



## Proximates Composition, Physiochemical Properties of Dogs Food and Nutritional Practices Adopted by Dog Owners in Central Punjab

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### ABSTRACT

This research was conducted to study the nutritional practices adopted by the dog owners in the Central Punjab. 50 dog feed samples were collected from various part of Central Punjab, which includes Patiala, Fatehgarh Sahib, Ludhiana, Moga, Jalandhar, Tarn-Taran and Amritsar. Moreover, 491 dog owners were randomly selected and interviewed directly by visiting houses and polyclinics from Central Punjab. The appraisal of data revealed that, 42% of population offer homemade feed, 6% population offer exclusively commercial feed and 52% of the population offer both homemade and commercial feed to their pets. 28% of the population of the Central Punjab feed only vegetarian diet to their dogs while 72% of the population offer mixed feed. 95% of the population feed chapatti to their dogs however, only 33% of the dog owners feed rice to pets. Milk is offered by 84% dog owners to their pets. Nutrient composition of feed samples indicated that 24% of feed samples were in range of 18-22% protein, 94% of the feed samples were having less than 5% fat and 66% of feed samples were having fibre less than 3.5%. The pH value was less than 4.0. Based on the data available, it is clearly indicated that feeding practices followed by the dog owners in Central Punjab closely followed the trend of food consumed by the dog owners. 60% of the feed samples were found not to fulfill the overall nutrient requirement of dogs. The microbial parameters were well below the prescribed limits.

### HIGHLIGHTS

- Proximate and physiochemical properties of dog food were studied.
- Nutritional practices adopted by dog owners of Central Punjab were also studied.

**Keywords:** Dog, Dog owner, Feeding Practices, Physiochemical properties

The role of the companion animals is very crucial in people's lives, as they provide a positive impact on both the emotional and physical health of people with whom they have contact, as well as strengthening the communities in which they live. With increase in the nuclear families the demand for adoption of companion animals such as dogs is increasing day by day (Ranjan, 2012). Most of the dog owners resort to unscientific management practices, because of convenience, due to which there is occurrence of various kind of metabolic diseases in pet at various stages of life like eclampsia, obesity, rickets etc. which in a study conducted by Seneviratne *et al.* (2016) in

Colombo, Sri Lanka, via questionnaires distributed to pet owners. They reported that 42% of dogs were fed only home-cooked food, while 18% were fed only commercial food. Presently, India's dog population is 11.67 million. Out of which 9.49 million populations is in rural areas and 2.18 million are present in urban India. In spite of very

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large population of dogs in Punjab, the scanty information is available regarding nutritional and managerial practices adopted by the dog owners. Keeping in view the importance of feeding and managerial practices, a benchmark survey was conducted to study the proximate composition, physiochemical properties of dog's food and nutritional practices adopted by dog owners in Central Punjab.

## MATERIALS AND METHODS

To fulfill the objective of the study, the present investigation was carried out to study the different feeding practices adopted by dog owners in Central Punjab which include district- Patiala, Fatehgarh Sahib, Ludhiana, Moga, Jalandhar, Tarn-Taran and Amritsar.

### Survey performa Selection of dog owners

A sample survey performa was designed and pretested by conducting survey. This survey performa includes the quarries regarding the feeding practices followed by the dog owners such as kind of feed, quantity and number of times in a day feed was offered to dogs which include both vegetarian and non-vegetarian feedstuffs, etc. 60 dog owners from each district were selected randomly, 30 were from the urban area and 30 were from rural areas. Total of 491 dog owners were surveyed from Central zone.

### Collection and Analysis of Dog food samples

Total 50 samples were collected from dog owners of different dog food ingredients such as milk, chapatti, pulses, fruits, meat, eggs, vegetables etc. in an insulated container to maintain the freshness of food and analyzed in the Department of Animal Nutrition. The complete diet was dried and converted to powder form and stored for analysis. The feed samples were analyzed for proximate composition viz. dry matter (DM), crude protein(CP), ether extract (EE), total ash (TA), acid insoluble ash (AIA), crude fiber (CF), minerals (calcium and phosphorus), physiochemical properties (pH, free fatty acids and peroxide value) and microbiological counts ( total plate count and coliform count) as per the following methods. Since the samples procured were fresh so the presence of Aflatoxin was obviated but Aflatoxin was estimated from the commercial feeds offered by the dog owners.

