

# EFFECT OF FEEDING DETOXIFIED NEEM (*AZADIRACHTA INDICA*) CAKES ON CHEVON CHARACTERISTICS OF GOATS.

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## ABSTRACT

To know the effect of feeding detoxified neem cake (dNC) on chevon characteristics and gross and histopathological changes in vital organs, eighteen growing Marwari male kids (BW  $16.82 \pm 0.18$ ) were randomly allotted to three groups for 120 days experiment. The group dNC-0 as control whereas dNC-25 and dNC-75 group were fed dNC replacing dietary soybean protein at 25 and 75 % level in the concentrate. The dressing percentage on pre slaughter and empty body weight basis ranged between 46.17 and 48.95 and 61.97 and 65.41, respectively, the weight of Liver (1.2-1.36), Lungs and trachea (1.08-1.12), Heart (0.44-0.61), Kidney (0.23-0.26), Spleen (0.16-0.17) and GIT (full: 24.13-25.29 and empty: 4.65-5.06) as % pre slaughter weight also statistically similar. No any gross lesions and pathological changes were found in vital organs of kids fed detoxified neem cake. There was no significant difference in chemical composition (CP%; 19.09 to 19.73 and fat% 2.44 to 2.66) of *longissimus dorsi* muscle of kids of different groups. It was concluded that the detoxified neem cake can be incorporated in concentrate mixture by replacing soybean meal protein up to 75% level without affecting chevon characteristics and gross and histo pathological changes in vital organs of growing kids.

## INTRODUCTION

The goat is one of the efficient converters of low quality feed into valuable animal protein. India ranks first in the world with a goat population of 111.3 million (FAOSTAT,2010), Chevon consumption in India, unlike beef and pork, has special sociocultural prestige since it has no religious taboos. However, in developing countries the balance between animal population and feed resources is so critical that the latter is often limiting. To mitigate the shortage of feeds with oil cakes, various new feed resources were tried in livestock feeding.

Neem seed cake, a protein rich (35-40% CP) agro-industrial by-product hitherto utilized as fertilizer-cum-pesticide, was found unsuitable for animal feeding due to presence of bitter and toxic triterpenoids (azadirachtin, salanin, nimbin and nimbidiol etc.), adversely affecting the growth, male reproductive system and sometimes even led to haematuria (Rao and Nath, 1979) despite similar intake of digestible energy and digestible crude protein (Rajagopal and Nath, 1981). Consequently, the cake has been treated by various methods, including water washing and successfully tested in goats up to 25% (Verma *et al.*, 1995, 1996 and Rao *et al.*, 2003), sheep up to 15% (Madhavi *et al.*, 2006) and alkali treatment (Katiyar *et al.*, 1993) without affecting the qualitative and quantitative carcass characteristics. The present study was designed to investigate the effect of replacement of Soya bean meal by detoxified neem cake as a major source of protein in concentrate mixture on carcass traits and gross and histopathological changes in vital organs.

## MATERIALS AND METHODS

### Detoxification of neem cake

The detoxified neem cake for the experiment was obtained from Ayurved Research Foundation Ltd., New Delhi. The detoxification method followed involves cleaning of seeds to remove dirt and other foreign matter. Then they ground and defatted using n-Hexane as a solvent. The defatted seed cake was then refluxed with 95% Methanol. The extract obtained was then filtered and the seed powder refluxed 4 times with ethanol (Gowda and Sastry 2000). The cake was then dried at 60-80°C to obtain a final moisture level at 6-8% (w/w). The detoxified neem cake contain 0.032% Azadirachtin, 492 (TIU/g) Trypsin inhibition activity and 0.025% Salanine.

### Animals, housing and feeding management

Eighteen growing Marwari kids, age 6-8 months of similar body weight were randomly divided into three groups (dNC-0, dNC-25 and dNC-75) comprising of six kids each in a completely randomized design. The average body weights were  $16.47 \pm 0.53$ ,  $16.75 \pm 0.98$  and  $16.63 \pm 0.93$  kg in dNC-0, dNC-25 and dNC-75, respectively. The group dNC-0 served as control whereas dNC-25 and dNC-75 group animals were fed detoxified neem cake replacing dietary soybean protein at 25 and 75 % level in the concentrate mixture (Table 1).

All the kids were housed under hygienic conditions in the stall. All the kids were dewormed with an anthelmintic, Albendazole (5 mg/ kg BW) and allowed to adapt for a few days before experimental feeding. Concentrate mixture was offered daily at 9.00 a.m. in addition to ad libitum jowar

(*Sorghum vulgare*) hay at 11.00 a.m and 3.00 p.m. They were let loose for exercise in the attached open yard daily for two hours in the morning and two hours in the afternoon, during which they had free access to fresh, wholesome drinking water.

