% Fenugreek seeds treated with enzymes may be incorporated in the diet in order to economize the meat type chicken production.

Key words: Carcass, dandelion, economics, fenugreek, meat chicken

INTRODUCTION

The antibiotic growth promoters have been used in poultry feed worldwide during the last 50 years (Yegani and Korver, 2008), but their ban has led the world to restrict their use in animal feed as growth promoters (Nisha, 2008). Therefore, herbs and plant extracts are being incorporated in poultry feed as growth promoters (Alloui *et al.*, 2013). Compared with synthetic antibiotics or inorganic chemicals, these plant-derived products have proven to be safe, less toxic, residue free and are thought to be ideal feed additives in food animal production (Hashemi and Davoodi, 2010). Herbs and plant extracts used in animal feed are known as phytogetic feed additives. Phytogetics have been defined as plant-derived natural bioactive compounds with positive effects on animal growth and health (Puvaca *et al.*, 2013). They are incorporated in the diet of animal feed in order to enhance productivity by improvement of digestibility, nutrient absorption and elimination of pathogens residents in the gut (Athanasiadou *et al.*, 2007).

Kashmir, often referred to as paradise on earth, is located at the northwestern tip of Himalayan biodiversity hot spot (Husain, 2001). The region supports a rich and spectacular plant biodiversity of great scientific curiosity and promising economic benefits. Among the herbal flora available in the region, two herbal plants i.e., Dandelion leaves (*Taraxacum officinale*) and seeds of Fenugreek (*Trigonella foenum graecum*) were utilized for the study in the diets of the meat type chicken. Dandelion is a well known medicinal plant that grows in nature in Asia, Europe and North America (Malik *et al.*, 2011). The roots of the herb are primarily considered for supporting digestion and liver function, while as its leaves are used as diuretic and digestive stimulant (Mir *et al.*, 2013). Fenugreek is grown mainly in India, Pakistan and China. Its seeds have many therapeutical effects such as hypoglycaemic, anti helminthic, anti-inflammatory and anti-microbial properties (Bash *et al.*, 2003). It also contains lecithin and choline that help to dissolve cholesterol and fatty substances. It also contains neurin, biotin, trimethylamine which tends to

stimulate the appetite by their action on the nervous system (Michael and Kumawat, 2003). Moreover, enzyme supplementation in poultry diets has been reported to improve the performance (Yousuf *et al.*, 2012) by degrading non-starchy polysaccharides, improving the digestion and absorption of nutrients (Tufarelli *et al.*, 2007) and improving their intestinal morphology (Ayoola *et al.*, 2015). Based on the aforementioned properties, the present study was thus conducted with the objective to explore the feeding value of dietary supplementation of raw or enzyme treated Dandelion leaves and Fenugreek seeds alone or in combination in meat type chicken.

MATERIALS AND METHODS

Day-old commercial meat type chicks (273) were procured from a reputed source. Chicks were reared in battery cages until 7 days of age. During this period all the birds were provided with a pre-starter mash (23% crude protein and 2800 Kcal/kg metabolizable energy). The diets were iso-nitrogenous, isocaloric and formulated to meet the recommendations of the bureau of Indian standards (BIS, 1992) and analyzed as per AOAC (2005a). The ingredient and chemical composition of basal diet have been given in Table 1. Birds had free access to feed and water throughout and were maintained on a constant 24 h light schedule. All chicks were vaccinated against Ranikhet disease on 5th day with F1 strain vaccine and IBV-95 vaccine against Infectious bursal disease on 16th day. Chicks were checked twice daily for mortality, if any. Birds were kept under the same managerial, hygienic and environmental conditions.

Experimental design: On eighth day, the chicks were individually weighed, distributed into seven treatment groups of three replicates with thirteen chicks in each in a completely randomized design so that the treatment means differ as little as possible. Birds in the control group were fed diets without additives (T₁). The other 6 treatment groups were fed the basal diet supplemented with 0.5% Dandelion leaves (T₂), 1% Fenugreek seeds (T₃), combination of 0.5% Dandelion leaves and 1% Fenugreek seeds (T₄), Enzyme treated Dandelion leaves 0.5% (T₅), Enzyme treated Fenugreek seeds 1% (T₆) and combination of Enzyme treated Dandelion leaves (0.5%) and (1%) Fenugreek seeds (T₇).

Material processing and mixing technique: Dandelion leaves and Fenugreek seeds were procured, dried and crushed into powder form before incorporation in the feed. Dandelion leaves and Fenugreek seeds in powder form were mixed thoroughly in aforesaid quantities to a small amount of feed (1 kg) in a premixer. The resultant mixture was then mixed with the rest of the feed in a mechanical blender until a thorough and consistent mixture was obtained.

