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Evaluation of Polyherbal feed additives on haematological and biochemical profiles in Yorkshire male pigs

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Abstract
Growth trial of thirteen weeks duration was carried out on 24 pigs (2 months age; 12.5 kg b. wt.) which were divided into four groups of 6 pigs each and were fed with control diet CFM (T0), CFM plus polyherbal superliv (500g/ton) (T1), CFM plus polyherbal Ruchamax (500g/ton) (T2) and CFM plus AV/AGP/10 polyherbal (500g/ton) (T3). The hematological parameters like RBC, Hb, PCV, MCV, MCH, MCHC, platelets and MPV estimated from the blood collected at the initial, mid and final stages of the experiment were within normal range except WBC. The biochemical parameters like creatinine, protein, albumin, globulin, ALT, AST and ALP were also within normal range. It was concluded that none of the polyherbal supplements influence the haematological and biochemical values and cause no adverse effect on pigs which indicated that the quantity of polyherbals supplemented was at safer level. However, the level can be further increased in the diets of growing pigs for better performance.

Keywords: Feed Additives, Polyherbs, Heamato biochemical profiles, Yorkshire Pigs

1. Introduction
Several herbs existed since prehistoric period worldwide have been used as medicines for various therapies due to their safety and security in contrast to the synthetics that are unsafe to human and environment. These plant products are used either single or in combination (polyherbs) to elicit better effect as medicine. The phytochemical constituents in herbs include saponins, tannins, alkaloids, alkenyl phenols, flavonoids, terpenoids, phorbol effects etc. which have desired healing effect (Meena *et al.*, 2009) [7]. The pharmacological effects of herbs in animals include stimulation of immune system, antibacterial activity, coccidiostatic, anti-helmenthic, antiviral and anti-inflammatory properties (Costa *et al.*, 2007) [1]. Several experiments conducted on various species of livestock for establishing the safety level have shown that there was an improved performance of beef and dairy cattle (Yang *et al*., 2007) [12]. Nowadays, use of polyherbals, was more significant in non ruminants particularly in poultry and swine than in ruminants. However, the data available on usage of various commercial polyherbal formulations on different species of livestock is lacking with respect to their dose and safety as feed supplement. Hence, the present experiment was undertaken to study the effects and safety of some commercial polyherbal feed additives on haematological and biochemical parameters in Yorkshire male pigs.

2. Materials and Methods
Twenty four Yorkshire male pigs (Age: 2 months, B.wt.: 12.50-12-52kg with 80% Yorkshire blood line) were divided into 4 groups of 6 pigs each. All groups were fed with common concentrate feed mixture (CFM), the group fed only CFM without any polyherbal additive served as control group (T0), T1 group was supplemented with polyherbal Superliv® (Liver stimulant), T2 with polyherbal Ruchamax®, (Appetite stimulant and digestive tonic) and T3 with polyherbal AV/AGP/10 (Bacteriostatic herbal growth promoter with essential oils). All pigs were housed individually in metal crates in a metabolic shed throughout the experimental period with good ventilation and were provided with similar management practices. Each crate had separate facilities for feeding and watering. All pigs were dewormed using Fenbendazole (Panacur®, 50mg/kg B.wt) and Metrinidazole (Flagyl®, 20-60 mg/kg B.wt) as per the standard schedule. The trial was carried out for 90days (13weeks). During the experiment period daily feed intake, weekly body weight was recorded. Blood samples were collected before the start, mid and at the end of experiment at 9 am before feeding from ear vein of all experimental pigs using EDTA vials in two sets. One set of samples was used for complete blood picture analysis

like WBC, RBC, hemoglobin, packed cell volume (Thorn, 2000) [11] and other set of sample was used for plasma separation by centrifugation. Plasma was used for analysis of aspartate transferase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP), total protein creatinine, albumin and globulin (Radostits *et al*., 2000) [9]. Data were analyzed by statistical analysis system (SAS, 2012) [10] and results interpreted accordingly.

3. Results and Discussion

Significantly higher (P<0.05) WBC values in T2 group, lower in T3 group and no difference between T0 and T1 groups were recorded whereas significantly higher (P<0.05) WBC values were noticed at initial of the experiment which was reduced significantly to lower levels (Table 1). The values recorded between the treatments and stages were above the normal values (10 -12 $x10^3$/µl). However, Igbasan and olugosi *et al.* (2013) [4] and Elagib *et al.* (2013) [2] reported that WBC values were not altered due to supplementation of herbal methionine in broilers. T3 group showed significantly higher RBC values than other groups and the values were gradually increased as the experiment advanced to the end and these values were within the normal range (5-8 $x10^6$/µl). Hemoglobin (Hb) values between the treatment groups were non-significant but between the stages were significant (P<0.01) which followed the same trend as that of RBC values, where Hb value significantly improved from initial (10.54) to final (15.78) stage of the experiment but lies within the normal range (10 – 15, g/dl). Similar results were noticed between the treatment when garlic powder was fed to broiler with respect to RBC and Hb values (Elagib *et al.* 2013) [2]. On contrary Praveen *et al.* (2015) [8] noticed significantly higher (P<0.01) Hb value when yakrifit bolus was given to pigs. No significant difference was noticed between the treatment groups in PCV (%) values but the values were significantly increased to 55.99% from 37.25% at final and initial stages of the experiment was higher than the normal values (30-48%). However, Praveen *et al.* (2015) [8] reported significantly higher (P<0.01) PCV values (37.1%) when piglets were fed with herbal growth promoter (AV/AGP/10) which were lower than the values reported in this study.