### Carcass traits

After 120 days of feeding, all goats were deprived of feed and water for 24 hours and slaughtered as per standard procedures after recording pre slaughter weight (PSW). After bleeding, remove the skin, head (at the occipito-atlantal joint), forefeet (at the carpal-metacarpal joint), hind feet (at the tarso-metatarsal joint) and weight was recorded as dressed weight. After removal of gastrointestinal tract (GIT), the weight was recorder as dressed carcass weight. After removal of vital organs including heart, liver, lungs, spleen and kidney the weight was recorded as empty carcass weight. The weight recorded after deducting weight of filled GIT from PSW was noted as empty body weight. The weight of visceral organs viz. lungs with trachea, liver, heart, spleen, kidney and testes were recorded and expressed as PSW. The dressed carcass was partitioned as per ISI (1963) method into different primal cuts viz., Neck and shoulder, rib chops, loin and hind legs. The weight of each primal cut was carefully recorded.

During the carcass traits study the gross lesions for all the kids were systemically recorded and tissues like heart, liver, spleen, kidney, testicle and lungs and trachea were collected in 10% formalin. The formalin fixed tissues were processed by paraffin wax embedding method of tissue sectioning. Sections were cut at 6-7 microns thickness with automatic section cutting machine (SLEE-MAINZ, Germany) and stained with haematoxyline and eosin (H&E) stain (Luna, 1968). The H&E stained sections were used for records of microscopic lesions.

Longissimus dorsi muscle from each carcass was subjected to moisture, fat, protein and ash analysis as per the AOAC (1980). Sensory evaluation of cooked muscle was carried out for evaluating appearance, colour, flavour, texture, tenderness/juiciness and overall palatability adopting a seven point Hedonic scaling as described by Piggott (1984) by a panel of 15 semi-trained judges.

The data were subjected to statistical analysis using methods as given in Snedecor and Cochran (1994). The Completely Randomized Design was followed.

## RESULTS AND DISCUSSION

### Carcass characteristics

The pre-slaughter weight, empty body weight and dressed weight of goats were comparable among treatment groups. The dressing percentage on pre slaughter weight and empty

body weight basis ranged between 46.17 and 48.95 and 61.97 and 65.41, respectively did not differ significantly among the three groups. The observed dressed% were comparable to Nagpal *et al.* (1995) and Saiyed *et al.* (2003) reported in Marwari goats, Palanivel *et al.* (2010) in Barbari and Jamuna pari goats and Singh *et al.* (2009) in Beetal kids.

The primal cuts expressed as percent of carcass weight did not differ significantly irrespective of the dietary treatments. Legs contributed maximum to the carcass followed by the neck and shoulder, rib chops and loin, in all the three groups. The observation is corroborated by earlier report in goats (Verma *et al.*, 1996) fed WWNSKC. The weight of visceral organs and GIT (both full and empty) as % pre slaughter weight (Table 2) did not differ significantly among the three dietary treatments. The percentage contributions of different visceral organs are similar to those reported by Mahgoub and Lodge (1996) and Palanivel *et al.* (2010) in goats. Weight of vital organs, viz. lungs with trachea, heart, kidney and spleen as % pre slaughter weight were comparable, irrespective of the treatment groups. All the values were within the range as reported by Kulkarni *et al.* (1992). The yield of non carcass components such as blood, head and skin was also not affected due to feeding of dJC and the values were within the range reported by Palanivel *et al.* (2010) in goats. The observation is corroborated by earlier report in goats (Verma *et al.*, 1996) fed WWNSKC.

### Gross and histo-pathological changes in vital organs

No any gross lesions were found in heart, lungs and trachea, liver, spleen, rumen, intestine, kidneys and testicles of kids in dNC-75 group and also control and dNC-25 groups.

The microscopic view of haematoxyline and eosin stained sections of different organs of kids under dNC-75 group. No any pathological changes were observed in heart, liver, kidney and spleen. This confirmed that the detoxification procedure employed for processing neem cake used in the present experiment completely removed the toxic anti-nutritional factors. Similarly, Musalia *et al.* (2000) reported that no pathological changes were associated on total replacement of GNC by 33% UTNSKC in concentrate mixture of growing lambs except presence of micro-calculi in the kidney.