## STATISTICAL ANALYSIS

The data was analyzed using software package for social science (SPSS version 21.0). The average values are reported along with standard error. The statistical significance was estimated at 5% level ( $P < 0.05$ ) and evaluated with Duncan's Multiple Range Test (DMRT).

## RESULTS AND DISCUSSION

### Feeding Practices Adopted by dog owners in Urban and Rural areas of Central Punjab

Perusal of the data (Table 1) adopted by urban and rural dog owners in Central Punjab showed that there was significant ( $P \leq 0.05$ ) higher consumption of milk products, number of Chapatti and bone in rural area as compared to urban area. As far as the consumption of rice is concerned it was decreased in dogs of rural area (31.15 g) as compared to dogs of urban area (41.94 g). Rest of the variables showed non-significant differences.

### Comparative feeding practices followed by urban dog owners of the Central Punjab

Data regarding the feeding practices followed in the urban areas of different districts of central zone is presented in table 2. The critical observation of the data showed that milk, curd, number of *chapattis*, quantity of *dal*, rice, meat and bone in urban areas of the Amritsar (514.10 ml, 430.40 ml, 5.13, 67.83 g, 94.57 g, 346.70 g and 68.48 g) showed highest ( $P \leq 0.05$ ) consumption. The consumption of milk by dogs was lowest ( $P \leq 0.05$ ) in Ludhiana and Patiala district. The consumption of milk products was highest ( $P \leq 0.05$ ) in Moga and lowest ( $P \leq 0.05$ ) in Patiala and Amritsar. District Fatehgarh Sahib leads ( $P \leq 0.05$ ) in the consumption of sweets whereas Moga district lag behind among all the district of this zone in sweet consumption by the dogs. However, the lowest ( $P \leq 0.05$ ) no. of chapatti was fed by the urban population of Jalandhar, Ludhiana and Patiala, whereas lowest ( $P \leq 0.05$ ) quantity of dal and rice were fed in Patiala (15.15 g) and Moga (6.25 g) district respectively. As far as the veggies consumption of dogs is concerned it was highest ( $P \leq 0.05$ ) in Tarn-Taran (94.29 g) and lowest ( $P \leq 0.05$ ) in Moga (25.63 g) district. The consumption with respect to non-vegetarian diets showed that meat and bone consumption was maximum

**Table 1:** Feeding practices followed by urban and rural dog owners in Central Punjab

Variable	Urban (248)	Rural (243)
<b>Milk and milk products</b>		
Milk (ml)	330.24 ± 14.66	319.34 ± 15.03
Milk product (g)	135.89 <sup>b</sup> ± 12.63	229.79 <sup>a</sup> ± 17.57
Curd (ml)	227.36 ± 15.02	210.49 ± 11.97
Sweet (g)	8.19 ± 1.35	5.34 ± 0.97
<b>Cereals and pulses</b>		
Chapatti (#)	3.58 <sup>b</sup> ± 0.13	3.96 <sup>a</sup> ± 0.14
Dal (g)	40.48 ± 3.98	33.37 ± 3.38
Rice (g)	41.94 <sup>a</sup> ± 4.12	31.15 <sup>b</sup> ± 3.52
<b>Fruits and vegetables</b>		
Vegetables (g)	56.25 ± 5.38	44.32 ± 4.46
<b>Non-Vegetarian</b>		
Meat (g)	170.36 ± 13.34	158.33 ± 11.34
Bone (g)	36.29 <sup>b</sup> ± 4.52	52.26 <sup>a</sup> ± 6.96
Egg (#)	1.44 ± 0.07	1.47 ± 0.08

Values in parenthesis represent number of respondents; Figures in each row with different superscripts differ significantly ( $P \leq 0.05$ ).