Different polyherbal supplementation could not elicit any significant difference among the treatment groups in MCV and MCHV values (Table 2) when compared to control group (T0) where as both the values were improved significantly (P<0.01) as the trial progressed. However, the values were within the normal range (MCV- 50-68fl; MCH 16-21 pg).

MCHC and platelets values did not differ among the treatment groups due to polyherbal supplementation but both were significantly different between the stages of the experiment and they were within the normal range (MCHC-29-34g/dl; platelets -300-500 $x10^3$/µl). MPV values were significantly higher (P<0.01) in T0 group than other treatment groups which indicated that herbal supplements did not influence the MPV values among the groups but significant (P<0.01) improvement was noticed at mid and final stages of the experiment when compared to initial stages of the experiment.

No significant difference among the treatment groups was observed in creatinine, protein values except creatinine values recorded at different stages of experiment which was significantly(P<0.01) elevated from 1.22-1.62 mg/dl at final stages of the experiment. However, numerically a higher plasma proteins level was noticed in T1 group which was due to significantly higher intake of crude protein (Table 3). Albumin and globulin levels between the treatment and stages were significantly (P<0.01) different where significantly higher albumin in values were recorded in T3 group and globulin in T0 groups. However, the values obtained in the experiment were well within the normal range.

No significant difference was observed between the treatment groups in ALT, AST and ALP values where as between the stages, all the three plasma enzyme level were significantly (P<0.01) elevated from initial of the experiment to the final stages of the experiment. As the polyherbal formulations, one or the other way, they were either liver stimulants or growth promoters, over a period of supplementation, stimulated the liver for higher intake of feed and better weight gain when compared to control group (Table 4). As far as liver specific enzyme levels were concerned with respect to supplementation of various herbal preparations in the diet of broilers, goats and pigs, no difference was observed in the serum enzyme levels (Kiran *et al.* 2012; Galbat *et al.* 2014; Kumar *et al.* 2014; Praveen *et al.* 2015) [5, 3, 6, 8]. These values were within the normal range in all groups.

It can be concluded that the none of the polyherbal supplements influence the haematological and biochemical values and cause no adverse effect on pigs which indicated that the quantity of polyherbals supplemented was at safer level. However, the level can be further increased in the diets of growing pigs for better performance.

Table 1: Mean WBC, RBC, Hb, PCV and MCV recorded during initial, mid and final stages of experiment in pigs

Particular	T0	T1	T2	T3	Mean	SEM	P-value	
							Treatment	Stage
WBC, x10000/µl								
Initial	31.27	28.23	39.00	24.18	30.67^{AB}	1.102	<0.05	0.028
Mid	35.40	35.60	40.62	30.43	35.51^{A}			
Final	27.05	29.93	34.50	21.57	28.26^{B}			
Mean	31.24^{ab}	31.25^{ab}	38.04^{a}	25.39^{b}				
RBC, x10^6 /µl								
Initial	5.71	6.06	5.84	5.86	5.87^{B}	0.129	0.012	<0.01
Mid	6.20	6.51	6.58	7.17	6.62^{B}			
Final	7.61	6.66	8.03	9.60	7.98^{A}			
Mean	6.51^{b}	6.41^{b}	6.82^{ab}	7.54^{a}				
Hb, g/dl								
Initial	10.40	11.28	10.28	10.20	10.54^{C}	0.300	0.160	<0.01
Mid	13.33	13.57	13.43	14.52	13.71^{B}			
Final	15.75	13.02	15.58	18.75	15.78^{A}			
Mean	13.16	12.62	13.10	14.49				

PCV,%								
Initial	36.98	39.2	36.4	36.43	37.25^{C}	0.896	0.127	<0.01
Mid	43.32	44.77	44.92	47.67	45.17^{B}			
Final	55.7	47.48	55.77	65.02	55.99^{A}			
Mean	45.33	43.82	45.70	49.71				
MCV, fl								
Initial	64.85	64.85	62.37	62.6	63.67^{B}	0.362	0.011	<0.01
Mid	69.85	68.8	68.22	66.52	68.35^{A}			
Final	73.48	71.58	69.12	67.48	70.42^{A}			
Mean	69.39^{a}	68.41^{ab}	66.57^{ab}	65.53^{b}				

*P<0.05, **P<0.01, Means with different superscripts in a column (^{abc}) and row (^{ABC}) differ significantly.

