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Effect of Feeding Japan Hlo (*Mikania micrantha* Kunth.*)* as Unconventional Protein Source on Haemato-biochemical Profiles of Growing Large White Yorkshire Pigs (LWY) in Mizoram

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A B S T R A C T

The study was to assess the effect of feeding Japan hlo (*Mikania micrantha* Kunth.*)* in '*meal form*' (JLM) as protein substitute on haemato-biochemical profiles of growing LWY pigs. Sixteen weaned LWY pigs were assigned four dietary treatments with JLM at 0%, 5%, 10% and 15% level as substitute of soyabean meal (SBM) at an amount on equivalent protein basis for a period of 75 days. For haemato-biochemical parameters, blood were collected at 0, 30th, 60th, 75th days of experiment and analysed utilising commercial analytical kits and following standard procedures. The results revealed no significant differences (P>0.05) in both haematological and biochemical parameters among the treatment groups up to 15% JLM inclusion level. The parameters were observed to be within normal range in all the groups, although were variable. Thus, it was concluded that Japan hlo (*Mikania micrantha* Kunth.*)* in '*meal form*' can be utilised up to 15% level as protein source replacing soyabean meal (SBM) at an amount on equivalent protein basis in growing LWY pigs of Mizoram.

Introduction

Piggery contributes substantially to economic sustainability of rural farmers in Mizoram. About 69.33% of the total livestock population of the state is pigs (Economic Survey Mizoram, 2017-18) and is one of the prime sources of livelihood and employment avenue of the state. The pig rearing practice in Mizoram is mainly of backyard type characterised by extensive uses of local vegetation, agro-wastes, and household and kitchen wastes (Kumaresan *et al.*, 2006). Amongst the various local unconventional feedstuffs, 'Japan hlo' (*Mikania micrantha* Kunth.) is one of the commonly used feed resource by the pig farmers of the state for its abundant availability throughout the year (Buragohain, 2012 and 2013). As the conventional ingredients are expensive, the search for alternative feed sources is the need of the hour to increase production efficiency of pigs (Nguyen *et al.*, 2010). In this regard, Japan hlo may be a promising alternative to the conventional ingredients of pigs raised under rural production system in Mizoram. It

is a good source of protein (21.76% crude protein on dry matter basis) with the lysine, methionine, aspartate, threonine, leucine, phenylalanine and alanine levels at 6.90, 2.40, 12.0, 5.70, 9.50, 6.10, 6.30 gm%, respectively (Hock-Hin Yeoh, 1992).

In the present study, an attempt was made to elucidate the effect of feeding Japan hlo in '*meal form*' at different levels as protein source substituting the conventional soyabean meal on equivalent protein basis on haemato-biochemical profiles of growing LWY pigs in Mizoram.

Materials and Methods

The study was carried out in the Instructional Livestock Farm Complex (ILFC) of College of Veterinary Sciences & Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram.

Sixteen weaned pure breed LWY piglets (average body weight 20.10±3.24 to 20.63±3.75 kg) were randomly selected from the herd maintained at ILFC, College of Veterinary Sciences & Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram and were divided into four experimental groups (G - I, II, III and IV) with four piglets in each group.

The Japan hlo **(***Mikania micrantha* Kunth.) was collected from different places in and around Selesih, Aizawl, Mizoram were pooled together and sun- dried before milling using grinding machine to prepare JLM.

Four experimental isonitrogenous rations were formulated (NRC, 1998) where Japan hlo (*Mikania micrantha* kunth.) meal (JLM) was incorporated at the rate of 0%, 5%, 10% and 15% level by replacing soyabean meal(SBM) at an amount on equivalent protein basis (Table 1).

The experimental pigs were housed individually under intensive management with provision for individual feeding and watering. The feed was provided *ad libitum* and drinking water was made available all the time. The feeding trial was carried out for 75 days with 7 days adaptation period at the start of the experiment.

For haematological and biochemical parameters, blood were collected from 3 piglets of each group at 0, 30^{th}, 60^{th}, 75^{th} of experiment following standard procedures. The experimental animals were restrained in ventro-dorsal position and the blood was collected directly from anterior vena-cava under aseptic condition. For biochemical parameters, serum was immediately separated by centrifugation and stored at -20^{0}C till further analysis. For haematological parameters, blood was collected in sterile tubes having EDTA as anti-coagulant. Haematological parameters were analysed following standard laboratory procedures, whereas the biochemical parameters were estimated using commercial analytical kits of Coral India Limited.

The data obtained were tabulated and subjected to statistical analysis as per the methods of Snedecor and Cochran (1994).

Results and Discussion

The nutritional composition of the experimental rations fed to different experimental groups is depicted in table 2.

