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Removal of Metallic Objects from Animal Feeds: Development and Studies on a new machine

A.G. Ramin[a], S. Jafari Shoorijeh[b]*, H.R. Ahmadi Ashtiani[c], M.M. Naderi[d], M.A. Behzadi[b] and A. Tamadon[b]

A simple machine was designed by the authors to remove different metallic objects from animal feed stuff. A series of experiments were conducted to judge the efficiency of the machine whose results revealed that the device could remove almost 100% of magnetic metallic objects and 50-62% of non-magnetic metallic material from different feed stuffs. Metallic objects were more efficiently removed from wheat, barley and alfalfa than hay. The rate of removal of nails and wire pieces was higher than that of needles.

KEY WORDS
Diet metal remover machine, traumatic reticuloperitonitis, iron metals, non-iron metals.

INTRODUCTION

Presence of sharp metallic objects in animal feeds causes a great economic loss to the livestock farmer. These objects once ingested by the animal especially ruminants may perforate the reticular wall causing severe ailments like vagus indigestion, diaphragmatic abscess, pneumonia, pleurisy, chronic pericarditis, and traumatic reticulo-peritonitis (TRP)[1,2].

[a]Department of Clinical Sciences, College of Veterinary Medicine, Uremia University, Uremia, Iran.
[b]Department of Clinical Sciences, School of Veterinary Medicine, Shiraz University, 1731, Shiraz 71345, Iran
[c]Department of Clinical biochemistry, College of Medicine, Tarbiat Modaress University, Tehran, Iran
[d]Department of Clinical Sciences, Veterinary College, Science and Research Section of Azad University, Tehran, Iran

TRP is of great economic importance as it causes severe production losses and high mortality rate in dairy cattle. Different measures are adopted to render the animal feed free from metallic objects to prevent TRP and other allied aliments. Passing of chopped feed over magnets repeatedly before being fed to cattle constitutes one of the preventive measures commonly adopted in organized dairy farms. Though, this process is time consuming and removes only a small fraction of magnetic materials, whereas non-magnetic objects are not removed at all. Similarly, the magnets administered orally to prevent or treat TRP can immobilize only those iron objects which are loose in reticulum and not embedded in to the reticular wall [3]. Rumenotomy may be the best treatment for TRP but is unnecessary in many instances because of tendency of foreign body to fall back in to the reticulum [4]. Therefore the only way to prevent TRP in dairy cattle is to make the animal feed absolutely free from metallic objects. During the present trial, an attempt was made to evolve and evaluate a device that could remove both the magnetic and non-magnetic metallic objects from different feed ingredients.

MATERIALS AND METHODS

A simple machine (Fig. 1) consisting of a funnel shaped inlet (part labeled 3) attached to a tubular body (part labeled 4) equipped with an electric motor (part labeled 2) on one end, a magnet (part labeled 6) at its base and a V shaped depression (part labeled 5) towards the outlet was designed by the authors themselves.

The efficiency of this machine in removing different metallic objects from commonly used animal feeds viz. hay, alfalfa, concentrate mixtures, wheat, barley, bread, straw and pulp was evaluated by conducting a series of experiments. The various metallic objects used in the trials included nails, wires, needles, aluminum, and copper pieces. Each of the metallic objects measured about 3 cms and weights ranged from 3-10 grams.

In the first experiment nails, needles, wires and copper pieces each 50 in number and 30 pieces of aluminum were mixed separately with 1, 2 and 5 Kgs of each food stuff and loaded one by one in the machine. The motor in the machine blows air towards the feed stuff at speeds sufficient to blow the feed particles out through the outlet canal. The nails, needles and wire pieces got stuck to the floor of the canal due to magnetic attractive forces. Owing to their weight copper and aluminum pieces got trapped in the V-shaped depression towards the canal outlet. The food particles blown out through the canal were collected and loaded again in the machine. This process was repeated ten times to obtain food stuff almost free from metallic materials. The trials were conducted separately for every food stuff and each metallic material.

To make the testing conditions more realistic the number of metallic objects were decreased in the second and third experiments. The food stuffs used in the second experiment were hay, alfalfa, barley, bread and straw. Only 10 objects from each of the metallic material were mixed with the food stuff and the mixture subjected to 10 operations of the machine. Similarly, in the third experiment the number of metals in every food stuff used was reduced to 3 each and the mixture subject to only 3 operations. The food stuff used in the third experiment consisted of hay, barley bread and straw.

The data generated there upon was statistically analyzed using 'SPSS for Windows' statistical software.

RESULTS AND DISCUSSION

The results of the various experiments are depicted in tables 1 to 4. It was observed that the machine could on an average remove 97.6%, 99.5% & 98.8% of needles, nails and wire pieces respectively. The rate of removal of copper was 50.2% while that of aluminum was 62.1%. The overall rate of removal got significantly increased on reducing the number of metallic objects mixed per unit quantity of the food stuff. The efficiency of the machine improved significantly when the number of each metallic objects mixed per unit quantity of feed was reduced from 50 to 10 and then to 3, making its use under actual field conditions a pragmatic possibility as incidence of metal impurities in common animal feeds is not as high as was used in experiment 1. These result are highly encouraging and favour the use of this cheap and easy to handle machine for preventing TRP especially at organized farms, since the disease is much more common in cattle fed on stored feeds especially those penned up inside far part of the year and rarely encountered in animals kept on free range grazing [1]. None the less this machine could be customized and sized to meet the requirements of not only the organized farms but also of a farmer with a small herd as well as at the feed manufacturing plant itself. Metallic objects were more efficiently removed from wheat, barley and alfalfa than from hay. The machine is able to remove up to 100% of magnetic objects and 52%-62% of non-magnetic metals. More research and further improvement in the design of the machine will increase its efficiency in removal of non-magnetic metals from feed stuff to a satisfactory level.

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*Address for correspondence:
Dr. Sardar Jafari Shoorijeh
DVM, PhD, Assoc. Prof. in Department of Clinical Sciences, School of Veterinary Medicine, Shiraz University, Shiraz, 71345, Iran.
e-mail: sjafari@shirazu.ac.ir
Tel.: +98-711-2286950, fax: +98-711-2286940

Table 1: Mean ± SE and percentage of removal rates of different metallic objects from 1 kg of various food stuffs subject to 10 consecutive operations of the machine