**Table 2:** Comparative feeding practices followed by urban dog owners of the Central Punjab

Food items	Urban						
	Amritsar (46)	Fatehgarh Sahib (33)	Jalandhar (34)	Ludhiana (35)	Moga (32)	Patiala (33)	Tarn Taran (35)
<b>Milk and milk products</b>							
Milk (ml)	514.10 <sup>a</sup> ± 40.07	247.00 <sup>bc</sup> ± 29.31	297.10 <sup>bc</sup> ± 41.74	197.10 <sup>c</sup> ± 26.72	470.30 <sup>a</sup> ± 51.14	207.60 <sup>c</sup> ± 25.29	320.00 <sup>b</sup> ± 28.71
Milk product (g)	67.39 <sup>c</sup> ± 28.04	115.2 <sup>bc</sup> ± 33.95	113.2 <sup>bc</sup> ± 32.61	150.00 <sup>bc</sup> ± 32.14	254.70 <sup>a</sup> ± 54.04	65.15 <sup>c</sup> ± 33.09	211.40 <sup>ab</sup> ± 32.14
Curd (ml)	430.40 <sup>a</sup> ± 51.09	197.00 <sup>bc</sup> ± 20.52	213.20 <sup>b</sup> ± 38.07	238.60 <sup>b</sup> ± 26.18	161.30 <sup>bc</sup> ± 35.48	100.00 <sup>c</sup> ± 23.23	172.10 <sup>c</sup> ± 24.27
Sweet (g)	3.80 <sup>bc</sup> ± 1.89	14.85 <sup>a</sup> ± 5.04	5.8 <sup>abc</sup> ± 2.80	7.14 <sup>abc</sup> ± 3.00	1.25 <sup>c</sup> ± 0.75	12.12 <sup>ab</sup> ± 4.37	13.57 <sup>ab</sup> ± 4.73
<b>Cereals and pulses</b>							
Chapatti (#)	5.13 <sup>a</sup> ± 0.26	2.97 <sup>cd</sup> ± 0.31	2.59 <sup>d</sup> ± 0.31	2.80 <sup>d</sup> ± 0.30	4.50 <sup>ab</sup> ± 0.48	2.82 <sup>d</sup> ± 0.31	3.77 <sup>bc</sup> ± 0.30
Dal (g)	67.83 <sup>a</sup> ± 8.97	31.82 <sup>bc</sup> ± 10.59	23.53 <sup>bc</sup> ± 10.43	42.00 <sup>abc</sup> ± 10.28	37.50 <sup>abc</sup> ± 9.79	15.15 <sup>c</sup> ± 10.59	54.29 <sup>ab</sup> ± 10.28
Rice (g)	94.57 <sup>a</sup> ± 8.83	40.91 <sup>b</sup> ± 10.43	22.06 <sup>bc</sup> ± 10.28	38.57 <sup>b</sup> ± 10.13	6.25 <sup>c</sup> ± 4.35	27.27 <sup>bc</sup> ± 10.43	42.86 <sup>b</sup> ± 10.13
<b>Fruits and vegetables</b>							
Vegetables (g)	67.83 <sup>ab</sup> ± 12.24	65.15 <sup>ab</sup> ± 14.45	43.82 <sup>bc</sup> ± 14.24	54.29 <sup>bc</sup> ± 14.03	25.63 <sup>c</sup> ± 7.73	35.45 <sup>bc</sup> ± 14.45	94.29 <sup>a</sup> ± 14.45
<b>Non-vegetarian</b>							
Meat (g)	346.70 <sup>a</sup> ± 47.20	116.70 <sup>b</sup> ± 25.89	147.10 <sup>b</sup> ± 27.03	134.3 <sup>b</sup> ± 25.17	87.50 <sup>b</sup> ± 14.72	116.7 <sup>b</sup> ± 22.89	174.30 <sup>b</sup> ± 24.37
Bone (g)	68.48 <sup>a</sup> ± 12.76	18.18 <sup>b</sup> ± 6.82	45.59 <sup>ab</sup> ± 20.72	15.71 <sup>b</sup> ± 6.07	20.31 <sup>b</sup> ± 6.29	33.33 <sup>b</sup> ± 7.74	40.00 <sup>ab</sup> ± 10.00
Egg (#)	1.70 ± 0.16	1.45 ± 0.19	1.35 ± 0.19	1.46 ± 0.19	1.56 ± 0.30	1.30 ± 0.20	1.54 ± 0.19

Values in parenthesis represent number of respondents; Figures in each row with different superscripts differ significantly ( $P \leq 0.05$ ).