Table 1: Ingredient and nutrient composition of experimental basal diet

Ingredients	Starter (1-3 wks)	Finisher (4-6 wks)
Yellow maize	53.90	65.06
Soybean meal	39.00	30.80
Deoiled rice bran	2.90	0.00
Oyster shell grit	0.90	0.90
Dicalcium phosphate	1.90	1.90
Lysine HCl	0.25	0.22
DL-methionine	0.20	0.17
Trace minerals mixture*	0.20	0.20
Vitamin premix**	0.20	0.17
Common salt	0.40	0.40
Toxin binder	0.15	0.15
Furazolidone, 20% w/w	0.05	0.05
Coccidiostat	0.05	0.05
Total	100.00	100.00
Nutrient composition		
Crude protein	22.35	19.82
Crude fibre	3.98	4.71
Ether extract	6.532	7.714
Total ash	4.89	5.761
Calcium***	1.61	1.52
Available phosphorus***	0.856	0.79
Lysine***	1.32	1.17
Methionine***	0.681	0.540
Metabolizable energy (Kcal/kg diet)***	2856	2978

*Trace mineral premix provided the following per kg of diet: Manganese 75 mg, Iron 60 mg, Zinc 70 mg, Copper 10 mg, Cobalt 0.2 mg, Iodine 1 mg and Selenium 0.3 mg

**Vitamin premix contained (units/kg): Vitamin A 12375 IU, Riboflavin 7.5 mg, Cholecalciferol 1800 IU, Vitamin K 1.5 mg, Thiamine 1.2 mg, Pyridoxine 2.5mg, Cyanocobalamine 12 mcg, Vitamin E 12 mg, Pantothenic acid 12 mg, Niacin 18 mg

***Calculated values

Parameters estimated: At the end of feeding trial, two birds per replicate were selected at random and weighed immediately before severing the jugular vein at the atlanto-occipital joint and allowed to bleed. The shanks were cut off at the hock joint and carcass was subjected to scalding process at 60°C for 30 sec. The feathers were removed completely by hand picking leaving the skin intact. Thereafter, the abdominal cavity was opened to expose the visceral organs and slaughter characteristics, yield of giblets and cutability characteristics were calculated by the method used by Salahuddin *et al.* (2000).

Economics of feeding was calculated by taking into consideration the market prices of feed ingredients, Dandelion leaves, Fenugreek seeds and enzyme at the time of purchase, feed consumed and feed conversion ratio.

Statistical analysis: The data obtained was statistically assessed by the analysis of Variance (ANOVA) through General Linear Model procedure of SPSS (20.0) software considering replicates as experimental units and the values were expressed as means±standard error. Duncan's multiple range test (Duncan, 1955) was used

to test the significance of difference between means by considering the differences significant at $p < 0.05$.

RESULTS AND DISCUSSION

The results of slaughter and carcass characteristics of chicken under different treatment groups have been presented in Table 2. There was no significant ($p > 0.05$) effect on the various slaughter and carcass characteristics between the various treatment groups and control except for the dressing percentage which was highest ($73.97 \pm 0.21\%$) in the group fed combination of enzyme treated Dandelion and Fenugreek group (T_7). This was followed by $73.66 \pm 1.03\%$ in the group fed enzyme treated Fenugreek seeds (T_6). The improvement in the dressing percentage might be due to the increase in growth rate and efficient utilization of nutrients with the supplementation of herbs and enzymes in meat type chicken (Abbas *et al.*, 1998; Khan and Siddique, 2006; Bharathidhasan *et al.*, 2009; Bansal *et al.*, 2012; Yousuf *et al.*, 2012; Qureshi *et al.*, 2015). There were no significant difference in the yield characteristics of giblets viz. gizzard weight, heart weight and liver weight among different treatment groups, thus confirming the reports of Rabia (2010); Aksa *et al.* (2012) and Yatoo *et al.* (2012).

The results on percent cutability characteristics of meat type chicken under different dietary groups have been

shown in Table 3. The results revealed no significant effect on various physical parameters like breast, drumsticks, wings, thighs, back and neck weights among different treatment groups and control. The results are in agreement with the results of Yatoo *et al.* (2012) and Duru *et al.* (2013) who reported no significant difference in the percent cutability parts of meat type chicken fed Fenugreek seeds as feed additives in the diet.