	Needle[X]		Nail[X]		Wire[X]		Copper[X]		Aluminum[Y]	
Feed	mean±SE	%	mean±SE	%	mean±SE	%	mean±SE	%	mean±SE	%
Hay	47.2±0.9 a	94.4	48.1±06 a	96.2	47.7±0.4 a	95.4	11±0.7 d	22.0	21.2±1 c	70.6
Alfalfa	49.3±0.2 a	98.6	50 a	100.0	50 a	100.0	21.3±1.7 b	42.2	24.8±0.7 c	82.6
Concentrate	49.6±0.2 a	99.2	49.9±0.1a	99.8	50 a	100.0	33.8±0.9 b	45.6	24.5±0.6 c	81.6
Wheat	50 a	100.0	50 a	100.0	50 a	100.0	38.7±1.4 b	77.4	8.5±0.4 c	28.3
Barely	50 a	100.0	50 a	100.0	50 a	100.0	36±0.7 b	72.0	10.1±0.5 c	33.6
Bread	48±0.9 a	96.0	49.9±01 b	99.8	50 b	100.0	15.9±0.9 c	31.8	17.8±0.9 d	58.3
Straw	48.5±0.3 a	97.0	50 b	100.0	50 b	100.0	21.1±0.8 c	42.2	23.6±0.9 d	78.6
Pulp	49.4±0.3 a	98.8	50 a	100.0	50 a	100.0	17.4±1.1 b	34.8	16.2±1.5 c	53.9
Total	49±0.4 a	98.0	49.7±0.1 a	99.5	49.7±0.1 a	99.4	24.4±0.1 b	46.0	18.4±0.8 c	60.9

[X]*= 50 numbers;* [Y]*= 30 numbers; Significant difference between different letters (a, b, c, d) in rows (P < 0.05)*

Table 2: Mean ± SE and percentage of removal rates of different metallic objects from 2 kg of various food stuffs subject to 10 consecutive operations of the machine

	Needle[X]		**Nail[X]**		**Wire[X]**		**Copper[X]**		**Aluminum[Y]**	
Feed	mean±SE	%	mean±SE	%	mean±SE	%	mean±SE	%	mean±SE	%
Hay	43.7±0.6 a	87.4	48.2±0.3 b	96.4	45.6±0.7 c	91.2	15±0.9 d	30.0	22.4±0.6 e	74.6
Alfalfa	49.3±0.2 a	98.6	50 a	100.0	50 a	100.0	24.5±2.1 b	49.0	24.4±0.6 b	81.2
Concentrate	49.7±0.2 a	99.4	50 a	100.0	49.9±0.1 a	99.8	34.8±0.6 b	69.6	24.9±0.4 c	82.9
Wheat	50 a	100.0	49.9±0.1 a	99.8	49.8±0.1 a	99.6	40.1±1.5 b	80.2	10.5±0.6 c	35.0
Barely	49.5±0.2 a	99.0	50 a	100.0	50 a	100.0	37.8±0.6 b	75.6	13.9±0.5 c	46.3
Bread	49.4±03 a	98.8	49.7±0.2 a	99.4	49.7±0.2 a	99.4	18.5±1.1 b	37.0	19.1±1.3 b	63.6
Straw	48.5±0.3 a	99.0	50 b	100.0	49.9±0.1 b	98.8	14.4±0.9 c	28.8	21.6±3.3 d	71.6
Pulp	49.4±0.3 a	98.8	50 a	100.0	50 a	100.0	33±0.6 b	66.0	20.8±0.8 c	69.3
Total	48.7±0.3 a	97.6	49.7±0.1 a	99.5	49.4±0.2 a	98.6	27.3±1 b	54.5	19.7±1 c	65.6

[X]*= 50 numbers;* [Y]*= 30 numbers; Significant difference between different letters (a, b, c, d) in rows (P < 0.05)*

Table 3: Mean ± SE and percentage of removal rates of different metallic objects from 5 kg of different food stuffs subject to 10 consecutive operations of the machine

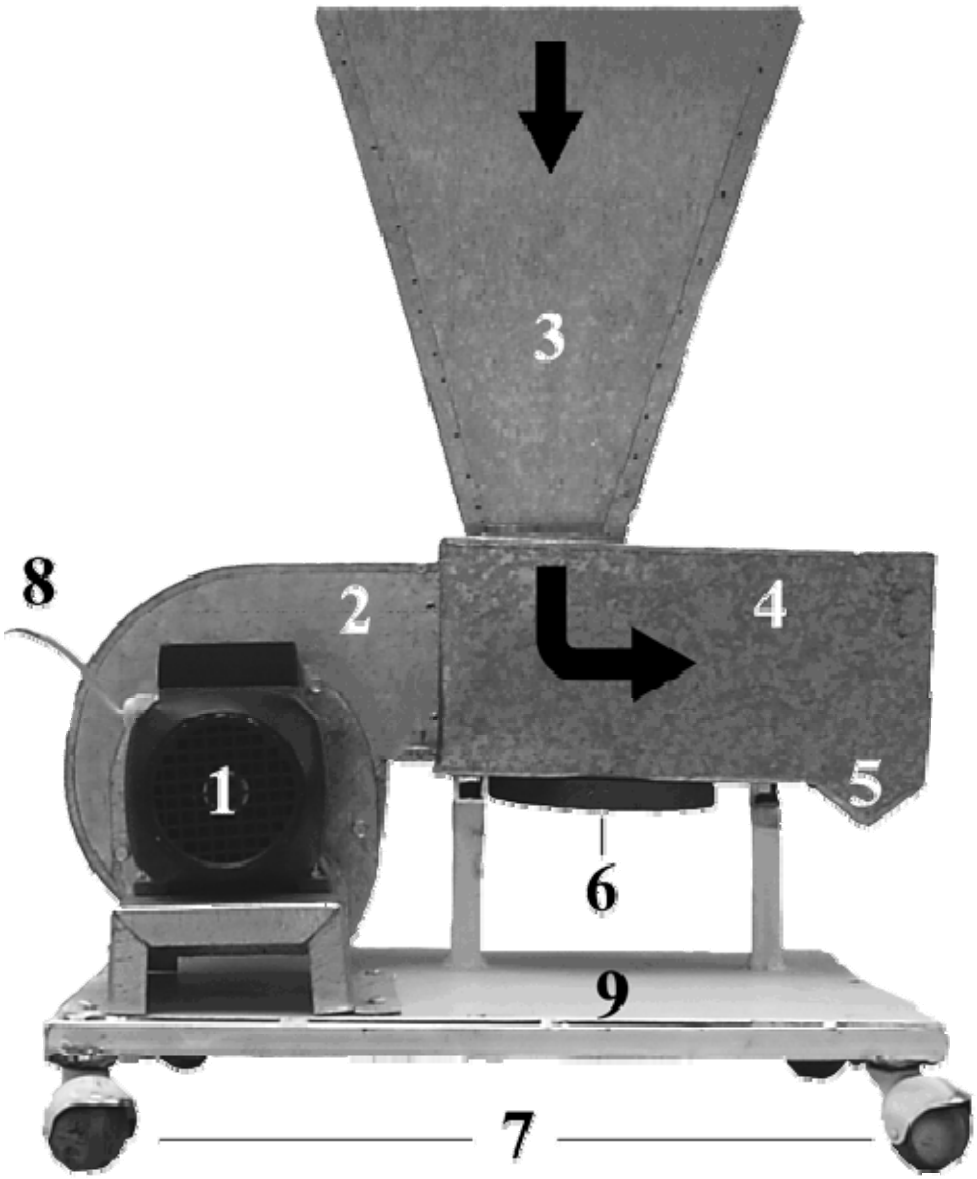
	Needle‡		**Nail‡**		**Wire‡**		**Copper‡**		**Aluminum†**	
Feed	mean±SE	%	mean±SE	%	mean±SE	%	mean±SE	%	mean±SE	%
Hay	41.1±0.9 a	82.2	477±0.6 b	95.4	45.1±0.7 c	90.2	15.1±0.9 d	30.2	25.1±0.6 e	83.6
Alfalfa	49.1±0.2 a	98.2	50 a	100.0	50 a	100.0	20.6±1.9 b	41.2	25.5±0.6 c	84.9
Concentrate	496±0.2 a	99.2	49.8±0.1 a	99.6	49.9±0.1 a	99.8	32.3±1.3 b	64.6	23.4±0.6c	77.9
Wheat	50 a	100.0	50 a	100.0	50 a	100.0	36.9±2.3 b	73.8	19.3±1.3 c	63.7
Barely	49.9±0.1 a	99.8	50 a	100.0	50 a	100.0	28.6±1.2 b	57.2	9.2±0.6 c	29.7
Bread	48.2±04 a	96.4	50 b	100.0	50 b	100.0	18.3±0.8 c	36.6	17.9±1.2 c	26.3
Straw	49.2±0.3 a	98.4	49.7±02 a	99.4	496±0.2 a	98.2	19±1.9 b	38.0	20.3±1.7b	76.6
Pulp	49.5±0.2 a	99.0	50 a	100.0	50 a	100.0	29.4±1.5 b	58.8	10.5±1 c	35.0
Total	48.3±0.3 a	96.7	49.7±0.1 b	99.4	49.3±0.1 b	98.5	24.8±1.5c	50.1	18.9±1 d	59.7