( $P \leq 0.05$ ) in Amritsar whereas it was minimum ( $P \leq 0.05$ ) in four districts viz. Fatehgarh Sahib, Ludhiana, Moga and Patiala. Non-significant difference was observed in egg consumption between all the districts of central Punjab. It was observed that in Ludhiana and Patiala district, many dog owner offer commercial readymade feed to the

dogs accordingly they offer less quantity of homemade products. Seneviratne *et al.* (2016) in which homemade diets were fed only to 42% of the dogs while commercial food accounted for 18% and both of these diets were fed to 40% of dogs. In another study, Laflamme *et al.* (2008) found that more than 90% of pet dogs were fed commercial

foods; however, non-commercial foods accounted to at least 25% of the diet for 17.3% of dogs. 23.6% of dogs were fed with bones or raw foods at least on weekly basis

### Comparative feeding practices followed by rural dog owners of the Central Punjab

The perusal of the data of feeding trends of rural dogs of all the districts (Table 3) shows that milk consumption was highest ( $P \leq 0.05$ ) in Moga (475.80 ml) and lowest ( $P \leq 0.05$ ) in Fatehgarh Sahib (230.60 ml) and Ludhiana (230.80). There was no significant ( $P \leq 0.05$ ) difference in consumption of milk product in all the rural areas of different districts except rural Patiala (48.57 g) where it was minimum ( $P \leq 0.05$ ). Curd feeding to dogs was maximum ( $P \leq 0.05$ ) in Tarn-Taran (300 ml), Amritsar (294.12) and Ludhiana (279.49) districts however curd consumption showed no significance ( $P \leq 0.05$ ) difference in rest of the districts of Central zone. There was no significant ( $P \leq 0.05$ ) difference in feeding of sweets among rural folks of all the districts except Ludhiana rural (12.82 g) where it was highest ( $P \leq 0.05$ ). No. of *chapattis* offered to dogs in rural areas was in highest ( $P \leq 0.05$ ) in Ludhiana (4.72) and Moga (4.64). However, the lowest ( $P \leq 0.05$ ) no. of *chapatti* were fed by the rural areas of Amritsar,

Jalandhar and Fatehgarh Sahib. Non-significant ( $P \leq 0.05$ ) differences were observed in dal feeding between all the districts of central Punjab. Rice feeding was maximum ( $P \leq 0.05$ ) in Amritsar district whereas Ludhiana district lag behind ( $P \leq 0.05$ ) in rice feeding. The feeding of rice to dogs in Fatehgarh Sahib, Tarn-Taran, Moga, Jalandhar and Patiala was comparable. The consumption of veggies by dogs was found to be maximum ( $P \leq 0.05$ ) in rural areas of Amritsar district and minimum ( $P \leq 0.05$ ) in rural areas of Jalandhar district. The consumption of non-vegetarian diets showed that non-significant ( $P \leq 0.05$ ) difference was observed in meat and egg consumption between all the districts of central Punjab. As far as the consumption of bone is concerned it was highest ( $P \leq 0.05$ ) in Patiala district. The consumption of bone by dogs found lowest ( $P \leq 0.05$ ) in Moga, Ludhiana and Jalandhar districts. Dodd *et al.* (2019) found that pet owners were more likely to be vegetarian (6.2%; 229/3, 673) or vegan (5.8%; 212/3, 673) than previously reported for members of the general population because of their huge interest in feeding plant-based diets. Tiwari *et al.* (2020) also reported that milk, milk product, curd, sweet and dal given by rural dog owners to their dog were highest in Ferozepur district than Fazilka district.