Data pertaining to length of different segments of intestine among the various dietary treatments have been given in Table 4. The length of various segments of intestine significantly ($p < 0.05$) increased in the treatment groups compared to the control group. Among various treatment groups, highly significantly ($p < 0.05$) values were achieved in the group fed combination of enzyme treated Dandelion leaves and Fenugreek seeds (T_7). The results are in harmony with the results of Duru *et al.* (2013) and Mamoun *et al.* (2014) who reported a significant ($p < 0.05$) increase in the length and weight of various segments of intestine with supplementation of Fenugreek seeds in the diet of meat type chicken. Several other researchers have reported the beneficial effect of Dandelion leaves and Fenugreek seeds on intestinal morphology which they have attributed to their antimicrobial action which in turn decreases the inflammatory reactions at the mucosa (Loddi *et al.*,

Table 2: Slaughter and carcass characteristics of meat type chicken supplemented with raw and enzyme treated Dandelion leaves and Fenugreek seeds

Slaughter traits	Treatments						
	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇
Dressing (%)	71.12±0.71 ^a	71.61±1.06 ^a	71.49±0.11 ^a	73.11±0.05 ^b	72.96±0.63 ^{ab}	73.66±1.03 ^b	73.97±0.21 ^b
Feather (%)	11.89±0.67	10.71±0.45	11.18±0.21	11.54±0.32	10.48±0.17	10.99±0.81	11.85±0.35
Head (%)	2.97±0.12	3.18±0.40	3.29±0.57	3.01±0.23	2.94±0.61	2.98±0.38	3.09±0.33
Shank (%)	5.27±0.41	5.06±0.28	5.51±0.08	4.97±0.14	5.14±0.31	5.01±0.07	5.39±0.82
Heart (%)	0.61±0.04	0.59±0.08	0.62±0.04	0.57±0.03	0.58±0.01	0.63±0.07	0.63±0.04
Liver (%)	2.43±0.25	2.39±0.14	2.41±0.27	2.45±0.15	2.50±0.22	2.49±0.05	2.47±0.20
Gizzard (%)	2.16±0.10	2.19±0.19	2.29±0.29	2.19±0.22	2.17±0.09	2.37±0.15	2.35±0.18
Total giblets (%)	5.20±0.13	5.17±0.20	5.32±0.22	5.21±0.07	5.25±0.19	5.49±0.25	5.45±0.03

Means within the same row with different superscripts are significantly different ($p < 0.05$)

Table 3: Per cent cutability characteristics of meat type chicken supplemented raw and enzyme treated Dandelion leaves and Fenugreek seeds

Cut up parts	Parameter	Treatments						
		T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇
Breast	Yield plw %*	23.07±0.31	22.93±0.11	23.58±1.09	23.69±0.37	23.10±0.71	23.77±0.33	23.91±0.61
	Yield pdw %**	32.61±0.25	31.97±0.57	32.72±0.44	32.87±1.18	32.59±0.98	32.91±1.19	32.97±0.47
Drum sticks	Yield plw %*	10.13±0.07	9.82±1.06	10.32±0.58	10.37±0.66	10.10±0.23	10.57±0.46	10.73±1.10
	Yield pdw %**	13.79±0.04	13.21±0.81	14.11±0.72	14.31±1.12	13.69±0.91	14.38±1.02	14.49±0.59
Thighs	Yield plw %*	10.91±0.02	10.63±0.03	11.09±0.12	11.27±0.22	11.02±0.08	11.37±0.16	11.58±0.13
	Yield pdw %**	14.88±0.01	14.68±0.08	15.38±0.09	15.79±0.33	15.19±0.33	15.76±0.24	15.91±0.21
Wings	Yield plw %*	7.82±0.22	7.29±0.07	7.91±0.22	7.81±0.30	7.32±0.09	7.88±0.47	8.02±0.21
	Yield pdw %**	10.73±0.36	10.15±0.28	10.98±0.16	10.73±0.21	10.29±0.41	10.92±0.32	11.16±0.11
Back	Yield plw %*	14.26±0.43	13.96±0.15	14.20±0.57	14.73±0.34	14.10±0.17	14.77±0.61	15.27±0.71
	Yield pdw %**	19.87±0.76	19.71±0.28	19.77±0.52	20.24±0.57	19.92±0.29	20.38±1.23	21.29±1.27
Neck	Yield plw %*	3.60±0.29	3.14±0.16	3.68±0.34	3.74±0.55	3.23±0.18	3.92±0.79	4.09±0.28
	Yield pdw %**	5.03±0.52	4.44±0.20	5.12±0.27	5.22±0.41	4.61±0.21	5.51±0.63	5.81±0.42