[X]*= 50 numbers;* [Y]*= 30 numbers; Significant difference between different letters (a, b, c, d) in rows (P < 0.05)*

Table 4: The percentage of removal rates of different metallic objects from 1, 2, 5 kg of different food stuffs by the diet metal remover machine subject to 10 and 3 consecutive operations of the machine

		10 numbers, 10 replicates				**3 numbers, 3 replicates**		
Food	**Food weight (kg)**	**Iron**	**Copper**	**Aluminum**		**Iron**	**Copper**	**Aluminum**
Hay	1	100	66	60		100	55.6	56
	2	100	38	36		100	77.8	78
	5	100	73	61		100	77.8	88.9
Alfalfa	1	100	44.4	62.8		ND	ND	ND
	2	100	77.8	100		ND	ND	ND
	5	100	100	100		ND	ND	ND
Barely	1	100	70	76		100	78	78
	2	100	68	75		100	78	66.7
	5	100	58	80		100	88.9	55.6
Bread	1	78	74	59		100	77.8	66.7
	2	100	59	52		100	33.3	89
	5	99	65	77		100	88.9	56
Straw	1	100	63	54		100	44.4	33.3
	2	89	77	58		88.9	44.4	62.8
	5	100	83	64		100	33.3	44.4

Fig. 1: Different parts and their function of the diet metal remover machine, large black arrows show the direction of food movement: 1) Electrical motor and blower fan: provided the blowing force of the machine; 2) Spiral part: increases the safety of machine; 3) Funnel shape part: for entering foods into machine; 4) Passing canal: the length changeable exiting place of food; 5) V shape curve: traps the non-iron metals that can not be removed by the magnet; 6) Magnet: absorbs the iron pieces;
7) Wheel: for carrying the machine; 8) Plug, wire and switch: connect to electricity and turns on and off the machine;
9) Metal surface and mounts



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Quality Evaluation of Rogenjosh Available in Srinagar City

Asif. H. Sofi†*, Sarfaraz A. Wani†, Mir Salahuddin†, A. H. Malik†,
M. A. Pal† and Z. H. Munshi‡

A study was carried out to find out the quality of Rogenjosh - a traditional Kashmiri meat product, available at various outlets of Srinagar city, in terms of physico-chemical (pH, moisture, protein, ether extract and ash), microbiological (Total Viable Count, Coliform count & presence of E. coli) and sensory quality. On the basis of infrastructure and services provided, outlets were divided into High standard (HS), Medium standard (MS) and Low standard (LS) restaurants. The results for moisture (%) and ether extract (%) differed significantly ($p<0.05$) between the outlets whereas pH, protein (%) and ash (%) showed non-significant ($p>0.05$) differences. The TVC and Coliform count showed increasing trend from HS to LS type. However, E. coli was present in 16.6 % of sample, (all from LS type). The overall acceptability score of the product from HS, MS and LS was found to be 6.46 ± 0.10, 5.90 ± 0.12 and 6.17 ± 0.12 respectively, on 8 point descriptive scale (8= extremely desirable, 1= extremely undesirable).

KEY WORDS
Market, Quality evaluation, Rogenjosh, Srinagar city, Traditional meat products.

INTRODUCTION

Kashmir is well known for its traditional meat products like Rista, Kabab, Goshtaba, Korma etc collectively termed as Wazwan. Rogenjosh forms an important component of wazwan and is a non-comminuted meat product prepared from meat chunks along with bones, cooked with various spices and condiments in gravy. The demand for ready-to-eat meat products including different Wazwan products like Rogenjosh is increasing day by day due to growing awareness about their nutritional and palatability characteristics, changing socio-economic status and life style. These products also cater to the fast food requirement of a large number of domestic and foreign tourists visiting the valley. Thus these products need to be prepared hygienically so as to safe guard the health of consumers.

The present study was conducted with the objective of evaluating physico-chemical, microbiological and sensory quality of Rogenjosh available at different types of outlets in Srinagar city.

MATERIALS AND METHODS

Survey

104 restaurants available in Srinagar city were surveyed. On the basis of their infrastructure and services provided, outlets were divided in to High standard (HS), Medium standard (MS) and Low standard (LS) restaurants.

Collection

A total of 18 samples, six from each type of outlet, were collected randomly and transported to the laboratory under aseptic and chilled conditions within shortest possible time for analysis.

Laboratory Analysis

The pH of the samples in duplicate was determined by using the method of Strange et al. (1977). Ten grams of sample was blended with

†Division of Livestock Products Technology
Faculty of Veterinary Sciences and Animal Husbandry
(SKUAST- K) Kashmir, India
‡ Division of Veterinary Public Health
Faculty of Veterinary Sciences and Animal Husbandry
(SKUAST- K) Kashmir, India

50 ml of distilled water for 1 minute. The pH of the resultant meat slurry was recorded by dipping the combination electrode of digital pH meter in it. The percentages of moisture, crude protein, ether extract and ash of Rogenjosh samples were determined as per standard procedure of Association of Official Analytical Chemists (AOAC, 1995). Microbiological quality in terms of Total Viable Count (TVC), Coliform count and presence of *E. coli* was determined as per Anon (2001). Sensory quality in terms of appearance, flavour, texture, saltiness, juiciness, mouth coating and overall acceptability was determined on 8 point descriptive scale (8= extremely desirable, 1= extremely undesirable) of Keeton (1983) modified and adopted by Division of LPT, Indian Veterinary Research Institute (Sharma et al. 1997).