**Table 3:** Comparative feeding practices followed by rural dog owners of the Central Punjab

Food items	Rural						
	Amritsar (34)	Fatehgarh Sahib (31)	Jalandhar (33)	Ludhiana (39)	Moga (31)	Patiala (35)	Tarn-Taran (40)
<b>Milk and milk products</b>							
Milk (ml)	342.60 <sup>ab</sup> ±45.04	230.60 <sup>b</sup> ±38.36	295.50 <sup>b</sup> ±32.67	230.80 <sup>b</sup> ±26.08	475.80 <sup>a</sup> ±89.02	328.60 <sup>b</sup> ±53.38	345.00 <sup>ab</sup> ±39.34
Milk product (g)	235.30 <sup>a</sup> ±44.69	224.20 <sup>a</sup> ±46.81	204.54 <sup>a</sup> ±45.37	357.70 <sup>a</sup> ±41.73	338.70 <sup>a</sup> ±87.95	48.57 <sup>b</sup> ±44.05	199.80 <sup>a</sup> ±41.21
Curd (ml)	294.12 <sup>a</sup> ±29.68	182.30 <sup>b</sup> ±31.08	159.10 <sup>b</sup> ±30.13	279.49 <sup>a</sup> ±27.72	100.00 <sup>b</sup> ±24.10	121.43 <sup>b</sup> ±29.26	300.00 <sup>a</sup> ±27.37
Sweet (g)	5.15 <sup>b</sup> ±2.54	4.84 <sup>b</sup> ±2.67	3.63 <sup>b</sup> ±2.59	12.82 <sup>a</sup> ±2.38	4.19 <sup>b</sup> ±2.35	4.29 <sup>b</sup> ±2.51	1.75 <sup>b</sup> ±2.35
<b>Cereals and pulses</b>							
Chapatti (#)	3.26 <sup>b</sup> ±0.36	3.55 <sup>b</sup> ±0.38	3.33 <sup>b</sup> ±0.37	4.72 <sup>a</sup> ±0.34	4.64 <sup>a</sup> ±0.50	3.91 <sup>ab</sup> ±0.36	4.18 <sup>ab</sup> ±0.33
Dal (g)	30.74±9.07	23.26±9.49	24.24±9.20	42.31±8.46	45.16±9.09	27.14±8.93	38.63±8.36
Rice (g)	51.47 <sup>a</sup> ±9.30	43.55 <sup>ab</sup> ±9.74	24.24 <sup>ab</sup> ±9.44	15.38 <sup>b</sup> ±8.68	25.81 <sup>ab</sup> ±7.99	27.71 <sup>ab</sup> ±9.17	32.00 <sup>ab</sup> ±8.56
<b>Fruits and vegetables</b>							
Vegetables	80.88 <sup>a</sup> ±11.48	30.65 <sup>bc</sup> ±12.02	12.12 <sup>c</sup> ±11.65	34.62 <sup>bc</sup> ±10.72	32.26 <sup>bc</sup> ±8.53	51.43 <sup>ab</sup> ±11.32	63.00 <sup>ab</sup> ±10.58
<b>Non-vegetarian</b>							
Meat (g)	191.90±30.11	104.80±31.54	157.60±30.57	132.10±28.11	156.50±69.82	157.10±29.68	200.00±27.76
Bone (g)	68.38 <sup>ab</sup> ±18.32	45.16 <sup>ab</sup> ±19.19	33.33 <sup>b</sup> ±18.60	29.49 <sup>b</sup> ±17.11	29.03 <sup>b</sup> ±9.78	94.29 <sup>a</sup> ±18.06	63.13 <sup>ab</sup> ±16.89
Egg (#)	1.47±0.17	1.10±0.22	1.76±0.20	1.28±0.22	1.52±0.25	1.37±0.21	1.78±0.26

Values in parenthesis represent number of respondents; Figures in each row with different superscripts differ significantly ( $P \leq 0.05$ ).

### Feeding practices followed by dog owners of Punjab at different ages of dogs

Critical evaluation of data with respect to age (Table 4), irrespective of breed or districts that there was non-significant difference in consumption of milk at different age groups of dog. The consumption of milk product and curd was highest ( $P \leq 0.05$ ) in 1-4 year of age, however the consumption of these two product above 4 year of age is comparable. The consumption of milk product and curd was lowest in less than 1 year of age Interestingly the consumption of sweet offered to dogs increased ( $P \leq 0.05$ ) linearly with increase in age which could due to their love towards young ones.