Haematological parameters

Haematology can be important in early identification of physical illness or disease. Variations in size, shape and number of blood cells give early insight into the general functioning of blood and bone marrow. Haematological parameters are indicators of

the physiological status of animals (Khan and Zafar, 2005) and animals with good blood composition show good performance (Isaac *et al.*, 2013).

Haemoglobin (Hb) level is primarily used for assessment of anaemia or its reverse, polycythaemia. In the present study, the Hb levels in all the groups were within the normal range throughout the experimental period indicating that feeding of JLM had no significant effect on Hb level of growing LWY pigs. The values were variable and ranged from 15.80±0.06 to 16.33±0.19 (g%/dl) for G-I i.e. without JLM in the ration and 15.73±0.09 to 16.27±0.19 (g%/dl) in JLM supplemented groups. However, Hb levels were comparatively lower in G-III and G-IV as compared to G-I and G-II. This might be effect of JLM on metabolic process of the animals.

Packed cell volume (PCV) measures the percentage of red blood cells in a standard volume of blood and is used to determine the presence and type of anaemia. In the present study, the PCV ranged from 29.48±0.34 to 30.40±0.17 in Gr. I and 29.40±0.12 to 31.40±0.10 in treatment groups. As no significant differences was observed and the values were within the normal range, it indicated that JLM had no significant effect on PCV level up to 15% feeding level.

Low total leucocytes count (TLC) indicates suppression of immune system of animals. The TLC levels were found to be within normal range and therefore was concluded that JLM did not impart any stress and impair immune system of the growing LWY pigs.

A low RBC count indicates anaemia, excess body fluid and blood loss, whereas a high count occurs in dehydration and in polycythaemia. In the present study, statistical analysis revealed no significant differences in TEC of pigs of different treatment groups. It might be the indication that JLM can be included up to 15% level in growing LWY pigs without any adverse effects in the synthesis of RBC of blood. However, TEC was comparatively lower at 10% and 15% JLM inclusion level (Table 3).

Table.1 Ingredient composition of the experimental rations with JLM at varying levels

Ingredients	G-I	G-II	G-III	G-IV
Maize	51	49.4	42.5	41.25
Rice Polish	20	18	22	20
Soyabean Meal	22	19.6	17.2	14.75
Fish Meal	4	5	5.3	6
Mineral Mixture	2.5	2.5	2.5	2.5
Common salt	0.5	0.5	0.5	0.5
JLM	0	5	10	15
Total	100	100	100	100
Cost/Kg (Rs.)	30.63	29.02	26.97	25.28

Table.2 Nutritional composition (% DM basis) of rations of experimental groups

Nutrient	G-I	G-II	G-III	G-IV
DM (%)	9.40	89.60	89.50	89.40
CP (%)	8.06	18.08	18.07	17.99
CF (%)	4.32	5.07	6.43	7.18
EE (%)	3.87	3.48	3.64	3.79
TA (%)	12.24	11.75	12.98	12.66
NFE (%)	61.51	61.62	58.88	58.38
OM (%)	87.76	88.25	87.02	87.34
*ME (kcal/kg)	3311	3208	3116	3014
*Lysine (%)	1.02	0.96	0.90	0.83
*Methionine (%)	0.38	0.36	0.36	0.34
*** Calculated values.**				

Table.3 Haematology in LWY pigs fed JLM at varying levels

Day	G-I	G-II	G-III	G-IV	p-value
Haemoglobin (%)					
0	15.80±0.06	15.90±0.25	15.80±0.06	15.83±0.17	0.963^{ns}
30th	16.00±0.10	16.07±0.24	15.97±0.13	15.77±0.38	0.835^{ns}
60th	16.30±0.15	16.27±0.19	15.73±0.09	16.07±0.24	0.166^{ns}
75th	16.33±0.19	16.20±0.30	15.90±0.06	16.17±0.19	0.522^{ns}
PCV (%)					
0	29.90±0.06	29.75±0.20	29.84±0.19	29.48±0.07	.268^{ns}
30th	29.60±0.35	29.40±0.12	29.90±0.06	30.00±0.06	.170^{ns}
60th	30.40±0.17	31.40±0.10	30.25±0.32	30.22±0.04	.469^{ns}
75th	29.48±0.34	29.87±0.44	29.92±0.45	29.78±0.17	.840^{ns}
TLC (1000/ml)					
0	5.50±0.15	5.47±0.15	5.45±0.10	5.44±0.08	0.986^{ns}
30th	5.65±0.09	5.43±0.01	5.42±0.10	5.33±0.19	0.315^{ns}
60th	5.80±0.06	5.96±0.06	6.20±0.06	5.90±0.25	0.271^{ns}
75th	6.33±0.13	6.47±0.03	6.28±0.12	6.49±0.24	0.713^{ns}
TEC (1000/ml)					
0	3.07±0.08	2.94±0.02	2.91±0.09	2.92±0.03	0.322^{ns}
30th	3.00±0.08	3.08±0.01	2.92±0.08	2.99±0.03	0.498^{ns}
60th	3.09±0.06	3.01±0.09	2.96±0.06	2.97±0.03	0.333^{ns}
75th	2.99±0.05	3.06±0.08	3.07±0.03	3.09±0.06	0.618^{ns}