Statistical analysis

Data obtained from the study were analyzed statistically following the method of Box et al. (1978). The data was processed in a computer using SPSS software package. The ANOVA of group means was computed and significance of means was tested by using least significant difference test (LSD) at 5% level of significance.

RESULTS AND DISCUSSION

The pH of Rogenjosh (Table1) did not differ significantly ($p > 0.05$) among the samples with values of 6.10 ± 0.06, 5.98 ± 0.05 and 6.14 ± 0.08 from HS, MS and LS respectively. The moisture in case of HS (68.60 ± 0.67 %) was significantly higher ($p < 0.05$) than both MS (62.70 ± 1.51%) and LS (65.04 ± 1.23 %). The probable reason for difference in moisture content could be because of difference in fat content in respective meat chops as fat and moisture is having an inverse relation (Samoon, 1988). Crude protein content in HS, MS and LS were comparable with values of 17.12 ± 0.45 (%), 17.82 ± 0.60 (%) and 17.99 ± 0.57 (%) respectively. Ether extract content did not differ significantly ($p > 0.05$) between HS (8.32 ± 0.99%) and LS (10.61 ± 1.10 %). The samples from MS had significantly ($p < 0.05$) higher ether extract content of 11.89 ± 1.38 (%) than samples of HS. However, MS and LS showed comparable values. The significant variation in fat (%) between different outlets might be because of difference in nature of meat chops used in developing such products. It could be due to liking, towards fatty chops, of customers visiting MS and LS type restaurants. Ash content of samples under study did not differ significantly ($p > 0.05$) among the three types with values as 2.81 ± 0.20 (%), 2.69 ± 0.28 (%), 3.21 ± 0.29 (%). Ash (%) in LS was slightly higher than HS and MS which could be because of addition of more spices and other condiments in LS than HS and MS.

Total Viable Count was significantly higher ($p < 0.05$) for samples of LS (2.95 ± 0.08 logcfu/g) than HS (2.59 ± 0.06 logcfu/g) and MS (2.55 ± 0.07 logcfu/g), whereas the latter two were comparable. The differences in microbiological counts could be because of differences in the manner of raw material handling during processing, before cooking and post-processing contamination before serving. The slightly higher pH in LS than HS and MS can also be explained by the higher microbial count in LS as an increase in microbial count causes an increase in pH (Das and Radhakrishana, 2001). Coliform count showed increasing trend from HS through MS to LS with values of 1.62 ± 0.19, 1.64 ± 0.14 and 2.36 ± 0.08 logcfu/g respectively. Both HS and MS samples differed significantly ($p < 0.05$) from LS. *E. coli* was reported only from Rogenjosh of LS origin where it showed 16.6% presence. The presence of *E. coli* from LS samples is suggestive of comparatively poor hygienic conditions which need to be given due consideration. However, the microbiological quality parameters studied were well within satisfactory limits (Gilbert et al., 2000; Goldenberg and Elliot, 1973).

The results regarding sensory characteristics of Rogenjosh procured from different types of outlets have been presented in Table 3. The appearance scores of Rogenjosh did not differ significantly ($p > 0.05$) and were between good to very good (6-7) in the samples from the three types of outlets. Since appearance scores depend

upon colour, shape of meat chunks etc. (Sharma et al., 1997) so comparable scores among the outlets prove that all the outlets are presenting Rogenjosh to the customers in more uniform shaped chunks and with good appearance. From the Table, it is also clear that the flavor scores of HS (6.28 ± 0.09) and LS (6.31 ± 0.18) were significantly higher than that of MS (5.93 ± 0.12). However, HS and LS did not differ significantly. The lower scores ranging between slightly desirable (6) to moderately desirable (7) in MS could possibly be due to the differences in cooking methods and ingredients added during cooking. Texture scores averaging moderately desirable (6) to very desirable (7) in HS was different from MS and LS, both of which showed scores between slightly desirable (5) to moderately desirable (6). The lower scores in MS and LS could probably be due to the difference in quality of raw material used, possibly use of meat from aged animals which is tougher. The scores of juiciness, mouth coating and saltiness showed non-significant difference among various outlets. The scores of these three sensory parameters were between moderately juicy (6) to very juicy (7), traces (6) to nil (7) and moderately desirable (6) to very desirable (7) respectively. These scores indicated that the product was acceptable from consumer point of view. Overall acceptability score for HS (6.46 ± 0.10) was significantly ($p < 0.05$) higher than that of MS (5.90 ± 0.12) but both were comparable with LS (6.17 ± 0.12). Similarly HS and LS values did not differ significantly ($p > 0.05$). The lower overall acceptability scores in MS could possibly be due to lower scores of flavour and texture as the attributes of flavour, texture and tenderness are having more bearing on final overall acceptability of the product than other attributes (Bartholomew and Osualo, 1986).

CONCLUSION

The physico-chemical quality of Rogenjosh analysed showed varying results between the outlets. TVC and Coliform count showed increasing trend from HS to LS, however were well within permissible limits. *E. coli* detected from only LS type of outlets is an indication of poor hygiene during processing and post processing in LS than HS and MS. All the sensory parameters showed mixed scores between 5-7.

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*Address for correspondence:
Dr. Asif Hassan Sofi, Department of Sheep Husbandry, Lal Mandi, Srinagar, Kashmir.
Tel: +91-9419539204, e-mail: sofihassanasif@yahoo.co.in

Table 1: Physicochemical quality of Rogenjosh marketed in Srinagar city.

Parameter	High standard (HS) restaurants	Medium standard (MS) restaurants	Low standards (LS) restaurants
pH	6.10 ± 0.06	5.98 ± 0.05	6.14 ± 0.08
Moisture (%)	68.60 ± 0.67^{b}	62.70 ± 1.51^{a}	65.04 ± 1.23^{a}
Crude protein (%)	17.12 ± 0.45	17.82 ± 0.60	17.99 ± 0.57
Ether extract (%)	8.32 ± 0.99^{a}	11.89 ± 1.38^{b}	10.61 ± 1.10^{ab}
Ash content (%)	2.81± 0.20	2.69 ± 0.28	3.21 ± 0.29

Row-wise group means (± S.E) with different superscript differ significantly (P < 0.05).

Table 2: Microbiological Quality of Rogenjosh marketed in Srinagar city.

Parameter	High standard (HS) restaurants	Medium standard (MS) restaurants	Low standard (LS) restaurants
Total viable count (logcfu/gm)	2.59 ± 0.06^{a}	2.55 ± 0.07^{a}	2.95 ± 0.08^{b}
Coliform count (logcfu/gm)	1.62 ± 0.19^{a}	1.64 ± 0.14^{a}	2.36 ± 0.08^{b}
Percent samples positive for *E. coli*	-	-	16.6

Row-wise group means (± S.E) with different superscript differ significantly (P < 0.05).

Table 3: Sensory Quality of Rogenjosh marketed in Srinagar city.