Among the cereals and pulses, number of *chapattis* and *dal* offered was highest ( $P \leq 0.05$ ) in dogs of 1-4 year and more than 4 year of age whereas lowest in dogs with less than 1 year of age. Non-significant differences were observed in the consumption of rice and veggie in all three categories of age. As far as the consumption of non-vegetarian diet is concerned meat consumption (185.50 g) was highest ( $P \leq 0.05$ ) in dogs of 1-4 year age. The lowest ( $P \leq 0.05$ ) quantity (137.28 g) of meat was offered to the dogs of more than 4 year of age. However, the consumption of dogs of

less than 1 year of age was comparable with that of dogs of above 4 year of age. Bone consumption (53.91 g) was maximum ( $P \leq 0.05$ ) in dogs of 1-4 years of age however it was comparable with consumption (41.45 g) of dogs of above 4 years of age. The lowest ( $P \leq 0.05$ ) consumption (24.78 g) of bones was in the smaller age group *i.e.* less than 1 year of age. As far as the egg consumption is concerned non-significant difference was observed among all the age groups.

### Feeding trends of large, medium and small breed of dogs in Central Punjab

Data with regards to feeding trends of large, medium and small breed of dogs in Central Punjab is presented in the Table 5. The perusal of data revealed that there was non-significant difference between large and medium breeds of dogs in terms of milk and milk products consumption but consumption of these products in small breed was significantly ( $P \leq 0.05$ ) less. The Consumption of curd was highest ( $P \leq 0.05$ ) in large breed dogs but the consumption was comparable in medium breeds. However, the lowest ( $P \leq 0.05$ ) consumption of curd and sweet was in small breeds of dogs.

**Table 4:** Feeding practices followed by dog owners of Punjab at different ages of dogs

Variable	Age		
	< 1 Y (115)	1-4 Y (262)	> 4 Y (114)
<b>Milk and milk products</b>			
Milk (ml)	310.43 ± 23.27	337.02 ± 16.43	311.40 ± 22.34
Milk product (g)	141.30 <sup>b</sup> ± 17.42	208.36 <sup>a</sup> ± 17.42	164.04 <sup>ab</sup> ± 23.68
Curd (ml)	183.57 <sup>b</sup> ± 21.29	242.08 <sup>a</sup> ± 15.04	201.75 <sup>ab</sup> ± 20.43
Sweet (g)	3.61 <sup>b</sup> ± 1.95	7.0 <sup>ab</sup> ± 1.38	9.43 <sup>a</sup> ± 1.88
<b>Cereals and pulses</b>			
Chapatti (#)	3.26 <sup>b</sup> ± 0.18	3.99 <sup>a</sup> ± 0.14	3.77 <sup>a</sup> ± 0.19
Dal (g)	23.65 <sup>b</sup> ± 6.09	42.55 <sup>a</sup> ± 4.30	37.68 <sup>a</sup> ± 5.84
Rice (g)	32.17 ± 6.21	38.82 ± 4.38	35.97 ± 5.96
<b>Fruits and vegetables</b>			
Vegetables (g)	46.52 ± 8.17	51.22 ± 5.77	52.19 ± 7.84
<b>Non-vegetarian</b>			
Meat (g)	143.26 <sup>ab</sup> ± 19.21	185.50 <sup>a</sup> ± 13.56	137.28 <sup>b</sup> ± 18.43
Bone (g)	24.78 <sup>b</sup> ± 9.59	53.91 <sup>a</sup> ± 6.78	41.45 <sup>ab</sup> ± 9.21
Egg (#)	1.36 ± 0.13	1.55 ± 0.09	1.33 ± 0.12

Values in parenthesis represent number of respondents; Figures in each row with different superscripts differ significantly ( $P \leq 0.05$ ).