*Percent live weight, **Percent dressed weight

Table 4: Length of different segments of intestine in meat type chicken supplemented with raw and enzyme treated Dandelion leaves and Fenugreek seeds

Parameters	Treatments						
	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇
Duodenum length (cm)	31.50±0.29 ^a	34.62±0.15 ^b	35.25±0.23 ^b	36.38±0.06 ^c	34.67±0.32 ^b	37.57±0.26 ^d	38.53±0.23 ^e
Jejunum length (cm)	85.77±1.81 ^a	94.12±0.39 ^b	95.84±0.63 ^b	98.92±0.15 ^c	94.30±0.89 ^b	102.13±0.64 ^d	104.77±0.62 ^d
Ileum length (cm)	64.13±0.24 ^a	70.25±0.29 ^b	71.54±0.47 ^b	73.87±0.12 ^c	70.43±0.67 ^b	76.23±0.46 ^d	78.27±0.45 ^e
Caecum length (cm)	17.87±0.19 ^a	20.10±0.07 ^c	20.68±0.17 ^d	21.63±0.03 ^e	19.50±0.17 ^b	21.97±0.15 ^e	22.77±0.15 ^f

Means within the same row with different superscripts are significantly different (p<0.05)

Table 5: Economics of supplementing raw and enzyme treated Dandelion leaves and Fenugreek seeds in meat type chicken

Components	Treatments						
	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇
Basal feed (Rs)	4000	4000	4000	4000	4000	4000	4000
Dandelion(Rs)	-	63.0	-	63.0	63.0	-	63.0
Fenugreek seeds (Rs)	-	-	60.0	60.0	-	60.0	60.0
Enzyme (Rs)	-	-	-	-	40.0	40.0	40.0
Total cost (Rs)	4000	4063	4060	4123	4103	4100	4203
FCR	2.17	1.94	1.95	1.94	1.90	1.91	1.88
Feed cost/100 kg (Rs)	4000	4063	4060	4123	4103	4100	4203
Feed cost/100 kg live weight gain (Rs)	8680	7882	7917	7998	7796	7831	7902
Difference in feed cost than control (Rs)	-	+798	+763	+682	+884	+849	+778

2004; Mahmood *et al.*, 2015). Further, enzyme inclusion is also beneficial in improving the intestinal morphology due to the fact that dietary inclusion of the enzymes helps to degrade the non-starch polysaccharides (NSPs) and diminish their negative impact on the gut morphology as these NSPs have been reported to suppress the gut morphological development at higher levels (Ayoola *et al.*, 2015). The positive effect on intestinal morphology could prolong the contact between the digesta and mucosal epithelium, which may be more effective for nutrient absorption (Boguslawska-Tryk *et al.*, 2012).

The results of economics of feeding Dandelion leaves and Fenugreek seeds have been presented in Table 5 and depicted in Fig. 1. The feed cost per 100kg live weight gain for the treatment groups T₁, T₂, T₃, T₄, T₅, T₆ and T₇ was Rs 8680, 7882, 7917, 7998, 7796, 7831 and 7902 respectively. There was reduction in the feed cost per 100 kg live weight gain among different treatment groups supplemented with either Dandelion leaves or Fenugreek seeds alone or in combination with or without enzyme addition when compared with the control group (T₁). Among different treatment groups, compared to control an additional profit of Rupees (Rs) 884 per 100 kg body weight was achieved in the group fed enzyme treated 0.5% Dandelion leaves (T₅), followed by Rs. 849 in the group fed enzyme treated 1% Fenugreek seeds (T₆). The results are in agreement with the findings of Abdel-Rahman *et al.* (2014) and Mamoun *et al.* (2014) who reported that the addition of Fenugreek seeds in the diet of chicken resulted in less feed cost per kg live weight gain and high profit compared to the control group. Similar results were recorded by Galib *et al.* (2010) with the addition of Dandelion in the diet of



Fig. 1: Comparison of feeding value of Dandelion leaves and Fenugreek seeds compared to control

meat type chicken. Further, Zou *et al.* (2013) also reported that the addition of enzyme in the diet of meat type chicken resulted in decrease of feed cost per kg of live body weight gain and in turn increased profit.

Conclusion: The raw or enzyme treated Dandelion leaves and Fenugreek seeds have beneficial effect in terms of reducing the feed cost/kg live weight gain in meat type chicken. These herbs also exert positive effects on the morphology of intestine, thus helping in better nutrient utilization particularly when used along with enzymes. Enzyme treated Dandelion leaves at 0.5% and Fenugreek seeds at 1% level may be incorporated in the diet in order to economize the meat type chicken production.

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