Parameter*	High standard restaurants	Medium standard restaurants	Low standards restaurants
Appearance	6.31 ± 0.10	6.46 ± 0.12	6. 41 ± 0.12
Flavour	6.28 ± 0.09^{b}	5.93 ± 0.12^{a}	6.31 ± 0.18^{b}
Texture	6.24 ± 0.10^{b}	5.81 ± 0.14^{a}	5.93 ± 0.15^{ab}
Juiciness	6.11 ± 0.11	6.07 ± 0.18	6.04 ± 0.15
Mouth coating	6.56 ± 0.14	6.43 ± 0.14	6.39 ± 0.17
Saltiness	6.63 ± 0.13	6.41 ± 0.17	6.33 ± 0.17
Over all Acceptability	6.46 ± 0.10^{b}	5.90 ± 0.12^{a}	6.17 ± 0.12^{ab}

Row-wise group means (± S.E) with different superscript differ significantly (P < 0.05)
** 8-point descriptive scale (8 = extremely desirable, 1= extremely undesirable)*

Fig 1: Proximate Composition of Rogenjosh procured from different outlets in Srinagar city.

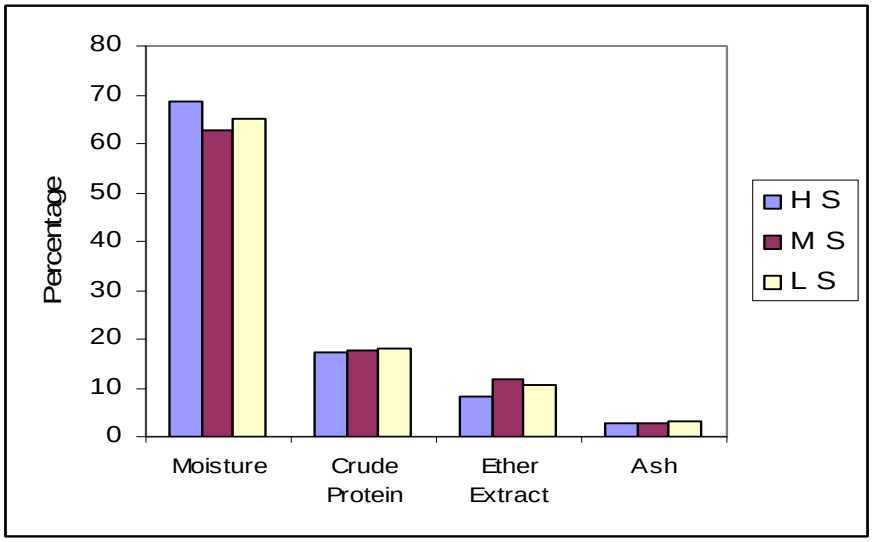


Fig 2: Microbiological quality of Rogenjosh procured from different outlets in Srinagar city.

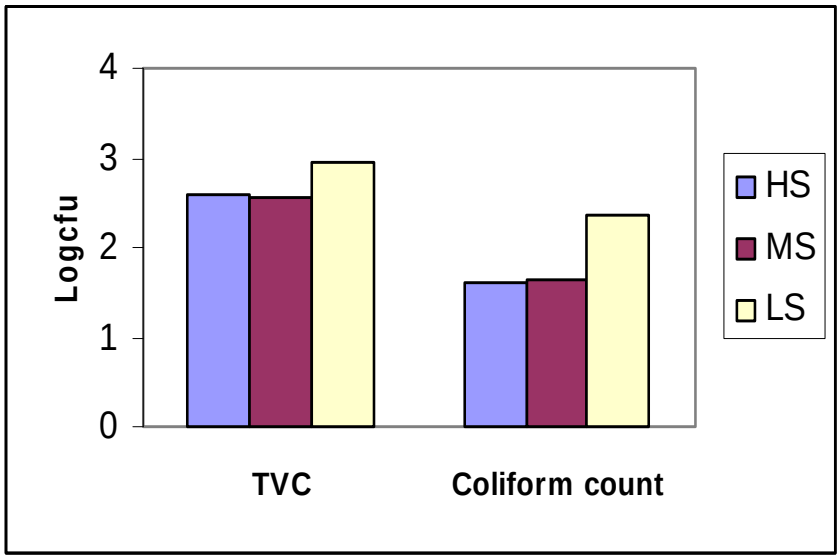
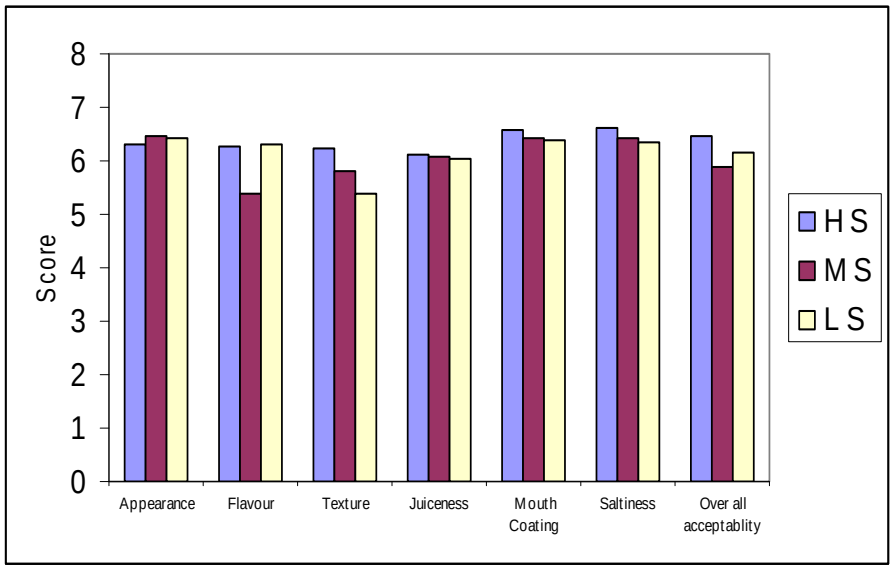


Fig 3: Sensory characteristics of Rogenjosh procured from different outlets in Srinagar city.



Article 28

Isolation of *Candida* spp. from Mastitic cows and Milkers

M. A. Tarfarosh†* and S. K. Purohit†

Fifty six cases of bovine clinical mastitis were screened for presence of Candida spp. *Of these Candida was isolated from milk of four cases (7.14%). The organism was also isolated from 80% of milkers of such animals.*

KEYWORDS
Candida spp., Mastitis, *Thrush*, Milkers.

INTRODUCTION

Candida is the most common species isolated from cases of mycotic mastitis in bovines (Radostitis, 1995). The organism and its spores have the ability to survive pasteurization; as such it assumes public health significance and has been indicated in causation of *thrush* in humans (Schmitt, 1971).

Administration of antibiotics may aggravate fungal mastitis as *Candida* spp. utilize penicillin and tetracyclines as a source of nitrogen (Meek, 1981). The present study was undertaken to isolate *Candida* spp. from clinical cases of bovine mastitis and also from the buccal cavity of milkers.