**Table 5:** Feeding trends of large, medium and small breed of dogs in Central Punjab

Variable	Breeds		
	Large (329)	Medium (45)	Small (117)
<b>Milk and milk products</b>			
Milk (ml)	356.08 <sup>a</sup> ± 13.12	390.00 <sup>a</sup> ± 33.94	211.97 <sup>b</sup> ± 20.44
Milk product (g)	199.97 <sup>a</sup> ± 13.91	234.44 <sup>a</sup> ± 36.00	97.53 <sup>b</sup> ± 21.68
Curd (ml)	233.81 <sup>a</sup> ± 12.08	229.11 <sup>ab</sup> ± 31.07	173.50 <sup>b</sup> ± 18.71
Sweet (g)	5.27 <sup>b</sup> ± 1.10	5.56 <sup>b</sup> ± 2.85	11.45 <sup>a</sup> ± 1.72
<b>Cereals and pulses</b>			
Chapatti (#)	4.32 <sup>a</sup> ± 0.11	4.11 <sup>a</sup> ± 0.29	2.11 <sup>b</sup> ± 0.17
Dal (g)	42.89 <sup>a</sup> ± 3.43	25.56 <sup>b</sup> ± 8.89	24.70 <sup>b</sup> ± 5.35
Rice (g)	39.66 ± 3.50	33.08 ± 9.05	23.33 ± 5.45
<b>Fruits and vegetables</b>			
Vegetables (g)	55.56 ± 4.61	49.33 ± 11.92	36.07 ± 7.18
<b>Non-vegetarian</b>			
Meat (g)	200.99 <sup>a</sup> ± 10.83	160.00 <sup>a</sup> ± 28.02	63.25 <sup>b</sup> ± 16.87
Bone (g)	52.43 <sup>a</sup> ± 5.41	50.00 <sup>a</sup> ± 14.00	18.80 <sup>b</sup> ± 8.43
Egg (#)	1.59 <sup>a</sup> ± 0.07	1.47 <sup>a</sup> ± 0.19	1.1 <sup>b</sup> ± 0.11

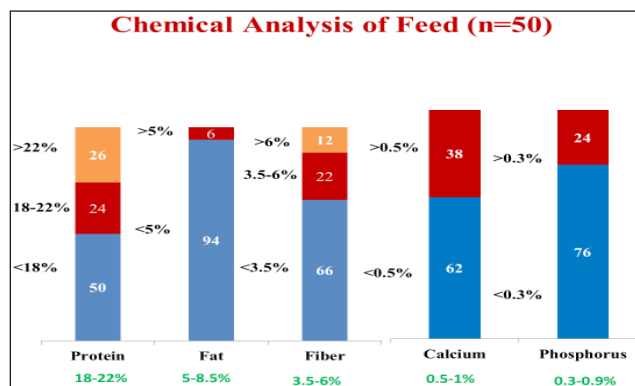
Values in parenthesis represent number of respondents; Figures in each row with different superscripts differ significantly (P≤0.05).

With regards to consumption of cereals and pulses it was observed that the consumption of chapatti showed non-significant difference between large and medium breed of dogs. However, the consumption of *chapattis* was lowest (P≤0.05) in small breed dogs. The consumption of dal exhibited significant (P≤0.05) difference among large breeds followed by medium and small breeds. The consumption of dal in medium breeds was significantly (P≤0.05) less than large breeds but more (P≤0.05) in small breed. As far as the consumption of rice and veggies is concerned there was no significant (P≤0.05) difference in all the breeds.

The consumption of non-vegetarian diets showed non-significant (P≤0.05) difference amongst meat, bone and egg consumption in large and medium breeds but the consumption was significantly (P≤0.05) less in small breed dogs. The overall consumption pattern confirms that the consumption in small breed is less due to their size but amongst large and medium breed’s consumption pattern is same. Sawaimul *et al.* (2009) also reported that large breed (German Shepherd) was the most popular breed in Nagpur.

### Chemical analysis of dog food

The dog food samples obtained from Central Punjab were analyzed for various proximate parameters (Fig. 1).



**Fig. 1:** Chemical analysis of feed

50 feed samples collected from urban and rural areas of Central Punjab during survey it was found that 24% of feed samples were in range of 18-22% protein however 26% feed samples were having more than 22% protein,

whereas 50% feed sample were having less than 18% protein. Following fat analysis of feed sample it was noticed that 94% of the feed samples were having less than 5% fat and only 6% feed samples were having more than 5% of fat. In fibre analysis it was observed that 66% of feed sample were having fibre less than 3.5%. 22% of the feed samples were in range of 3.5-6% whereas 12% of the feed samples were found to have more than 6% fibre. Hewson-Hughes *et al.* (2013) conducted research using nutritional geometry in a controlled environment has demonstrated that dogs of various breeds select a macronutrient profile in which 30% of their metabolizable energy comes from protein, 63% from fat and 7% from carbohydrates. As far as calcium and phosphorus is concerned 62% of sample were having less than 0.5% calcium and 38% sample were having more than 0.5% calcium. 76% of sample were seen to have less than 0.3% phosphorus and 24% of sample were having more than 0.3% phosphorus. 60% of the feed samples was found not to fulfill the overall nutrient requirement of dogs whereas only few samples crossed the upper limit which depends upon the source of ingredients. Shakhar *et al.* (2010) found that in India, the diets seem to be nutritionally inadequate and/or imbalanced especially with respect to protein, energy and minerals especially calcium and phosphorus.