Means bearing different superscript (a, b, c) in a row differ significantly (P<0.05)

Table.4 Biochemical parameters in LWY pigs fed JLM in Mizoram

Day	G-I	G-II	G-III	G-IV	p-value
AST (IU/L)					
0	66.81±4.73	75.00±0.58	64.82±2.07	66.19±3.78	^{ns}0.185
30th	75.56±1.99	73.53±1.36	75.73±2.04	76.00±0.57	^{ns}0.694
60th	85.61±0.11	85.03±2.35	84.31±1.57	84.87±1.43	^{ns}0.950
75th	90.95±0.24	92.71±1.17	92.35±1.13	91.26±0.17	^{ns}0.419
ALT (IU/L)					
0	6.75±0.26	7.45±1.18	8.20±1.56	9.05±0.72	^{ns}0.489
30th	9.95±0.66	11.15±0.89	10.05±1.01	10.15±0.61	^{ns}0.711
60th	12.61±0.33	12.67±0.0.08	12.88±0.17	13.53±0.56	^{ns}0.274
75th	14.44±1.13	15.03±0.87	16.75±1.19	15.32±1.00	^{ns}0.499
ALP (IU/L)					
0	9.90±0.17	10.20±0.92	10.13±0.48	9.87±0.18	^{ns}0.960
30th	12.29±0.39	12.58±0.45	13.23±0.34	13.29±0.12	^{ns}0.190
60th	20.02±0.39	20.05±0.36	20.24±0.86	20.23±0.69	^{ns}0.990
75th	30.29±0.99	31.56±0.42	31.36±0.64	31.01±0.02	^{ns}0.537
Glucose (mg/dl)					
0	93.33±0.83	93.37±0.05	93.32±0.39	92.90±0.13	^{ns}0.877
30th	92.20±0.11	92.05±0.48	89.89±1.72	89.72±1.02	^{ns}0.244
60th	90.16±0.68	89.16±0.68	88.51±0.55	88.46±0.56	^{ns}0.258
75th	89.05±0.81	87.14±1.30	89.19±0.66	88.71±0.47	^{ns}0.376
Total protein (mg/dl)					
0	8.08±0.11	8.39±0.13	8.41±0.28	8.67±0.12	^{ns}0.209
30th	8.63±0.04	8.59±0.07	8.74±0.05	8.54±0.11	^{ns}0.305
60th	8.79±0.02	8.83±0.04	8.76±0.08	8.69±0.05	^{ns}0.455
75th	8.86±0.03	8.83±0.01	8.82±0.08	8.79±0.07	^{ns}0.845
Albumin (g/dl)					
0	4.94±0.02	4.86±0.04	4.90±0.01	4.91±0.05	^{ns}0.414
30th	5.03±0.04	5.04±0.02	5.04±0.02	5.02±0.11	^{ns}0.990
60th	5.12±0.05	5.28±0.06	5.13±0.02	5.25±0.11	^{ns}0.251
75th	5.02±0.01	5.57±0.24	5.55±0.20	5.64±0.26	^{ns}0.194
Creatinine (mg%)					
0	0.88±0.01	0.91±0.03	0.88±0.01	0.91±0.02	^{ns}0.465
30th	0.96±0.01	0.95±0.02	0.99±0.01	1.01±0.02	^{ns}0.137

60th	0.98±0.01	1.03±0.03	1.03±0.05	1.17±0.10	0.189ns
75th	1.05±0.08	1.28±0.04	1.24±0.03	1.24±0.14	0.266ns
BUN (g%)					
0	33.25±0.76	33.71±0.87	33.17±0.51	32.93±0.65	0.887ns
30th	34.54±0.69	34.69±0.74	35.92±0.89	35.25±0.59	0.565ns
60th	35.97±0.57	36.83±1.11	37.06±0.79	37.09±0.81	0.764ns
75th	36.48±0.54	37.45±0.73	39.21±1.28	38.24±0.72	0.226ns
Cholesterol (mg/dl)					
0	71.01±0.28	71.72±0.21	71.80±0.98	72.91±1.71	0.623ns
30th	72.95±1.25	74.36±1.18	74.32±0.58	74.25±0.69	0.698ns
60th	73.29±0.59	73.41±1.35	72.75±0.83	72.47±1.26	0.908ns
75th	75.34±0.58	74.11±2.83	72.23±1.26	71.19±1.03	0.354ns
Triglycerides (mg/dl)					
0	122.08±0.88	123.24±0.84	121.91±0.69	121.99±0.77	0.622ns
30th	122.65±1.37	121.96±0.68	122.03±1.17	121.35±0.55	0.837ns
60th	122.69±0.80	122.04±1.05	121.43±0.87	120.52±0.38	0.343ns
75th	121.93±0.97	120.76±0.99	120.36±0.76	119.97±0.25	0.399ns