MATERIALS AND METHODS

Milk samples from 56 clinical cases of bovine mastitis were aseptically collected at the college clinic and other veterinary hospitals in Bikaner city. About 20ml of milk was collected from each affected animal after discarding first few strips. The samples were rushed to laboratory under cold conditions and incubated at 37°C for 24 hours and there after streaked on Saborauds glucose agar plates. The plates were incubated at 37°C and examined for growth at 24, 48 and 72 hours and at biweekly intervals for 4 weeks after which the plates showing no growth were considered negative.

Swabs from the buccal cavity of persons in close contact with cows showing fungal mastitis were aseptically collected and incubated in the same manner as the milk samples.

Identification of Candida spp.

Diagnostic mycology largely rests on a detailed study of morphological evolution of the isolates and has therefore been termed as “exercise in contemplative observation” (Ananthnarayan and Paniker, 1994).

During the present study too the identification of *Candida* spp. was done on the basis of study of colony characteristics, colour, microscopic exanimation of teased mounts with lacto-phenol cotton blue and Leishmans stain and formation of heavy dry pellicle on surface of broth and chlamydospore production on corn meal agar.

RESULTS AND DISCUSSION

Out of the 56 cows suffering from clinical mastitis only 4 (7.14%) were found to harbour *Candida* infection. These findings are comparable with observations of Bansal et al (1991) and Singh et al (1992) who reported incidence of *Candida* mastitis as 8.51% and 5.71% respectively. Typical *Candida* colonies (fig 4) were observed on Saborauds agar plates. The microscopic examination of teased mounts revealed pseudo-hyphae, clusters of budding cells, blastospores and chlamydospores (fig 3 & 5). Clinical examination of the affected animals revealed inflammation, tenderness and hardening of the

†Department of Veterinary Medicine,
College of Veterinary and Animal Sciences,
Bikaner, India

udder with secretion of watery milk containing yellowish clots (fig 1).

Milkers from these four cases of mycotic mastitis were screened for the presence of *Candida* spp. by swabs taken from their buccal cavities. Among these, 3 samples (75%) showed presence of *Candida* spp. on Saborauds glucose agar medium (fig 2 & 3). The tongues of the milkers showed rough and hard surface typical of *Candida* infection. Although *Candida* spp. is a normal commensal of oral mucosa but increased exposure due to proximity to affected animal and or consumption of infected milk could be the cause for development of *thrush* in these milkers. Schmitt (1971) has reported mastitis milk as a cause for *thrush* in humans.

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*Address for correspondence:
Dr. M. A. Tarfarosh, Institute of Animal Health and Biological Production, Department of Animal Husbandry, Zakura, Srinagar
Tel: +91-98580-83322

Fig. 1: Inflammation and hardening of udder with discoloration of milk

Fig. 2: Swabs were taken from the buccal mucosa of the milkers of affected cows

Fig. 3: Microscopic slides of the growths obtained on Saborauds glucose agar medium

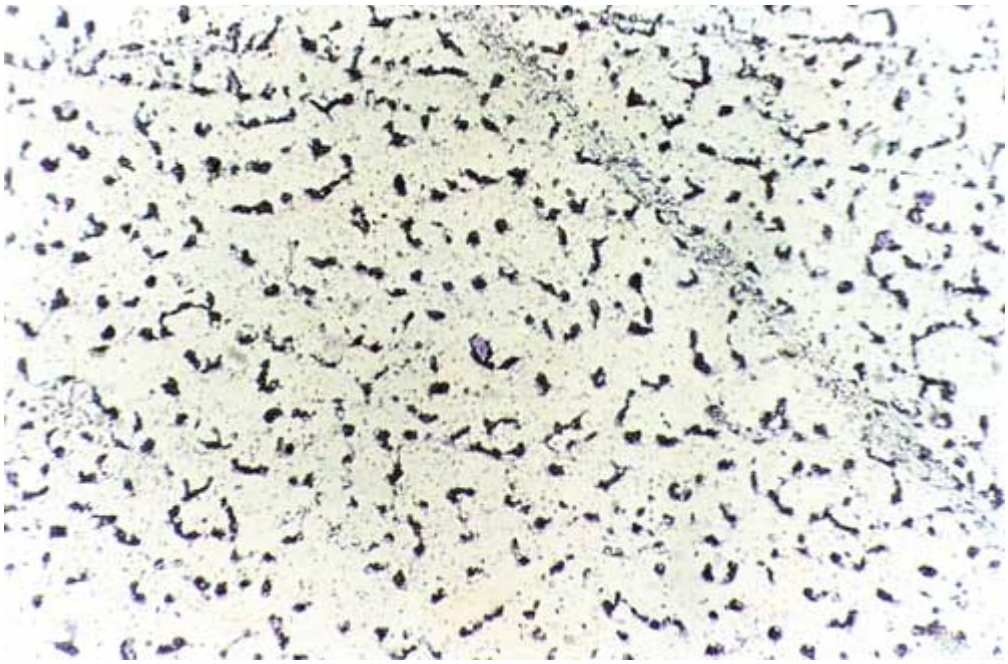

Fig. 4: *Candida* colonies on Saborauds agar plates

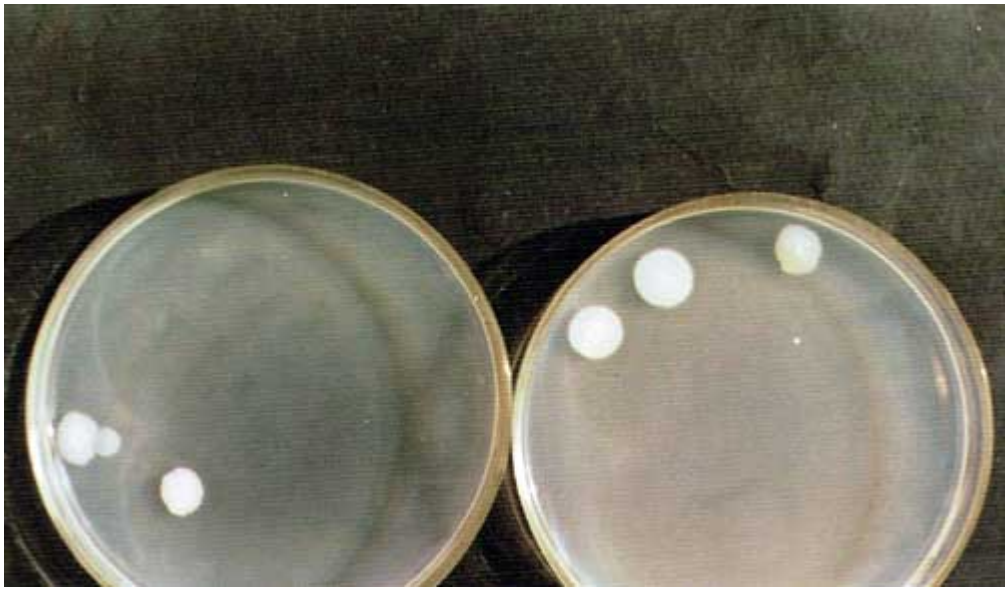

Fig. 5: Another slide prepared from teased mounts

Article 29

Efficacy of different Anthelmintic formulations against Helminth Infestation in Sheep

S. Nasreen†*, M. R. Khan†, S. Peerzada† and S. A. Andrabi ‡

A study of comparative efficacy of six different commercial anthelmintic formulations against natural helminth infestations in sheep was conducted. Pre and post-treatment EPG (eggs per gram) values were recorded and efficacies compared. Results showed that a combination of Ivermectin and Clorsulon in injectable form gave the overall highest curative rate against the parasites studied.