### Chemical composition

Table 3 indicates that, there was no significant difference in chemical composition of LD muscle of kids of different groups. The CP% varied from 19.09 to 19.73 and fat% 2.44 to 2.66 which was in range reported by Verma *et al.* (1996) for kids. No significant difference with reference to appearance, colour, flavour, texture, tenderness and juiciness could be judged in the meat of kids from different diets (Table 3). Feeding of

**Table 1: Ingredient composition of the concentrate mixture**

Ingredients (% as fed basis)	dNC-0	dNC-25	dNC-75
Maize	20	20.3	25
De-oiled rice bran	40	40	35
Soybean meal	27	20.2	7
Detoxified neem cake	-	6.5	20
Molasses	10	10	10
Mineral mixture	2	2	2
Salt	1	1	1

**Table 2: Effect of feeding graded levels of detoxified neem cake on carcass traits**

Attributes	dNC -0	dNC-25	dNC-75	P- value
<b>Carcass characteristics</b>				
Pre slaughter weight (kg)	26.43 ± 1.09	25.15 ± 1.81	25.13 ± 1.03	0.753
Empty body weight (kg)	20.04 ± 0.64	18.80 ± 1.23	18.70 ± 0.44	0.423
Dressed weight (kg)	12.85 ± 0.66	12.32 ± 0.98	11.59 ± 0.51	0.449
Dressed weight (% PSW)	48.58 ± 0.87	48.95 ± 0.92	46.17 ± 1.58	0.379
Dressed weight (% EBW)	64.04 ± 1.38	65.41 ± 0.95	61.97 ± 2.44	0.575
Shrinkage %	3.75 ± 0.36	4.30 ± 1.26	2.81 ± 0.42	0.292
<b>Weight of primal cuts (% dressed weight)</b>				
Neck and shoulder	23.53 ± 1.50	25.69 ± 0.39	25.47 ± 1.05	0.486
Rib chops	6.69 ± 0.15	6.80 ± 0.14	7.22 ± 0.45	0.675
Loin	5.28 ± 1.33	3.92 ± 0.28	5.05 ± 0.45	0.461
Hind legs	39.18 ± 0.91	38.89 ± 0.55	43.75 ± 3.84	0.582
<b>Yield of visceral organs (% pre slaughter weight)</b>				
Liver	1.36 ± 0.12	1.21 ± 0.01	1.23 ± 0.21	0.390
Lungs and Trachea	1.03 ± 0.04	1.12 ± 0.02	1.08 ± 0.03	0.270
Heart	0.61 ± 0.15	0.44 ± 0.03	0.47 ± 0.03	0.303
Kidney	0.24 ± 0.01	0.23 ± 0.02	0.25 ± 0.01	0.643
Spleen	0.17 ± 0.02	0.17 ± 0.05	0.16 ± 0.01	0.979
Diaphragm	0.23 ± 0.05	0.23 ± 0.02	0.20 ± 0.02	0.731
GIT (full)	24.13 ± 0.77	25.15 ± 1.00	25.29 ± 1.88	0.909
GIT (empty)	4.65 ± 0.31	4.66 ± 0.36	5.06 ± 0.12	0.349
Head	6.42 ± 0.12	6.64 ± 0.11	6.30 ± 0.23	0.620
Blood	3.11 ± 0.81	2.65 ± 0.46	3.12 ± 0.30	0.773
Skin	6.84 ± 1.68	8.91 ± 0.57	7.96 ± 0.38	0.344
Abdominal fat	0.94 ± 0.22	0.61 ± 0.21	1.03 ± 0.25	0.584

**Table 3: Chemical composition and organoleptic evaluation of longissimus dorsi muscle**

Chemical composition (%)	dNC -0	dNC-25	dNC-75	P- value
Moisture	74.89 ± 0.45	74.75 ± 0.37	75.25 ± 0.93	0.941
CP	19.73 ± 0.54	19.09 ± 0.04	19.28 ± 0.50	0.647
Ether extract	2.66 ± 0.69	2.50 ± 0.52	2.44 ± 0.98	0.976
Ash	1.12 ± 0.09	1.11 ± 0.01	1.14 ± 0.06	0.971
Ca	0.11 ± 0.01	0.11 ± 0.02	0.14 ± 0.02	0.373
<b>Sensory attributes</b>				
Appearance	6.5 ± 0.19	6.4 ± 0.16	6.1 ± 0.14	0.476
Colour	6.8 ± 0.22	6.5 ± 0.17	6.2 ± 0.19	0.535
Flavour/ Taste	7.1 ± 0.11	6.8 ± 0.34	7.0 ± 0.21	0.461
Texture/ Tenderness	6.8 ± 0.21	6.7 ± 0.43	6.5 ± 0.27	0.453
Juiciness	5.8 ± 0.25	5.5 ± 0.37	5.7 ± 0.21	0.633
Overall palatability	6.7 ± 0.23	6.6 ± 0.41	6.4 ± 0.44	0.458

detoxified neem cake did not affect quality of meat of kids, as overall palatability was quite comparable between meat of detoxified neem cake and soybean meal fed kids.

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