Means bearing different superscript (a, b, c) in a row differ significantly (P<0.05)

In a feeding trial in growing LWY pigs, Fasuyi *et al.*, (2013) reported that *Tithonia diversifolia* (wild sunflower) leaf meal could be incorporated up to 20% level as protein supplement without significant (P<0.05) effects in haematological parameters namely TLC, and could be a suitable health diet at 10% level to combat some fatty acid metabolic diseases in pigs. Olayeni *et al.*, (2012) also reported no significant differences (P>0.05) in haemoglobin, packed cell volume, total red blood cell count and mean corpuscular haemoglobin level in pigs when fed wild sunflower (*Tithonia diversifolia*) leaf meal.

Blood biochemical profile

Biochemical profile assesses the function of internal organs, measures the electrolytes and identifies the levels of circulating enzymes.The serum metabolites (albumin, globulin, creatinine and urea) are indicators of adequacy of protein in terms of quality and quantity in the diet. These parameters show whether there are protein malnutrition, alterations in the dietary intake of protein and pattern of utilization, and possibly the extent of muscle wastage and subsequent degradation of muscle (Eggum, 1970). Other serum metabolites (glucose, triglyceride and cholesterol) indicate the efficiency of utilisation of metabolisable energy in a given ration (Fanimo, 1991 and Anderson, 1983). High level of AST and ALT indicates muscle damage, heart muscle damage, liver damage, toxin ingestion, inflammation and various metabolic disorders, whereas their low level indicates starvation or malnutrition (Table 4).

In the present study, both the AST and ALT levels were within the normal range besides without any significant differences (P>0.05) among the groups throughout the study

period.

High level of alkaline phosphatase (ALP) indicates bile duct obstruction, liver disease etc. and low level is indication of starvation or malnutrition. As the ALP levels were within normal range and no significant differences (P>0.05) was recorded, it can be opined that JLM can safely be incorporated up to 15% level without any adverse effects on body metabolism and on the liver of LWY pigs.

High glucose level indicates stress, diabetes and pancreatitis and low level is the indication of liver disease, severe bacterial infection and hypothyroidism. The glucose levels (g/dl) were found to be within the range (89.05±0.81 to 93.33±0.83) without any significant differences (P>0.05).

High serum total protein (TP) level indicates dehydration, inflammation, chronic infection and certain cancers and its low level indicates intestinal absorption problems, liver disease, and losses through the kidneys. Serum albumin carries various substances important for maintaining pressure within the vessels. High level indicates dehydration and low level indicates chronic inflammation, liver disease, kidney disease, starvation and blood loss. In the present study, both the serum TP and albumin levels were found to be within the normal range without any statistical significance (P>0.05). This might be the indication that feeding of JLM to the growing pigs up to 15% level had no adverse effects on the health status of the pigs.

High level of BUN indicates kidney failure or disease, dehydration, shock, high protein diet, certain toxin ingestions, poor circulation to the kidneys and urinary obstruction and low level indicates liver disease or starvation. Although no significant differences (P>0.05) were observed, BUN levels in G-III and G-IV with 10% and 15% JLM inclusion were comparatively higher. As JLM is known to contain some anti-nutritional factors, this might contributed to higher BUN levels in G-III and G-IV as ingestion of such substances might be more than at low (5% JLM) or non-supplemented groups. However, since values were within the normal range, it might indicate that feeding of JLM had no adverse effects on BUN in growing LWY pigs.

Low level of serum cholesterol indicates liver disease, starvation, kidney disease, pancreatitis, diabetes and hypothyroidism and higher level is associated with seizures. The estimated cholesterol and triglyceride levels were within normal range without significant differences (P>0.05). Fasuyi *et al.*, (2013) also observed no significant difference (P<0.05) in serum total protein level for dietary inclusion of *Tithonia diversifolia* leaf meal from 10% to 30% level in growing LWY pigs.

From the findings of the present study, it was concluded that JLM could be incorporated up to 15% level as substitute of soyabean meal at an amount on equivalent protein basis in the ration of growing LWY pigs without any significant effects on blood haematological and biochemical parameters.

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