KEYWORDS
Anthelmintic, Helminth, Parasitic gastroenteritis, Sheep.

INTRODUCTION

Helminth infestation continues to be one of the major problems facing sheep husbandry. Decreased wool growth, reproduction and not infrequently death due to secondary infections being the common sequels.

Parasitic gastroenteritis is another outcome when helminths infest the alimentary tract. It is world wide in occurrence and is very common in Jammu and Kashmir. The present study was undertaken to know the comparative efficacy of six commonly available anthelmintic formulations against natural gastrointestinal helminth infestation of sheep in Kashmir Valley.

†Division of Parasitology,
Sheep Husbandry Department, Kashmir

‡Department of Animal Husbandry, Kashmir.

MATERIALS AND METHODS

Forty two (42) male hoggets with naturally acquired gastro-intestinal helminth infestations were selected at the Sheep Breeding Farm, Dachigam, Srinagar. The selected animals were tagged and randomly grouped in to seven groups (A, B, C, D, E, F, and G) of six animals each (Table 1).

Fecal samples (pre-treatment) were collected from all of the animals in the different treatment groups (day 0) followed immediately by administration of anthelmintic drug formulations (Formulation 1 to 6). The composition of the formulations, dosages and respective treatment groups are presented in Table 2. The animals of group "A" were not administered any anthelmintic and served as control.

The quantitative faecal sample examination was undertaken in all the sheep of the seven groups pre-treatment (day 0) and then on 7th, 14th and 21st day post treatment by Stoll's egg counting technique to determine the number of eggs per gram of feces (EPG) (Soulsby, 1986). Percent efficacy of the various anthelmintic formulations was calculated for 7th, 14th and 21st day post treatment by using the standard formula (Taylor et al, 1993)

$$\text{Percent efficacy} = \frac{A - B}{C} \times 100$$

Where, A= Mean EPG Pre treatment,
B= Mean EPG Post treatment and
C= Mean EGP Pre treatment

RESULTS AND DISCUSSION

The percent efficacy of the six different anthelmintic formulations against various gastrointestinal helminth parasites is presented in Table 4.

In group A (untreated control) the average EGP showed a progressive increase in count over the period of observation for all the parasites studied. In all the treated groups (B, C, D E, F, and G) the EPG's showed varying levels of reduction or became zero (Table 3).

The average efficacy of Formulation-1 (oxydozanide-levamisole) was higher for GI nematodes and trematodes (*Strongyle* 97.29%, *Strongyloid* 95%, *Dictyocaulus* 90.19% and *Fasciola*/*Dicrocoelia* 96.66% spp.) than cestodes (*Moneizia* spp. 20%). This result is in agreement with the observations of Singh et al (2001) who too reported similar poor results of the formulation for *Moneizia* spp.

A high efficacy was shown by Formulation-2 (oxyclozanide-oxybendazole) against *Dictyocaulus* (93.33%), and *Moneizia* (96.66%) spp. however it had a relatively poor action against *Strongyloid* (29.62%), *Strongyle* (83.33%) and *Fasciola*/*Dicrocoelia* (86.66%) spp.

The efficacies of Formulation-3 (triclabendazole-ivermectin) and Formulation-4 (ivermectin) were high against *Strongyle* (99.66%), *Strongyloid* (100%), *Dictyocaulus* (94.27%) and *Fasciola* (93.33%) spp. and low against *Moneizia* (35.83%). Similar observations have also been reported by S. Nasreen et al (2007), Singh RJ (2001) and Swan et al (1984).

Formulation-5 (enbendazole-praziquental) showed a high efficacy against S*Strongyle* (98.96%), *Strongyloid* (96%) and *Dictyocaulus* (93.33%) spp. but low against *Fasciola*/*Dicrocoelia* (29.62%) and *Moneizia* (79.66%) spp., observations in agreement with previous works of Khillore et al (2002) and Nasreen et al (2007) for sheep infected with Nematodirus.

Formulation-6 (ivermectin-clorsulan, injectible) was very efficacious against all studied helminths. Showing 100% efficacy against *Dictyocaulus*, 99.73% against *Strongyle*, 99.20% against *Strongyloid*, 98.33% against *Fasciola*/*Dicrocoelia* and 99% against *Moneizia* spp. Similar observations have also been reported by Westcott et al (1982) against intestinal nematodiasis in sheep and goat.

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*Address for correspondence:
Dr. S. Nasreen,
Division of Parasitology, Sheep breeding farm, Department of Sheep Husbandry (Kmr), Dachigam, Srinagar
Tel: +91-99065-09564

Table 1: Groups- composition and treatment

Group	Number of animals	Formulation administered
A	6	Nil (untreated control)
B	6	Formulation-1
C	6	Formulation-2
D	6	Formulation-3
E	6	Formulation-4
F	6	Formulation-5
G	6	Formulation-6

Table 2: Composition of the formulation, dosage and groups administered

Formulation	Composition	Dosage and route	Administered Group
1	Oxyclozanide IP vet 6% w/v, Levamisole HCl 3% w/v	1ml per 4 Kg body weight, orally	B
2	Oxyclozanide BP vet 3% w/v, Oxybendazole BP vet 1.5% w/v	1ml per 3 Kg body weight, orally	C
3	Triclabendazole 5%, Ivermectin BP 0.1%	1ml per 5 Kg body weight, orally	D
4	Ivermectin BP 0.08% w/v	1ml per 4 Kg body weight, orally	E
5	Fenbendazole BP vet 15mg/ml, Praziquental 5mg/ml	1ml per 4 Kg body weight, orally	F
6	Ivermectin BP 1% w/v, Clorsulon USP 10% w/v	200 µg per Kg body weight, sub-cutaneously	G

Table 3: Changes in EPG values for various helminth parasites of sheep on various treatment days