#### Physio-chemical properties of dog diet of different districts

The dog food samples obtained from all the seven

districts of Central Punjab were analyzed for various physio-chemical (pH, free fatty acids and Peroxide value) and microbiological (Standard Plate Count (SPC) and coliforms count) parameters (Table 6). The data of the dog food samples from all the districts of Central Punjab revealed that the pH value was less than 4 *i.e.* the samples were having acidic nature which may be due to the higher proportion of milk and milk products which when dried lead to acidic conditions. Estimation of free fatty acids and peroxide value was performed to check the fat rancidity was very less which might be due to good quality of different food ingredients given to the dogs. The mean values of the microbiological parameters such as SPC and Coliforms were also well below the prescribed limits of the cooked dog foods. The results found by Fredriksson-Ahoma *et al.* (2017) concluded that 28% of the RMBDs showed enteric pathogens and *Campylobacter* was the most frequent pathogen found in 15% of the RMBDs whereas all the samples were negative for *Campylobacter jejuni* and *Campylobacter coli*. Salmonella was detected in only 2% of the samples and, surprisingly, *Y. pseudotuberculosis* was also detected in two samples. Since all the samples taken were fresh and analyzed as such, Aflatoxin presence was obviated. However, the commercial feed offered to dog owners showed aflatoxin below the prescribed limits.

As per the study report, it is concluded that mixed feed (>50 %) is preferred choice by dog owners in Central Punjab. Moreover, 60% of the feed samples did not fulfill the nutritional requirements (except fat) of dogs.

**Table 6:** Physio-chemical properties of dog diet of different districts

Parameters	Districts						
	Ludhiana (7)	Jalandhar (8)	Fatehgarh Sahib (7)	Patiala (7)	Moga (7)	Amritsar (7)	Tarn-Taran (7)
pH (7)	4.13 <sup>c</sup> ±0.12	4.36 <sup>bc</sup> ±0.15	2.97 <sup>d</sup> ±0.16	3.32 <sup>d</sup> ±0.24	5.19 <sup>a</sup> ±0.08	4.75 <sup>ab</sup> ±0.09	4.71 <sup>ab</sup> ±0.19
Free Fatty Acid (<2%)	0.25 <sup>bcd</sup> ±0.03	0.18 <sup>d</sup> ±0.02	0.32 <sup>ab</sup> ±0.03	0.22 <sup>cd</sup> ±0.04	0.40 <sup>a</sup> ±0.02	0.33 <sup>ab</sup> ±0.03	0.29 <sup>bc</sup> ±0.03
PV (1-2%)	0.51 <sup>b</sup> ±0.10	1.02 <sup>a</sup> ±0.17	1.00 <sup>a</sup> ±0.14	0.69 <sup>ab</sup> ±0.09	1.12 <sup>a</sup> ±0.09	0.86 <sup>ab</sup> ±0.14	0.58 <sup>b</sup> ±0.15
TPC (<7 log <sub>10</sub> cfu/ gm)	2.40 <sup>b</sup> ±0.07	2.56 <sup>ab</sup> ±0.11	2.55 <sup>ab</sup> ±0.10	2.52 <sup>ab</sup> ±0.12	2.80 <sup>a</sup> ±0.08	2.39 <sup>b</sup> ±0.07	2.53 <sup>ab</sup> ±0.09
Coliform (<3 log <sub>10</sub> cfu/gm)	1.17 <sup>a</sup> ±0.22	0.38 <sup>b</sup> ±0.25	1.16 <sup>a</sup> ±0.30	1.43 <sup>a</sup> ±0.07	1.13 <sup>a</sup> ±0.24	1.09 <sup>a</sup> ±0.20	0.94 <sup>ab</sup> ±0.25

Values in parenthesis represent number of respondents; Figures in each row with different superscripts differ significantly (P≤0.05).



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