Table 2: Mean MCH, MCHC, Platelets and MPV recorded during initial, mid and final stages of experiment in pigs

Particular	**T0**	**T1**	**T2**	**T3**	**Mean**	**SEM**	**P-value**	
							Treatment	**Stage**
MCH, fl								
Initial	18.15	18.60	17.58	17.43	17.94^{C}	0.123	<0.01	<0.01
Mid	21.47	20.83	20.35	20.23	20.72^{A}			
Final	20.48	19.58	19.18	19.37	19.65^{B}			
Mean	20.03^{a}	19.67^{ab}	19.04^{b}	19.01^{b}				
MCHC, g/dl								
Initial	20.07	28.77	28.20	27.90	26.24^{B}	0.106	0.567	<0.01
Mid	30.72	30.25	29.85	30.38	30.30^{A}			
Final	27.92	27.35	27.75	28.68	27.93^{B}			
Mean	26.24	28.79	28.60	28.99				
Platelets, x10000/µl								
Initial	382	442	410	383	404.25^{A}	10.711	0.444	<0.01
Mid	335	375	356	422	372.00^{AB}			
Final	344	364	299	247	313.50^{B}			
Mean	353.67	393.67	355.00	350.67				
MPV, fl								
Initial	9.30	8.55	8.67	8.52	8.76^{B}	0.069	<0.01	<0.01
Mid	10.15	9.55	9.77	9.42	9.72^{A}			
Final	9.90	9.32	9.58	9.68	9.62^{A}			
Mean	9.78^{a}	9.14^{b}	9.34^{ab}	9.21^{b}				

**P<0.01, Means with different superscripts in a column (^{abc}) and row (^{ABC}) differ significantly

Table 3: Mean creatinine, protein, albumin and globulin recorded at initial, mid and final stages of experiment in pigs

Particular	**T0**	**T1**	**T2**	**T3**	**Mean**	**SEM**	**P-value**	
							Treatment	**Stage**
Creatinine, mg/dl								
Initial	0.80	0.73	0.76	2.59	1.22^{A}	0.092	0.035	<0.01
Mid	0.58	0.59	0.83	0.68	0.67^{B}			
Final	1.51	1.77	1.53	1.68	1.62^{A}			
Mean	0.96	1.03	1.04	1.65				
Protein, g/dl								
Initial	4.75	9.56	5.20	5.41	6.23	0.396	0.578	0.853
Mid	7.42	6.33	6.25	6.89	6.72			
Final	7.07	6.58	6.90	6.16	6.68			
Mean	6.41	7.49	6.12	6.15				
Albumin, g/dl								
Initial	3.18	3.87	3.19	6.13	4.09^{A}	0.160	<0.01	<0.01
Mid	0.89	3.90	3.76	2.73	2.82^{B}			
Final	3.80	4.13	4.13	4.80	4.22^{A}			
Mean	2.62^{b}	3.97^{a}	3.69^{ab}	4.55^{a}				
Globulin, g/dl								
Initial	1.57	1.71	2.01	0.72	1.50^{C}	0.209	<0.01	<0.01
Mid	6.53	2.43	2.49	4.16	3.90^{A}			
Final	3.26	2.45	2.77	1.37	2.46^{B}			
Mean	3.79^{a}	2.20^{b}	2.42^{ab}	2.08^{b}				

*P<0.05, **P<0.01, Means with different superscripts in a column (^{abc}) and row (^{ABC}) differ significantly

Table 4: Mean ALT, AST and ALP recorded at initial, mid and final stages of experiment in pigs

Particular	T0	T1	T2	T3	Mean	SEM	P-value	
							Treatment	Stage
ALT, IU/L								
Initial	31.75	16.42	14.13	17.41	19.93^{B}	1.677	0.016	<0.01
Mid	27.56	22.24	18.21	26.61	23.66^{B}			
Final	38.56	34.21	34.80	36.59	36.04^{A}			
Mean	32.62	24.29	22.38	26.87				
AST, IU/L								
Initial	7.23	5.70	6.78	5.32	6.26^{B}	1.670	0.017	<0.01
Mid	17.51	35.48	27.32	16.44	24.19^{A}			
Final	32.18	25.43	47.32	29.83	33.69^{A}			
Mean	18.97	22.20	27.14	17.20				
ALP, IU/L								
Initial	63.41	37.60	20.38	17.61	34.75^{B}	3.506	0.970	<0.01
Mid	45.45	57.72	50.92	62.13	54.06^{B}			
Final	49.42	55.80	80.66	84.15	67.51^{A}			
Mean	52.76	50.37	50.65	54.63				

*P<0.05, **P<0.01, Means with different superscripts in a column (^{abc}) and row (^{ABC}) differ significantly

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