Formulation/Group	**Parasitic Species**	**"0" day**	**7th day**	**14th day**	**21st day**
Control-Infested and untreated, Group A	*Strongyle* spp.	3600	6000	6500	6550
	Strongyloid spp.	19	30	150	160
	Dictyocaulus spp.	20	30	50	55
	Moneizia spp.	280	285	292	300
	Fasciola/Dicrocoelia spp.	15	25	26	30
Infested and treated groups					
Formulation-1, Group B	*Strongyle* spp.	2800	80	67	80
	Strongyloid spp.	100	10	5	-
	Dictyocaulus spp.	17	5	-	-
	Moneizia spp.	200	150	150	150
	Fasciola / Dicrocoelia spp.	10	1	-	-
Formulation-2, Group C	*Strongyle* spp.	2800	500	400	500
	Strongyloid spp.	90	65	60	65
	Dictyocaulus spp.	50	10	-	-
	Moneizia spp.	300	43	5	-
	Fasciola / Dicrocoelia spp.	10	2	2	--
Formulation-3, Group D	*Strongyle* spp.	3000	30	-	-
	Strongyloid spp.	20	-	-	-
	Dictyocaulus spp.	30	5	-	-
	Moneizia spp.	200	2	-	-
	Fasciola / Dicrocoelia spp.	10	2	3	-
Formulation-4, Group E	*Strongyle* spp.	2500	33	17	-
	Strongyloid spp.	125	17	-	15
	Dictyocaulus spp.	100	20	10	5
	Moneizia spp.	210	130	130	130
	Fasciola / Dicrocoelia spp.	7	3	2	1
Formulation-5, Group F	*Strongyle* spp.	3200	66	-	30
	Strongyloid spp.	125	10	-	5
	Dictyocaulus spp.	10	2	-	-
	Moneizia spp.	150	77	-	15
	Fasciola/Dicrocoelia spp.	9	7	5	7
Formulation-6, Group G	*Strongyle* spp.	2500	-	-	10
	Strongyloid spp.	210	-	-	5
	Dictyocaulus spp.	15	-	-	-
	Moneizia spp.	200	3	-	-
	Fasciola/Dicrocoelia spp.	20	1	-	-

Table 4: Percent changes (efficacy) in EPG values for various helminths parasites of sheep on various treatment days

Parasite	Group-Drug Used	7th day	14th day	21st day	Average efficacy
Strongyle spp.	Group B Formulation-1	97.14	97.60	97.14	97.29
Strongyloid spp.	Group B Formulation-1	90.00	95.00	100.00	95.00
Dictyocaulus spp.	Group B Formulation-1	70.58	100.00	100.00	90.19
Moneizia spp.	Group B Formulation-1	25.00	25.00	10.00	20.00
Fasciola/Dicrocoelia spp.	Group B Formulation-1	90.00	100.00	100.00	96.66
Strongyle spp.	Group C Formulation-2	82.14	85.71	82.14	83.33
Strongyloid spp.	Group C Formulation-2	27.77	33.33	27.77	29.62
Dictyocaulus spp.	Group C Formulation-2	80.00	100.00	100.00	93.33
Moneizia spp.	Group C Formulation-2	85.66	98.33	100.00	96.66
Fasciola/Dicrocoelia spp.	Group C Formulation-2	80.00	80.00	100.00	86.66
Strongyle spp.	Group D Formulation-3	99.00	100.00	100.00	99.66
Strongyloid spp.	Group D Formulation-3	100.00	100.00	100.00	100.00
Dictyocaulus spp.	Group D Formulation-3	83.33	100.00	100.00	94.51
Moneizia spp.	Group D Formulation-3	37.05	35.00	35.00	35.83
Fasciola/Dicrocoelia spp.	Group D Formulation-3	80.00	100.00	100.00	93.33
Strongyle spp.	Group E Formulation-4	98.68	99.32	100.00	99.33
Strongyloid spp.	Group E Formulation-4	86.04	100.00	88.00	91.46
Dictyocaulus spp.	Group E Formulation-4	80.00	90.00	95.00	88.33
Moneizia spp.	Group E Formulation-4	98.09	35.71	35.23	36.34
Fasciola/Dicrocoelia spp.	Group E Formulation-4	57.14	71.42	85.71	71.42
Strongyle spp.	Group F Formulation-5	97.96	100.00	98.92	98.96
Strongyloid spp.	Group F Formulation-5	92.00	100.00	96.00	96.00
Dictyocaulus spp.	Group F Formulation-5	80.00	100.00	100.00	93.33
Moneizia spp.	Group F Formulation-5	48.66	100.00	90.33	79.66
Fasciola/Dicrocoelia spp.	Group F Formulation-5	22.22	44.44	22.22	29.62
Strongyle spp.	Group G Formulation-6	99.61	100.00	99.6	99.73
Strongyloid spp.	Group G Formulation-6	100.00	100.00	97.61	99.20
Dictyocaulus spp.	Group G Formulation-6	100.00	100.00	100.00	100.00
Moneizia spp.	Group G Formulation-6	98.00	100.00	100.00	99.00
Fasciola/Dicrocoelia spp.	Group G Formulation-6	95.00	100.00	100.00	98.33

Article 30

Cutaneous Papilomatosis in a Horse - A case report

Khurshid A. Shah†

Papilomatosis was recorded in a young horse of about two years of age. Local and oral administration of hameopathic drug "thuja" cured the disease completely.

KEYWORDS
Papilomatosis, horse, thuja.

INTRODUCTION

In equines cutaneous papilomatosis is caused by a host specific papova virus and is encountered only on lower face, affecting the muzzle, nose or the lips. Cutaneous papilomatosis cases usually recover spontaneously within one to two months. However, in some cases papilomas may persist longer due to immuno deficency of the animal and cause problems to the affected animal during ingestion of food, also the traumatised papilomas may serve as a substrate for bacterial infections (Blood et al. 2002). Surgical intervention may sometimes aggravate the condition, resulting in increased size of residual warts and prolonged course of the disease.

The present communication elucidates the possibility of curing persisting cutaneous papilomatosis in a horse with a homeopathic drug, thuja.

CASE HISTORY

A young horse about two years of age was presented for treatment at veterinary center Shalteng, Srinagar. The animal had previously developed rough elevations on lower face which had now turned into small, multiple, sessile, rough grey outgrowths varying 5-8mm in diameter. The lesions had been persisting for last 1 year and resembled with that of cutaneos paplomatosis as described by Blood et al (2002).

MATERIALS AND METHODS

The affected part was cleaned with 3% hydrogen peroxide solution and about 1ml of thuja-Q was injected locally around the papilomas using a tuberculin syringe (Elig Jones, 1991).The treatment was repeated at weekly intervals for four weeks. In addition, thuja-200X, 10 drops in 100ml of lukewarm water, was also administered orally twice a day for four weeks.

RESULTS AND DISCUSSION

The outgrowths started subsiding within two weeks and a complete recovery was observed after two months of treatment. Thuja has been reported to be very effective in treatment of papilomas and nodular growths in Cattle (Rai et al, 1991), Dog (Varshney & Paliwal, 2000) and Poultry. Homeopathic drug thuja is extensively used in human medicine for warts and cauliferous outgrowths (Shah MA 2003), (Elig Jones, 1991). The drug needs to be tried at a large scale to develop a successful, safe and economical treatment of papilomatosis in domestic animals.

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†Department of Animal Husbandry, Srinagar, Kashmir, India

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*Address for Correspondence:
Dr. Khurshid Ahmad Shah, Department of Animal Husbandry, Red Cross Road, Gow Kadal, Srinagar, Kashmir 190001, India
Tel: +91-94190-58692, e-mail: khurshid@kashvet.org

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